PONTIFICIA UNIVERSITAS GREGORIANA

FACULTAS TEOLOGIAE

MADE IN his IMAGE AND LIKENESS

Human Cloning Against Principles of Life: An Ethical Approach

CAROLUS B. KUSMARYANTO, SCJ

Dissertatio ad Doctoratum
In Facultae di Teologiae
Pontificiae Universitatis Gregorianae

ROMAE 2004

Vidimus et approbamus ad normam Statutorum Universitatis

Romae, ex Pontificia Universitate Gregoriana
Die 14 mensis Junii anni 2004

R. P. Prof. Philipp Schmitz, SJ
R. P. Prof. Mark Attard, O Carm

ACKNOWLEDGEMENT

In presenting this dissertation, I feel boundless gratitude to God because of his presence, assistance, and guidance throughout my life, especially during my study in Rome and particularly for his special grace enabling me to complete this dissertation.

Many people have helped me to bring this study into a completion. In this special occasion, I would like to express my sincere gratitude to all of you. My special thanks go to my director of this dissertation, Rev. Fr. Prof. Philipp Schmitz, SJ for his valuable insights, suggestion, and vision in directing my research and especially his patience, guidance, wisdom, and encouragement, especially during my difficult time. Thank you also to Rev. Fr. Prof. Norman Tanner, SJ who presided the public discussion on June 8, 2004 at the Gregorian University – Rome. I want to thank also to Rev. Fr. Prof. Mark Attard, O.Carm who is the second reader of this dissertation and gave me many interesting insights in the public discussion. Certainly, many thanks to Pontifical Gregorian University, who accepted me as a student and accept my proposal to make a research on human cloning.

I am immensely grateful to the Provincial of the Priest of Sacred Heart of the Indonesian Province, who gave me this good opportunity to study in Rome. Thank you to Father General and his councils for his constant support and encouragement. My gratitude also goes to Father Rector and all of my confreres in Collegio Leone Dehon (Rome) for their brotherhood, moral support, and encouragement whilst living together in the community. I want to thank to my Indonesian confreres who support me with their love and attention. I also want to say thank you to the Indonesian Community in Rome (IRRIKA) whose constant supports, brotherhood and loves give me a good environment to live. I want to thank also to His Excellency Mr. Bambang Prayitno and

madamme, the Indonesian Ambassador to the Holy See (Vatican), Mr. and Mrs. Mozes Tandung Lelating, and all of staffs. The Indonesian Ambassador to the state of Italy, His Excellency Mr. Freddy Numberi, Mrs. Annie Numberi and his staffs.

I am deeply indebted to the correctors of my English. They are Sister Kathleen OSU, Sister Helen FDNSC, Father David Marsden SCJ, Sister Claire Marie SJH (Bound Brook, NJ, the USA) and Rev. Fr. Peter McKenna SCJ (Toronto, Canada). They helped me in an extraordinary way so that the present dissertation can be understood more easily.

Finally, I thank my parents, my brothers, and sisters whose constant love, support, and prayers encourage me to finish my study in Rome.

May God bless you all and reward you abundantly.

Rome, July 20, 2004

Carolus B. Kusmaryanto, SCJ

TABLE OF CONTENTS

INTRODUCTION 5

CHAPTER I: HUMAN CLONING 15

A. Terminology 15

B. History of Cloning and Stem Cell Research 19
1. Literature 19
2. Scientific Research 21
   a. Cloning of Amphibians 22
   b. Cloning of Mammalians 27
   c. Cloning of Human Beings 38
   d. Stem Cell Research 41

C. Biology of Human Life 47
1. Biological Factors of Human Life 47
2. Hereditary 51
   a. Ancient Answer 51
   b. Modern Answer 54
3. Natural Fertilization of the Human Gametes 56
   a. Genome of the Child 59
   b. Sex of the Child 60
4. Natural Development of the Human Embryo 61
   a. Coordination 65
   b. Autonomy/Independency 66
   c. Continuity 67
   d. Gradualness 69

D. Biological Aspects of Cloning 70
1. Techniques of Cloning 70
   a. Embryonic Splitting or Twinning 70
   b. Somatic Cell Nuclear Transfer 73
2. Biological Breakthrough of Cloning 81
3. Identical Genome of Cloned People 85

4. The Beginning of Life in Human Cloning 88
5. New Proposed Terminologies 91
a. The Principal Actor and the Result of Cloning 91
b. The Direct Product of Cloning 94
c. Inner Cell Mass 97
d. Type of Cloning 98
6. Types of Cloning 102
a. Cloning to Create Human Beings 102
b. Cloning to Create Therapeutic Means 103
- Cloning to Create Therapeutic Means Using Human Cells 103
- Cloning to Create Therapeutic Means Using Animal Cells 105
7. Description of Stem Cells 108
a. Definition 109
b. Types of Stem Cells 111
- Embryonic Stem Cells 112
- Adult Stem Cells 114
c. Advantages and Disadvantages of Each Type of Stem Cells 116
- Embryonic Stem Cells 116
- Adult Stem Cells 118

E. Objectives of Human Cloning 119
1. Reproduction 119
2. Therapy 123
a. Regenerative Medicine 123
b. Transplantations 124
c. Testing New Drugs 125
3. Eternal life/Immortality 125
4. Business 127

CHAPTER II: THE PROPERTIES OF HUMAN LIFE 131

A. Identity and Status of the Human Embryo 131
1. Biological Base 133
a. Beginning of Life 133
b. Pre Embryo 147
- Pre-embryo and Clifford Grobstein 147
- Pre-embryo and Individuality 151
2. Personhood of Human Embryo 158
a. Person as Legal Subject 162

b. Person as Moral Subject 163
c. Human Embryo as Person 164
3. Biological Identity, Uniqueness, and Unrepeatability of Human Life 167

B. The Value of Human Life 171
1. Life as a Basic Human Right 174
2. Intrinsic and Extrinsic Value of Human Life 177
3. Dignity of Human Life 182
a. Terminology and Meaning of the Dignity of Human Life 183
b. Dignity of Human Life According to the Catholic Church 189
c. Dignity of Human Life in the Secular Context 197
d. Dignity of Human Life in Bioethics 200
4. Right to Life 205
5. Sanctity of Life 209
a. Terminology and Context of the Sanctity of Life 209
b. Biblical Base 212
c. Sanctity of Life in Bioethics 216
d. Sanctity of Human Life Versus the Quality of Human Life 217
6. Inviolable Value of Human Life 222
a. Inviolable Value of Human Life in Christian Tradition 222
b. Inviolable Value of Human Life in Philosophical Context 227

CHAPTER III: DANGERS OF HUMAN CLONING 231

A. Human Beings Playing God 233
1. God as Creator and Human Beings as Creatures 234
a. Human Beings as Creatures 236
b. Created as Man and Woman 239
c. Created and Loved 242
2. Life of Human Being as a Gift from God 245
3. Dominion over the Earth and Participation in God's Creative Work 249

B. Human Cloning as Against Human Dignity 255
1. Confusing the Personal Identity 257
2. Limiting Freedom and Auto-determination 263

3. Making Unequal of Human Beings otherwise Equal 267
4. Transgressing the Right to not Know the Future 270
5. Forcing to Live in the Shadow of other Person 272

C. Transmission of Life 274
1. Cloning as against the Right to be Conceived in Natural Way 281
2. Children at any Cost 285
3. Distortion of Familial Relationship 288

D. Research on Human Embryos and Its Regulation 296
1. Freedom of Research in Biomedical Research and Its Regulation 296
2. Ethical Principles of Biomedical Research on the Human Embryo 298
   a. International Agreement on Biomedical Research on the Human Embryo 299
   b. The Christian Teaching on Biomedical Research on the Human Embryo 307

E. Technique of Cloning and Its Related Problems 312
1. Technological Fatalism 314
2. Embryos as Instrument 316
3. Women as Instrument 319
4. Eugenics and Planned Killing 325
5. Health Dangers of Technically Related Cloning 329

CHAPTER IV: ALTERNATIVE SOLUTIONS 335

A. Adult Stem Cells 336

B. Tissue Engineering 339

GENERAL CONCLUSION 341

BIBLIOGRAPHY 347

INTRODUCTION

One of the most important biological achievements that marked the last century was the cloning of Dolly which was announced on February 27, 1997.[1] This cloning of Dolly was one of the most significant biological breakthroughs in research and technology in the area of bio-molecular sciences. The cloner of Dolly, Ian Wilmut, stated that, "*her birth overturns one of the deepest dogmas in all of biology.*"[2] Before the success of Dolly, biologists were convinced that the specialized cells would remain specialized cells and could not be "rebooted" into totipotent or multipotent cells. The success of Dolly overturned this deepest dogma because Ian Wilmut and his team succeeded in making specialized cells into totipotent cells which developed into a full living being.

The reaction of people regarding the announcement of the birth of Dolly was varied. On the one hand, people were very enthusiastic about hearing this announcement, but, on the other hand, people were afraid, anxious and worried. The real reason for such a reaction was not the birth of Dolly itself, but what this meant for the next step in cloning. People asked, "What is next?" Certainly, people thought that sooner or later the next step would be human cloning.

At the time of the writing of this thesis, human cloning as a means of reproduction has not yet become a reality although Korean scientists succeeded in making human embryo but the embryos was

---

[1] Ian Wilmut, A.E. Schnieke, J. McWhir, Keith H. Campbell, "Viable offspring derived from fetal and adult mammalian cells", in *Nature* 385(1997) 810 – 813. Actually, Dolly was born on July 5, 1996 but it was announced only on February 27, 1997. Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 208

[2] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 3

stopped their development in the age of five days[3]. Yet the anxiety of people has not calmed. As a matter of fact, this anxiety has been heightened by some announcements of some successful human cloning, which until now has never been verified or validated. Researchers from many disciplines of science pay attention to the development of cloning because each of them has his own interest (concern) in the subject. Human cloning has become a meeting point for many studies such as biology, medicine, psychology and ethics. Researchers in these areas of science can share information and dialogue with each other while still maintaining the autonomy and competency of their respective science.

This dialogue among many sciences is a must in this modern world so that we may have a holistic approach to resolving problems. This holistic approach is very important because human problems are never just single problems as much as they are complex and interrelated problems. In this way, we have many points of view that can enrich one another. This study of human cloning is one of the contributions to a holistic approach to human cloning from an ethical point of view.

1. Choice of theme, scope and limitation of the thesis

Cloning a human being is new discovery. Because it is a new discovery, there are still many obscure and confusing aspects. Although the process of cloning seems quite simple – inserting the nucleus of a somatic cell into an enucleated ovum and then exposing them to an electrical current to stimulate them to divide and develop into full beings – in fact it is a very complicated process and there are still many questions regarding the techniques and their application to clinical use[4]. This might be the main reason why the success rate of cloning is still very low. The success rate of animal cloning ranges from 1% to 3%[5].

Some confusion may also arise from the meaning of the word cloning and its derivation. If the word cloning itself does not have a single meaning, then one can expect that the product of cloning and its

---

[3] Tim Radford, "Korean scientists clone 30 human embryos" in *British Medical Journal* 328 (2004) 421, February 21, 2004

[4] Philip Hunter, "Differentiating Hope from Embryonic Stem Cells" in *The Scientist* vol. 17 no.24 (December 2003) 31

[5] Tanja Dominko, Calvin Simerly, Crista Martinowich, and Gerald Schatten, "Cloning in Nonhuman Primate", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 422;

related issues may produce even more confusion. In some cases, the confusion regarding terminology and meaning has its origin not only in the obscurity of the objects, but also in the moral position (moral stance) of the users regarding certain issues implied in the terms because the terms and their usages are not free of value. Some people prefer to use or not to use certain terminology because of the ethical dimensions of the terminology with which they may or may not agree.

Confusion also arises from an ethical perspective. Ethical confusion originates in many ways: disagreement about the moral status of the embryo, disagreement about the principles of research concerning the use of the human embryo, disagreement about the status of the early stages of a cloned human being and so forth. Certainly, this confusion leads to significant controversy as is noted by Ronald M. Green, one of the leading bioethicists of the Ethics Institute at Dartmouth College in the state of New Hampshire in the United States. He stated, "*No biomedical technology has produced more ethical controversy or fear than has human cloning.*"[6]

On the level of the Magisterium of the Church, there is no systematic official teaching. All that we can find at this moment is a quick reaction of the Pontificia Academia Pro Vita[7] to the announcement of the cloning of Dolly as well as some declarations from the Permanent Observer of the Holy See to the United Nations in the year 2002[8] and in the year 2003[9], and some scattered phrases of the Pope's discourses.[10] The Church seemingly wants to wait and see the development and the result of cloning before it gives a systematic official teaching. The Church needs more knowledge and time for deeper reflection.

---

[6] Ronald M. Green, "Ethical Implications of Cloning", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 477

[7] Pontificia Accademia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997,

[8] Renato R. Martino, "Remarks to the United Nations on Human Cloning", in *The National Catholic Bioethics Quarterly* 2(2002) 140;

[9] http://www.vatican.va/roman_curia/secretariat_state/2003/documents/rc_seg-st_20031021_migliore-cloning_en.html

[10] L'Osservatore Romano, Lunedì – Martedì 10 – 11 Novembre 2003, page 5; Pope John Paul II, "Address to the International Congress on Transplant", in *The National Catholic Bioethics Quarterly*, 1(2001)90; John Paul II, "Remarks to President Bush on Stem Cell Research", in *The National Catholic Bioethics Quarterly* 1(2001) 618

In the midst of these obscurity and confusion regarding cloning, this dissertation chooses the theme of human cloning as a challenge to unveil some of its ethical problems. It is an attempt to bring light to this obscurity so that we may better know the problems regarding human cloning. Sometimes we arrive only at an understanding of the problems without knowing precisely how to solve these problems. There are still many of them unresolved.

The main focus of this thesis is the ethical problems of human cloning. Two groups of criteria will be presented to evaluate these ethical problems. The first group is God's revelation which is eternalized in Scripture and the Church's tradition (the teachings of the *Magisterium*). The second group of criteria is what many people call "*bioetica laica*"(lay bioethics)[11], that is bioethical reflections without any direct reference to God's revelation. Personally, the author of this dissertation does not agree with this division because it sounds as though there are two kinds of truth. In this thesis we attempt to reconcile these two groups of criteria to enlighten the real ethical problems regarding human cloning.

2. Methodology

Cloning is an important outcome of long research, many studies and laboratory experiments in recent decades. Many scientists and researchers have worked hard in their laboratories to study the nature of cells and their development with the hope they would be able to imitate and manipulate cells. Scientists have discovered that the most important factor in being a living being is the normal completeness of chromosomes of cells according to each species. In human beings, the normal completeness of human chromosomes is 46 chromosomes; in a house mouse, 40; and in a fruit fly (*Drosophila melanogaster*), 8. After discovering the nature, development, and behavior of cells, researchers have tried to imitate and manipulate their development and behavior in their laboratories to build new living beings. Briefly, cloning is primarily a laboratorial work which tries to imitate and – if it is needed

[11] For the discussion of the "bioetica Laica", see Luigi Lorenzetti (ed.), *Teologia e Bioetica Laica*, EDB, Bologna, 1994; Laura Palazzani, "Dall'etica 'Laica' alla bioetica 'laica': Linee per un approfondimento filosofico – critico del dibattito Italiano Attuale" in *Humanitas* 46 (1991) 513 – 546

– to manipulate the cells or deviate their development to create a new living being.

Although cloning is primarily a laboratorial work, the present reflection will begin not in the laboratory but in the natural locus of embryonic generation and development, the womb of women. To better understand the problem of human cloning, one needs to know well the natural generation and development of a human embryo. For this reflection, we can rely on many natural scientists who have worked diligently to discover the nature and structure of human fertilization and its development. The discoveries in the last decades are fantastic.

The biological foundations are important for the process of ethical reflection on human cloning because the starting point of our reflection is reality. Therefore, our reflection has a solid basis in reality and is not merely speculation. Biology gives natural data upon which philosophers and theologians can reflect and philosophers and theologians can contribute an inner reflection and direction upon which the natural sciences can proceed.

Certainly, there are conditions in which mutual enrichment and a holistic approach can bear good fruit. First of all, it is related to the biological data and its interpretations. Both philosophers and natural scientists must have a clear vision and understanding of biological data and the interpretations which are given by the scientists themselves. Then, the philosophers are involved in selecting the more consistent and convincing of those explanatory hypotheses which deal with the empirical aspects of reality.[12]

And, the second condition focuses on the process of analyses. Certainly, the natural scientists must follow a scrupulous scientific logic in explaining their collected data, but there is a need for them to go further in drawing conclusions derived from their findings. They must have a willingness to employ the process of philosophical analysis and of inference from the human sciences. This process is important in acknowledging the value of the conclusions which were drawn from

---

[12] Angelo Serra and Roberto Colombo, "Identity and Status of the Human Embryo: the Contribution of Biology", in Juan de Dios Vial Correa and Elio Sgreccia (eds.), *Ide tity and Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Città del Vaticano, 1998, pp. 128 - 129

the process itself, a value which is of a speculative as well as operative order.[13]

Certainly this type of reflection has a weakness. Since our understanding of the reality (c.q. biological data) changes continuously so the stepping stones of our reflection change. Therefore, the final result of the reflection may have a slight difference from time to time, although some ethical principles will remain unchanged. But this point also may become the strength of this ethical reflection. Because of the changes (development) of our knowledge of the biological data, our reflection becomes more dynamic and always up to date to catch up with the new development of human civilization. In this way, ethical reflection will be dynamic and fruitful.

The biological foundation should become a bridge whereby many disciplines of science are able to dialogue and sit together to resolve the many problems of human beings for the well-being of humankind. "To build the bridge" between the different cultures (science and the humanities) is precisely the original aim of bioethics as it was formulated by the inventor of the term bioethics, Van Rensselaer Potter, in his famous book *Bioethics: Bridge to the Future*[14]. According to Potter, this bridge is very important for the survival of human beings.[15] Though a relatively new science, bioethics proves to be a place of dialogue and a bridge for many disciplines of science.

This bioethical dialogue between different partners is encouraged by Pope John Paul II in his encyclical *Evangelium Vitae*, "*The emergence and ever more widespread development of bioethics is promoting more reflection and dialogue—between believers and non-believers, as well as between followers of different religions—on ethical problems, including fundamental issues pertaining to human life.*"[16] But the Pope insists further than Potter on the topic of the aim of the dialogue. The Pope calls for the reflection on life itself and not only on the survival of human beings when he says, "*where people's expectations are no longer concentrated so much on problems of survival as on the search for an overall improvement of living*

---

[13] Angelo Serra and Roberto Colombo, "Identity and Status of the Human Embryo: the Contribution of Biology", p. 129

[14] Van Rensselaer Potter, *Bioethics: Bridge to the Future*, Prentice-Hall, Englewood Cliffs, 1971, page vii.

[15] Cf. Van Rensselaer Potter, "Bioethics: The Science of Survival" in *Perspective in Biology and Medicine* 14 (1970) 120 – 153

[16] *Evangelium Vitae*, no. 27

conditions, especially significant is the reawakening of an ethical reflection on issues affecting life."[17]

Indeed, the center of the bioethical reflection should be life itself. The properties of human life are the paradigm principles in judging human cloning. The explanation of the properties of human life has its basis in two categories: the biological aspect and the philosophical–theological aspect. In the biological aspect, we draw some conclusions based on the biological data which is provided by the experts in this area. In the philosophical–theological aspect, we describe the value of human life based on philosophical and theological reflection. Here we explain some important factors regarding human life, such as the fact that life is a basic human right which must be respected, the life of human beings has intrinsic value and dignity so that it cannot be regarded as a means but as an end in itself, and finally that life is sacred and, therefore, it cannot be violated.

These are the steps to be followed in this dissertation. The First Chapter will describe the biological data of human cloning. The Second Chapter will be the reflection on the properties of human life which become the evaluating principles of human cloning. Then emerge the ethical problems regarding human cloning which are described in the Third Chapter. It will be clear in this third chapter that human cloning cannot be justified ethically. Since human cloning cannot be justified ethically, some alternatives will be offered in the Fourth Chapter.

Briefly, in reflecting on the ethical problems of human cloning, we will employ the method of interfacing the two elements: the biological data as the basis or stepping stone of reflection and then interfacing this data with the properties of human life in order to bring a light to the ethical problems. Its conclusion is clear: human cloning cannot be justified ethically because it is in conflict with so many ethical principles.

It is important to note that up until the time when this thesis was written, there was no reported success of viable human cloning as a mean of reproduction. Therefore, there is no example of cloned human beings as the point of reference to verify the validity of my research. Thus, this study is a tentative and prognostic study. It is an anticipation of a possible successful human cloning which lies ahead of us. Up to the present, not everything is clear because of the lack of biological knowledge about the process of genetic reprogramming and the

---

[17] *Evangelium Vitae*, no. 27.

epigenetic consequences of transferring a nucleus into an enucleated ovum and reprogramming specialized cells and the real experience.[18] But it is not impossible that researchers will succeed in cloning a human being in the future although human cloning is prohibited legally in most countries. If it ever happens, we are ready to anticipate the ethical problems.

Although it is true that our starting point is a reality or real biological data, our reflection surpasses the real biological data and goes to the "not yet real data". That is the reason why we must be open to unexpected possibilities. It is possible that what we now see as a problem may not be a problem in the future or vice versa. This dissertation attempts to identify the possible problems, both the lasting problems as well as the temporary problems which exist in human cloning.

3. Actuality of the Theme

Cloning in general and especially the cloning of a human being is a very actual topic. Although the hoped for result of cloning (a new human being or therapeutic means) are not yet available, discussions, seminars, and courses are held in all over the world. Even people on the streets talk about human cloning. Every new development makes the headlines of the newspapers and breaking news on the televisions.

There are varied motives why people are interested in the cloning of human beings. Many people want to know about the cloning of human beings only for the sake of curiosity because it is a new thing which they have never imagined before. Some other people want to know because of the promises that 'cloning to create therapeutic means' will cure many incurable diseases. Some people even say that the success of stem cells would totally change medical science and the way we cure illness.

4. Sources

Although bioethics in general and especially in the area of cloning is new, literature on this new science is abundant. There are

---

[18] Roberto Colombo, "La Clonazione Umana: Aspetti Antropologici e Morali", in *L'Osservatore Romano* August 20, 2003, page 5

many books, journals, articles, and news broadcasts that discuss cloning. Some basic bioethical books, especially those which were published after the announcement of Dolly, also discuss human cloning. Certainly, human cloning cannot be separated from the discussion of human embryology, genetics, and reproduction in general. The real problem for an ethicist who is not an expert in biology, is not to get the information but to select good and authoritative sources that can guarantee originality and correctness.

Since the development and new areas of concern in bioethics research are moving rapidly, many researchers have published their discoveries and research only on the Internet, which has become a more and more important part of modern life due to its convenience, easiness, and abundant information. For the present study, the sources from the internet played a role in collecting information about bioethics in general and especially in the cloning of a human being. The selection of authoritative websites is very important. In selecting the authoritative websites, we have used websites which have been cited or recommended by highly respected authors or books.

Finally, this work is not gender sensitive. When the term "he" or "man" is used to designate the single third human person, it does not mean that woman is excluded. In this work, we do not want to enter in the gender problem but it is only a way to simplify in writing this work.

CHAPTER I

HUMAN CLONING

A. Terminology

The word cloning comes from the Greek word κλων, *klôn*, which means slip, twig, or stem as Plato used it in his book Protagoras[1]. In ancient usage, the word *klôn* was used primarily by gardeners as a means to multiply the plants in their gardens[2]. There are many ways to multiply plants and one of them is called *klôn*. How did they make a *klôn*? A good branch was bent in such a way that a part of it was buried in the land without cutting it from the tree while the other part (the one with leaves) was left unburied. After a couple days or so, the part of the

---

[1] In the dialog between Socrates and Protagoras, he said, "*I know of many thing that are disadvantageous to humans, foods and drinks and drugs and many other things, and some that are advantageous; some that are neither to humans but one or the other to horses; some that are advantageous only to cattle; some only to dogs some that are advantageous to none of these but are so to trees; some that are good for the roots of a tree, but bad for its shoots, such as manure, which is good spread on the root of any plant but absolutely ruinous if applied to the new stems and branches.*" For the words "new stems" he used words "*néous klônas*" (Protagoras, 334b). See John M. Cooper (editor) *Plato: Complete works*, Hackett Publishing Company, Cambridge, 1997, p. 767

[2] George E. Seidel, Jr, "Genetic and Phenotypic Similarity among Members of Mammalian Clonal Set", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 215; Juan-Ramón Lacadena, *Genética y Bioética*, Comillas, Madrid, 2002, p. 205; National Academy of Sciences, *Scientific and Medical Aspects of Human Reproductive Cloning*, National Academy Press, Washington, D. C., 2002, p. 19; Anne McLaren, "Introduction", in Council of Europe, *Cloning: Ethical Eye*, Council of Europe Publishing, Strasbourg, 2002, p. 9; Craig Donnellan, *The Cloning Issue*, Independence, Cambridge, 2002, p. 2

branch that was buried in the land started growing stems in the branch and roots. After it had enough roots to support independent life, the branch was cut off from the tree and planted in a different place so that the new plant emerged and had the same characters as the original mother[3]. Later on, the word κλων, (*klôn*) entered in the English vocabulary and became: to clone (verb), clonal (adjective), cloning (noun), clonally (adverb), and cloner (noun)[4].

Among the one-cell organisms, such as bacteria, cloning is a very normal process of reproduction, because their reproduction is done by dividing themselves so that their genome is identical to each other and to the ancestral cell[5]. As it has been mentioned above, cloning is also commonplace in the plant world of reproduction. People have been engaged in cloning as a way to multiply plants for many centuries. While in mammalians and human beings, the identical genome occurs in a limited way, in the early development of the embryo in what we call twinning which refers to one embryo which splits and becomes two or more embryos.

Although the term was originally used loosely to mean asexual reproduction of any kind[6], following early experiments in the manipulation of hereditary and reproductive process during the mid-1960-s, the term became more and more associated with animal/human biological engineering[7].

---

[3] Henri Atlan et al., *Le Clonage Humain*, Seuil, Paris, 1999, p. 9; Giovanni Russo, *La Clonazione di Sogietti Umani*, Coop. S. Tom, Messina, 1997, p. 9

[4] It is better not to confuse with the similar word "*clonus*" (noun) and "*clonic*" (adjective) which means "*rhythmical contraction of a muscle in response to a suddenly applied and then sustained stretch stimulus. It is most readily obtained at the ankle when the examiner bends the foot sharply upwards and then maintains an upward pressure on the sole. It is caused by an exaggeration of the stretch reflexes and is usually a sign of disease in the brain or spinal cord*". Elizabeth A. Martin (Editor), *Oxford Concise Medical Dictionary*, Oxford University Press, Oxford, 1998, p. 133

[5] Advisers to the President of the European Commission on the Ethical Implications of Biotechnology, "Ethical Aspects of Cloning Techniques", in *Journal of Medical Ethics* 23 (1997) 349

[6] Craig M. Klugman and Thomas H. Murray, "Cloning, Historical Ethics, and NBAC" in James M. Humber and Robert F. Almeder (eds.), *Human Cloning*, Humana Press, Totowa, 1998, p. 7

[7] Dorothy Nelikin & M. Susan Lindee, "Cloning in the popular Imagination", in Arlene Judith Klotzko (ed), *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001, p. 83

In line with above definition, until a couple of decades ago, cloning was used in a broad sense for many molecular terminologies; such as, *molecular cloning* in which strings of DNA containing genes are duplicated in a host bacterium; *Gene cloning* which refers to a group of identical genes produced by techniques of genetic engineering where the parent gene is isolated using restriction enzymes and inserted into bacterium in which it replicates; *cellular cloning* in which copies of a cell are made, resulting in what is called a cell line, a very repeatable procedure where identical copies of the original cell can be grown indefinitely; *embryo cloning* or embryo twinning which refers to an embryo who is formed in sexual reproduction that splits or divides into two or more embryos which are identical to each other.

Recently, cloning has been associated more with somatic cell nuclear transfer, which is the process of taking the nucleus of an adult somatic cell and implanting it in an egg cell where the nucleus has been removed (enucleated egg). This was the technique used to produce Dolly, the first mammalian cloning ever succeeded[8].

In recent usage there are many definitions of cloning that are used by experts:

1. A group of cells (usually bacteria) descended from a single cell by asexual reproduction and therefore genetically identical to each other and to the parent cell[9].
2. An organism derived from a single cell of its parent and therefore genetically identical to it[10].
3. A precise genetic copy of a molecule, cell, plant, animal, or human being[11].
4. A process by which a cell, or a group of cells, from one individual organism is used to derive an entirely new organism, whose genome is identical to the ancestral cell or organism[12].

---

[8] Elizabeth A. Martin (Editor), *Oxford Concise Medical Dictionary*, p. 132; Burton Guttman, Anthony Griffits, David Suzuki, and Tara Cullis, *Genetics: a beginner guide*, Oneworld, Oxford, 2002, p. 111; Enzo Gallori, *Genetica: I geni, le mutazioni, le terapie genetiche*, Giunti, Firenze, 1998, p. 82; Edoardo Boncinelli, *Genoma: Il Grande Libro dell'Uomo*, Arnoldo Mondadori, Milano, 2001, pp. 53 – 54.

[9] Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 132

[10] Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 132

[11] National Bioethics Advisory Commission, *Cloning Human Beings: Report and Recommendations of the NBAC*, National Bioethics Advisory Commission, Rockville, 1997, p. 13

5. Making genetically identical animals or plant[13].
6. Clone refers to an organism or a group of organisms produced from a single organism or cell so that all have identical heredities[14].
7. The asexual production of a new human organism that is, at all stages of development, genetically virtually identical to a currently existing or previously existing human being[15].
8. Cloning, or asexual reproduction, is the production of individuals who are genetically identical to an already existing individual[16].

Personally, I prefer the two last definitions which were formulated by Leon R. Kass for the following reasons:

a. The reproduction is asexual (without sexual relationship) and without fertilization of the ovum by sperm. So the asexual reproduction with fertilization of the ovum by sperm (assisted reproduction, IVF) is not the object of my research because it is not cloning.
b. The genetic identicalness between the cloned individual and the individual being cloned is virtually because their genomes are not (always) exactly the same.
c. The genetic identicalness is between the cloned individual and to an already existing or previously existing individual. So in this case, the identicalness between the two newborn natural twins is not the object of my research because it is not cloning. It is a natural twin.

In further descriptions, I will explain thoroughly the above reasons so that one can understand fully after reading completely of this research.

---

[12] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998, p. 94

[13] Anne McLaren, in Council of Europe, *Cloning: Ethical Eye*, Council of Europe Publishing, Strasbourg, 2002, p. 9

[14] Lane Lester and James Hefley, *Human Cloning: When Science Fiction becomes Reality*, Marshall Pickering, London, 1999, p. 3

[15] Leon R. Kass, *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. xliii

[16] Leon R. Kass, *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics*, Encounter Books, San Francisco, 2002, p. 147

Every time the term "cloning" and its derived words are mentioned in this dissertation, the above definition is intended, unless a further description is added.

B. History of Cloning and Stem Cells Research

1. Literature

It is an interesting phenomenon to note that the development of technologies is often preceded or anticipated by literature, especially science fiction which imagines or even sometime predicts its development and its impact on human beings. Even in some cases like cloning, the technological research is inspired by certain science fiction and moves in the direction that the science fiction indicates.

The first literature that invited to people to think seriously about the possible impact of advanced modern medical technologies was a science fiction novel by Mary Shelley, titled "*Frankenstein*" published in 1818. In her novel, Mary Shelley explained the possible serious danger of advanced technologies for human beings. One of the prominent figures of the book is Dr. Victor Frankenstein who was so obsessed with his work, and ended up creating a monster. His creation revolted against his creator and destroyed him and humanity. The tragedy of Dr. Frankenstein was not due to his scientific triumph over nature, but his failure to care for what he had created. He was unable to recognize or experience the humanness of another's self. Shelly warned the researchers not to play God in creating life just because they can. It is God's privilege to create and to control life. Once a monster is created, there is no time for regrets. Therefore, one needs to meditate and reflect on all possible impacts before performing experiments[17].

When Aldous Huxley published his science fiction book "*Brave New World*" in 1932, people started paying more serious attention to

[17] Roger Gosden, *Designing Babies: The Brave New World of Reproductive Technology*, W.H. Freeman and Company, New York, 1999, pp. 13 – 14 ; James M. Humber, Robert F. Almeder, *Human Cloning*, Humana Press, Totowa, 1998, pp. 9 – 10

human cloning in relationship to the imminent impacts of advanced medical technologies on human civilization. The book was an extraordinary success and was translated into many languages[18] and inspired many other ethical-scientific books, such as *How Brave A New World: Dilemmas in Bioethics* by Richard McCormick (1981); *Ethics for A Brave New World* by John and Paul Feinberg (1993); *Remaking Eden: Cloning and Beyond in a Brave New World* by Lee M. Silver (1998); *Genetic Engineering Dream or Nightmare?: The Brave New World of Science and Business* by Mae-Wan Ho (1998); *Brave New Worlds: Staying human in the genetic future* by Bryan Appleyard (1998); *Designing Babies: The Brave New World of Reproductive Technology* by Roger Gosden (1999); *Medicine's Brave New World : Bioengineering and the New Genetics*, by Margaret O. Hyde, John F. Setaro (2001); *Our Brave New World: Essays on the Impact of September 11* by Wladyslaw Pleszczynski (2002) and many others.

In his book, Huxley described a terrifying vision of human cloning, although the word cloning never appears in his book. What he described is actually the twinning of embryos in what he called a process of Bokanovsky. He explained this process in the first chapter of his book. Fertilization is done by immersing ovum in a container full of sperms. After fertilization, embryos were separated into two groups. The first group consisted of Alfa and Beta which were placed in an incubator until they were ready to be placed permanently in bottles. The second group consisted of Gamma, Delta, and Epsilon which go through the process of Bokanovsky. For the time being, the process of Bokanovsky was able to make one embryo to split into eight embryos and then split again into 96 embryos which will develop into 96 full human beings with the same character. In the future, from one ovum can be processed 16.000 embryos. They do not need a womb to carry out the pregnancy. Everything is done in laboratories. The aim of this process is to establish social stability by creating thousands of people of the same character and ability. Each group of people is made from one ovum through the process of Bokanovski and the people are created in such a way that they are typical and uniform with each other and form a

[18] The book was translated into Italian and published in 1933 by Arnoldo Mondadori Editore, Milano. When the book was revised in 1958, its title was changed into Brave New World Revisited and was translated into Italian with the title, "Il Mondo Nuovo : Ritorno al Mondo Nuovo". Since then, the book has been published numerous times.

type of caste in the society of the Brave New World. They will work with the same machine and the same rhythm. If all the people in the world were created through the process of Bokanovsky, there would be no more problems, no more war or envy because everyone would work according to its destiny which is established during bokanovsky. This is the aim of the Bokanovsky as it is emblazoned in the gate of the company, "Community, Identity, Stability".

After the success of *Brave New World*, there were many more science fictions regarding cloning such as *World Without Man* (1958) by Charles Eric Maine; *Virgin Planet* (1959) by Paul Anderson; *Joshua, Son of None* (1974) by Nancy Freedman; *The Boys from Brazil* (1976) by Ira Levin in which he narrated the success of cloning Adolph Hitler; *In His Image: The cloning of a man* (1978) by David Rorvik. The most recent famous film, *Jurassic Park*, narrated the cloning of Dinosaurs and drew millions of people around the world to see it[19].

2. Scientific Research

Cloning in the modern sense is a newcomer in the history of science. It started only in the beginning of the 21st century. Certainly, its existence was preceded by many discoveries in molecular biology without which cloning would be impossible. In the history of science, molecular biology is not an ancient subject either like medicine, astrology, or mathematics that have been studied and known for hundreds of years. Molecular biology only started to emerge slowly after the invention of the microscope in the early 17th century. However it developed more rapidly after the rediscovery of the works of Mendel in 1900 by three researchers. They were Carl Erich Correns (Germany), Hugo de Vries (Holland), and Erich Tschermak von Seysenegg (Austria) who worked independently but reaffirmed the discoveries of Gregor Mendel. Gregor Mendel (1822 – 1884) was an Augustinian monk who discovered and explained scientifically the law

[19] Lane Lester, James Hefley, *Human Cloning: When Science Fiction becomes Reality*, p. 4; James M. Humber and Robert F. Almeder, *Human Cloning*, pp. 9 – 10

of heredity. When he published his discovery in 1865, no one paid any attention to it[20].

Mendel's discovery opened up a wide door for further research on molecular biology, in terms of heredity, genes, cloning and so on. Here we will trace the history of cloning which was started chronologically with cloning of simple animals, amphibians, and then continued with animals whose biological structure is more complicated, mammalians and finally cloning of human beings.

a. Cloning of Amphibians

There were many reasons why the first phase of research on cloning was done with amphibians. There were many advantages to using amphibians, especially frogs. First of all, there was an advantage related to the natural fertilization and embryonic development of the frog which takes place in water or a swamp. So the natural process of fertilization and its embryonic development takes place out side of the frog's body. It is very different from other animals in which all the processes take place inside the body. That is why it was easy to observe step by step its fertilization and embryonic development and also why it was easy to create an identical natural habitat in the laboratory. The second advantage related to the numerous numbers of ova. In every cycle of ovulation, a female frog produces about two thousand ova. These are inexhaustible resources for research[21].

The first successful experiment was conducted by Hans Spemann in 1914. He succeeded in transferring embryonic nucleus of triton into a cell and developed it until 16 cells. The first intention of his experiment was not to make a cloning but he wanted to verify August Weismann's theory (1834 - 1914) that during the development

---

[20] Richard Lewontin, *Il Sogno del Genoma Umano: E Altre Illusioni della Scienza*, Editorti La Terza, Roma, 2002, pp. 61 – 86. This book is translation from Richard Lewontin, *It Ain't Necessarily So: The Dream of the Human Genome and Other Illusionss*, The New York Review of Books, New York, 2000; Burton Guttman, Anthony Griffiths, David Suzuki, Tara Culli., *Genetics*, Oneworld Publications, Oxford, 2002, pp. 50 – 60; Bernardino Fantini, "100 Anni di Genetica: le Leggi di Mendel e la Filosofia della Vita", in Atti dei Convegni Lincei, *Centenario della Riscoperta delle Leggi di Mendel*, Accademia Nazionale dei Lincei, Roma, 2001, pp. 11 - 20

[21] Severino Antinori, *Come avere un figlio e la clonazione terapeutica: Una svolta epocale per la salute dell'uomo*, Carmenta Editore, Bologna, 2002, p. 15

[redacted]

of the embryo, cells lost genetic information which was not needed in the development. According to Weismann, was a German biologist and professor of zoology and comparative anatomy at the University of Freiburg im Breisgau, although in its beginning, the one-cell embryo had all the possibilities to develop into all tissues but as the development occurred, the cell lost unneeded genetic information so that the genetic information of skin was different from the genetic information of hair, and so on[22]. Hans Spemann proved that this theory was wrong, at least until 16 cells of the embryo, because he observed the embryonic development only up to 16 cells. At the stage of 16 cells, he separated one cell and it gave rise to a new embryo so that he saw clearly that in the embryonic development, cell did not lose its genetic information. In a further development (1938), Spemann proposed to insert somatic nucleus cell into enucleated ovum to give rise to a new embryo. This basic technique of cloning has not changed essentially until now because this is the technique that was used to produce Dolly as the first cloned mammalian and eventually a human being[23].

The next steps were initiated by Walter Sutton and Theodor Boveri in 1902 who found that heredity, which we now call gene, is located in the chromosome[24].

In the 1920's Dr. Fred Griffith, a British microbiologist, conducted research on two strains of pneumococcus (the bacteria that can cause pneumonia). One strain had a smooth outer coating and the other had a rough outer coating. When he injected the smooth strain into a mouse, the mouse died. When he injected the rough strain into another mouse, it was not harmed. When he killed the smooth strain and injected it to a mouse, the mouse was not harmed. He concluded that killing the bacteria rendered the animal harmless. He continued his

---

[22] Vincente Bellver Capella, *Clonare?: Etica e diritto di fronte alla clonazione umana*, G. Giappichelli Editore, Torino, 2002, pp. 23 – 24. This book is translation from Vincente Bellver Capella, *¿Clonar? Ética y derecho ante la clonación humana*, Editorial Comares, Granada, 2000;

[23] John B. Gurdon and James A. Byrne, "The History of Cloning", in Council of Europe, *Cloning: Ethical Eye*, Council of Europe Publishing, Strasbourg, 2002, p. 36. Vincente Bellver Capella, *Clonare?: Etica e diritto di fronte alla clonazione umana*, p. 24; Severino Antinori, *Come avere un figlio e la clonazione terapeutica: Una svolta epocale per la salute dell'uomo*, Carmenta Editore, Bologna, 2002, pp. 12 – 15.

[24] Demetrio Neri, *La Bioetica in Laboratorio*, Editori Laterza, Roma, 2001, p. 22

experiment: he injected the dead smooth strain together with the rough strain which is harmless, the mouse died. So Fred Griffith concluded that something in the dead, harmful strain had transformed the harmless strain into the deadly strain[25].

Based on the Griffith's discovery, Oswald T. Avery and his team from Rockefeller University in New York City, studied the cause of the transformation of the deadly strain. In 1944 he discovered that the transforming substance was DNA (deoxyribonucleic acid). In other words, it is DNA which affects hereditary traits[26]. As the research continued, many researchers had a better understanding about the composition of DNA although no one knew exactly what the molecular structure of the DNA was.

The next step in the research of DNA was conducted by Maurice Wilkins and Rosalind Franklin who worked at Kings College in Cambridge. They used X-ray diffraction photography to study DNA and came up with an outline of the objects that were photographed by passing X rays through them[27].

The groundwork of genetic revolution was laid in 1953 when James Watson and Francis Crick published a brief article in Nature magazine that described the structure of DNA which is the genetic material found in all living organisms. Using the X-ray diffraction photographs of Rosalind Franklin, James Dewey Watson (an American geneticist and biophysicist) and Francis Harry Compton Crick (British biophysicist) built three-dimensional models of the possible structures of the molecules in Cambridge University, England[28]. Watson was convinced that the gene could be understood only after something was known about the nucleic acid molecules. In spring 1953, Watson saw that the essential DNA components – four organic bases – were linked in definite pairs. This discovery was the key factor that enabled

---

[25] Linda Tagliaferro, *Genetic Engineering: Progress or Peril?*, Lerner Publications Company, 1997, pp. 16 – 17

[26] Demetrio Neri, *La Bioetica in Laboratorio,* Editori Laterza, Roma, 2001, p. 23

[27] Linda Tagliaferro, *Genetic Engineering: Progress or Peril?* p. 17 – 18

[28] There was a big controversy about this. Some people said that Crick and Watson used Rosalind Franklin's photograph without Franklin's authorization so that some people said that Crick and Watson robbed Franklin's intellectual property. John Rennie, "Una Conversazione con James D. Watson", in *Le Scienze* (Dossier) 15(2003)5 – 7; Nicholas Wade, "Was She, or Wasn't She?" in *The Scientist* vol.17 No. 7 (April 2003)72; Giovanni Siniscalchi, "La Doppia Elica", in *Newton* 4 (April 2003) 62 – 66

Watson and Crick to formulate a molecular model for DNA: a double helix which can be likened to a double staircase of intertwined sugar – phosphate chains, with the flat base pairs forming the steps between them. Watson and Crick's model also showed how the DNA molecule could duplicate itself. Thus, it came to know how genes, and eventually chromosome, duplicated themselves.

They published their discovery in *Nature* magazine April – May 1953. Watson was only 25 years old when he published their discovery. Because of their achievement, in 1962 James D. Watson, Francis Crick, and Maurice Wilkins, received the Nobel Prize for Physiology or Medicine for their determination of the molecular structure of DNA (deoxyribonucleic acid), the chemical substance ultimately responsible for hereditary control of life functions. This accomplishment was widely regarded as one of the most important discoveries of 20th-century biology[29].

In the meantime research on reproduction also reached an important stepping-stone. The first successful freezing of bull semen was announced in 1950. The semen was frozen at –79°C and used for research to produce better calves[30].

The next step of research on nuclear transfer was conducted by Robert Briggs and Thomas King in 1952. He succeeded in transferring nucleus of blastula[31] of *Rana Pipiens* and inserted it into an enucleated somatic cell. It developed into an embryo. This was the first successful

---

[29] James C. Peterson, *Genetic Turning Points: The Ethics of Human Genetic Intervention*, William B. Eerdman, Grand Rapids, 2001, pp. 4 – 5; Burton Guttman, Anthony Griffits, David Suzuki, and Tara Cullis, *Genetics*, pp. 118 – 124; Tom Wilkie, *Perilous Knowledge: The Human Genome Project and its implications*, pp. 4 – 7; Enzo Gallori, *Genetica: Atlanti Universali Giunti*, Giunti, Firenze, 1998, pp. 24 – 27. 1994-1999; LeRoy Walters, Julie Gage Palmer, *The Ethics of Human Therapy*, Oxford University Press, Oxford, 1997, pp. 5 – 6; Linda Tagliaferro, *Genetic Engineering: Progress or Peril?*, p. 17 – 21; Renato Dulbecco, *La Mappa della Vita: L'Interpretazione del Codice Genetico*, Sperling Kupfer Editori, Milano, 2001, pp. 17 – 18. Lauro Galzigna, Mario Galzigna, *Nascita della Biologia Moleculare: Dalla Doppia Elica alle Biotecnologie*, Edizione GB, Padova, 2001, p. 10 – 42; James D. Watson explained further his discovery together with Francis Crick in his new book, "*A Passion for DNA. Genes, Genomes and Society*, 2000. It was translated and published in Italian with the title, "*Geni Buoni Geni Cattivi: Storia di una passione per il DNA*", Utet Libreria, Torino, 2002.

[30] Lane Lester, James Hefley, *Human Cloning: When Science Fiction becomes Reality*, p. 3

[31] Early stage of the embryonic development of animals.

transfer of a living nucleus into an enucleated somatic cell. When he used the nucleus of an embryo in further development and inserted it into an enucleated somatic cell, it did not develop into an embryo. From his experiment, he concluded that during embryonic development, cells lost their genetic information. Thus, he affirmed Weismann's theory[32].

The notion that a human being might be cloned in the near future became more evident in 1952 when John B. Gurdon, British molecular biologist from Oxford, transplanted a mature nucleus from an intestinal cell of a tadpole into an enucleated frog's egg[33]. He succeeded in developing it into a normal adult frog although of very low efficiency. With his discovery, Gurdon demonstrated that a differentiated cell nucleus could be undifferentiated in the environment of the enucleated egg cell and could reactivate those genes necessary to create an entire frog. In this way, he proved that cells didn't loose their genetic information during embryonic development. So he opposed Briggs and King's theory about the loss of genetic information. In the history of cloning, Gourdon's experiment became the landmark experiment in nuclear transplantation although it made many people upset[34]. In 1975 Gurdon and his team repeated his experiment with more careful observation. He used nuclei from the adult skin cell of a frog. From his experiment, he got 4%of the nuclei that developed into tadpoles[35]. In his further research, Gurdon and his team used other types of specialized cells. For example, in 1970 and 1975, he used a nucleus of

---

[32] Robert Briggs and Thomas J. King, "Transplantation of living nuclei from blastula cells into enucleated frog's eggs", in *Proceeding National Academy of Science USA*, 38(1952)455 – 463; Gina Kolata, *Cloni: Da Dolly all'uomo*, Rafaello Cortina Editore, Milano, 1998, pp. 86

[33] John B. Gurdon, "The developmental capacity of nuclei taken from intestinal epithelium cells of feeding tadpoles", in *Journal of Embryology Experimental Morphology* 10(1962) 622 - 640

[34] James D. Watson, "Moving toward the clonal man: is this what we want?", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 2. The articel originally was published in 1971; Lane Lester, James Hefley, *Human Cloning: When Science Fiction becomes Reality*, p. 3; Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, p. 96

[35] John B. Gurdon, R.A. Laskey, O.R. Reeves, "The developmental capacity of nuclei transplanted from keratinized skin cells of adult frogs", in *Journal of Embryology Experimental Morphology*, 34(1975)93 – 112; Gina Kolata, *Cloni: Da Dolly all'uomo*, Rafaello Cortina Editore, Milano, 1998, pp. 81 – 83

the adult skin of a frog and succeeded in developing them into adult frog[36]. Gurdon and his team went further with his research. He eventually used the nucleus of an adult albino frog and inserted it into an enucleated ovum of many types of non-albino frogs. All of the frogs that came out from his research were albino frogs. In this way he proved that the material genetic from the donator (albino frog) developed into new frogs[37].

b. Cloning of Mammalian

In the year 1966, Joshua Lederberg, a geneticist from Stanford and pioneer in the field of bacterial genetic, wrote an article in *The American Naturalist*[38] and *The Washington Post*[39] which explained scientifically human cloning and eugenics advantages and other forms of genetic engineering. Certainly, it was not the first article about cloning but it was the most influential one. He predicted that cloning could help us to overcome unpredictable human procreation problems that have existed until now and it can even speed up the rate of evolutionary change in human beings. He conducted many seminars on cloning and became among the first scientists to talk about cloning as a practical matter to the general public. He was very optimistic that in the near future scientists would clone human beings[40].

---

[36] John B. Gurdon and R.A. Laskey, "The Trasplantation of nuclei from single cultured cells into enucleated frog's eggs", in *Journal of Embryology Experimental Morphology*, 24(1970) 227 – 248; John B. Gurdon, R. A. Laskey, O.R. Reeves, "The developmental capacity of nuclei transplanted from keratinized skin of adult frogs", in *Journal of Embryology Experimental Morphology* 34(1975)93 – 112

[37] John B. Gurdon and James A. Byrne, "The History of Cloning" in Council of Europe, *Cloning: Ethical Eye*, Council of Europe Publishing, Strasbourg, 2002, pp. 38 – 39

[38] Joshua Lederberg, "Experimental Genetics and human evolution" in *The American Naturalist* 100(1966)519 – 531

[39] Joshua Lederberg, *The Washington Post*, September 30, 1967

[40] James D. Watson, "Moving toward the clonal man: is this what we want?", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, p. 5; Leon Kass, "The Wisdom of Repugnance", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, p. 14 – 15; Leon R. Kass and James W. Wilson, *The Ethics of Human Cloning*, The AEI Press, Washington DC, 1998, p.5 – 7; Gina Kolata, *Cloni: Da Dolly all'uomo*, p. 88; Craig M. Clugman and Thomas

The first attempt to clone mammalians was conducted in 1975 by Derek Bromhall. He tried to insert the blastula of a rabbit into a non-fertilized egg of rabbit. Unfortunately the entire embryo died in the first stage of embryonic development. So the first attempt to clone a mammalian was a failure[41].

On July 25, 1978, Louise Brown, the first baby from IVF, was born in Oldham General Hospital as the fruit of research by Patrick Steptoe and Robert Edwards[42]. This achievement was a big step in reproductive technology and news of it soon spread around the world. The widespread of IVF raised many ethical questions, so the British government established the Warnock Committee to provide a statutory framework for the control and supervision of research involving human embryos. The committee recommended that embryos could be used as research tools until 14 days of age. They concluded that although the human embryo merits the respect of a human subject, the advantages to be ascertained from its research are of a greater value than the embryo statute[43]. This recommendation was adopted as a law in 1 November 1990[44].

Another type of cloning, twinning, presented relatively successful results. This type was done by dividing the embryo in the early stage of development. The first successful cloning with this technique was conducted by Steen Willadsen in 1979. He succeeded in dividing blastomere of sheep and produced five healthy sheep of

---

H. Murray, "Cloning, Historical Ethics, and NBAC" in James M. Humber, Robert F. Almeder, *Human Cloning*, Humana Press, Totowa, 1998, pp. 10 – 12

41 J. D. Bromhall, "Nuclear Transplantation in the rabbit egg", in *Nature* 258(1975)719 – 722; John B. Gurdon and James A. Byrne, "Storia della Clonazione" in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, pp. 56

42 R. G. Edwards, D. Bavister, and P.C. Steptoe, "Early Stages of Fertilization in vitro of human oocytes matured in vitro", in *Nature* 221(1969)632 – 635

43 Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, p. 62

44 Anthony Dyson, *The Ethics of IVF*, Mowbay, London, 1995, p. 1; Angelo SERRA, "La Sperimentazione sull'embrione umano: Un dibattito fra scienza ed etica", in *La Civiltà Cattolica* 2(1988) 435 – 449; SERRA, Angelo, "L'Embrione umano <<cumulo di cellule>> o <<individuo umano>>", in *La Civiltà Cattolica* 152(2001) 348 – 362;

monozygotic twins[45]. He repeated his research with a new method in 1986.

This method was also applied to the human embryo. The first researchers to conduct experiments with this method with the human embryo were Jerry Hall and Robert Stillman. They announced their experiment on October 13, 1993 at George Washington Medical Center. Their objective was to create multiple embryos from one embryo to help those who have difficulty producing sufficient numbers of embryos to be implanted into the womb (IVF). They received 22 polyploid embryos[46] from unused IVF programs. Hall and his team divided the embryos into two groups of 17 embryos which were coated by artificial zona pellucida and five embryos which were not coated with artificial zona pellucida. From the 17 embryos Hall and his team divided them and got 48 embryos[47]. This announcement raised tremendous polemics with critics both in the scientific community and in the public community. It created immense worries. A survey conducted by *Time* magazine regarding this announcement gave the clear position of society: 75% of those responding thought that cloning was not a good thing and 58% thought that it was morally wrong; 37% of the respondents wanted to ban cloning and 40% called for a temporary halt to research[48]. In December of 1994, The authorities of the university discovered that Jerry Hall and Robert Stillman did not

---

[45] Steen M. Willadsen, "A Method for culture of micromanipulated sheep embryos and its use to produce monozygotic twins", in *Nature* 277(1979) 165 - 172

[46] Polyploid embryo is embryo who has three or more sets of chromosome. Normally, embryo has diploid (a pair) of chromosome.

[47] Jerry Hall and Robert Stillman, "Human embryo cloning reported", in *Science* 262(1993)652 – 653; Jerry L. Hall, Robert J. Stillmann, et al., "Experimental cloning of human polyploid embryos using an artificial zona pellucida" in THE AMERICAN FERTILITY SOCIETY, *Abstracts: Scientific paper to be presented at the conjoint meeting of the American Fertility Society and the Canadian Fertility and Andrology Society, October 11 – 14, 1993, Montreal*, Supplement "Fertility and Sterility" (1993)S1 – S225; Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. ix; John Harris, *Clones, Genes, and Immortality: Ethics and the Genetic Revolution*, Oxford University Press, Oxford, 1998, p. 27; Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, p. 98. For a complete orinigal Jerry Hall's text and its discussion, see. Giovanni Russo, *La Clonazione di Sogietti Umani*, Coop. S. Tom, Messina, 1997, pp. 17 – 35, Angello Serra, "Verso Clonazione dell'Uomo?", in *La Civiltà Cattolica* 3543(1998) 224 – 234

[48] As cited by Dorothy Nelkin and M. Susan Lindee, "Cloning in the Popular Imagination", in Arlene Judith Klotzko, *The Cloning Sourcebook*, p. 85

have permission to conduct this kind of research. The university gave a penalty to all the scientists who participated in this research and they ordered them to destroy all the information that related to the research. Finally Jerry Hall had to leave George Washington University[49]. In the year 2000, the American Society of Reproductive Medicine declared that the technique of splitting an embryo like the one that Hall did, was ethically acceptable. This technique serves to help sterile couples to have more embryos to be implanted into the womb[50].

In October 10, 1990 The Human Genome Project was launched officially and was scheduled to last for 15 years (2005)[51]. The Human Genome Project (known inevitably as HUGO) is an international project which coordinates many scientists around the world to decode the entire human genome. Genome is the total genetic material of an organism, comprising all the genes contained in its chromosome[52]. In fact, the American Human Genome Project was founded in 1988 and was financed by the US National Institute of Health and US Department of Energy. For the first three years (1989 – 1992) James Watson was its director. HUGO is a scientific ambitious project and many people called it "The Holy Grail[53] of Modern Biology" because of the promising power to cure many incurable illness[54]. The objective of the Human Genome Project was simple to state but audacious in scope: to map and to analyze every single gene within the double helix

---

[49] Vincente Bellver Capella, *Clonare?: Etica e diritto di fronte alla clonazione umana*, p. 17; Angelo Serra, *L'Uomo-embrione: Il Grande Misconosciuto*, Cantagalli, Siena, 2003, p. 119

[50] John B. Gurdon and James A. Byrne, "The History of Cloning" in Council of Europe, *Cloning: Ethical Eye*, Council of Europe Publishing, Strasbourg, 2002, pp. 40 – 43

[51] Kevin Davies, *Il Codice della Vita: Genoma: Una Srotia e il futuro di una grande scoperta*, Mondadori, Milano, 2001, p. 9. The original title of this book is "Cracking the genome" (2001)

[52] Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 270

[53] "Holy Grail" is a cup or chalice that in medieval legend was associated with unusual powers and was much sought after by knights: identified with the cup used at the Last Supper and given to Joseph of Arimathea. *Ramdom House Webster's College Dictionary: Electronic Dictionary and Thesaurus*, Reference Software International, 1992

[54] Tom Wilkie, *Perilous Knowledge: The Human Genome Project and its implications*, p. 1; John Scally, *A Brave New World?*, Veritas Publication, Dublin, 1998, p. 49

of humanity's DNA and to locate all the genes[55]. In other words, the project wanted to know in detail the human genome. Many scientists, like Watson, believed that upon finishing this project, it would transform medicine and biology radically because it would cure many genetics diseases and many others as well. It would open up a pathway to a goal that touches all of humanity. Most geneticists, like James Watson, believed that genetics must ultimately serve human ends[56]. Until now, most of the genetic diseases cannot be cured completely because the process of curing the diseases deals only with the symptoms rather that the real causes. The real causes are abnormalities of genes that cause the suffering. When every single gene has been mapped, we can correct genetic abnormalities, we can ameliorate every single gene, and we can even enhance the property of genes so that the quality of human life will be increased significantly[57].

Research to map human genes attracted not only governmental institutes, like HUGO but also private companies. Among the many companies interested in this sector is Celera Genomic which was founded by Craig Venter. In May of 1998 Craig Venter announced his ambitious plans to decode the entire human genome by 2001. In fact, his work finished earlier than scheduled because of the rapid development of computers which work more rapidly and more precisely. On June 26, 2000 the completion of a working draft was officially announced in a joint press conference by Francis Collin, director of the Human Genome Project and Craig Venter from Celera Genomics. It was published only on February 16, 2001[58].

---

[55] David Cole, "The Genome and the Human Genome Project", in Ted Peters (ed.), *Genetics: Issues of Social Justice*, The Pilgrim Press, Cleveland, 1998, p. 49.

[56] Tom Wilkie, *Perilous Knowledge: The Human Genome Project and its implications*, p. 7

[57] Tom Wilkie, *Perilous Knowledge: The Human Genome Project and its implications*, pp. 1 – 16; Cristina Serra, *Il Progetto Genome Umano: Conoscere I nostri geni potrà cambiarci la vita*, Cuen Srl, Napoli, 2000, pp. 29 – 55; Ted Peters(ed.), *Genetics: Issues of Social Justice*, The Pilgrim Press, Cleveland, 1998, pp. 49 – 66; Richard Lewontin, *Il Sogno del Genoma Umano: E Altre Illusioni della Scienza*, Editorti La Terza, Roma, 2002, pp. 106 – 156; Angelo Serra , "La Rivoluzione gnomica: conquista, attese e rischi", in *La Civiltà Cattolica* 2 (2001) 439 – 453

[58] J. Craig Venter and team, "The Sequence of the Human Genome", in *Science* 291(2001)1304-1351; Burton Guttman, Anthony Griffiths, David Suzuki, Tara Cullis, *Genetics*, p. 205

Another attempt was to clone sheep by Steen Willadsen. After success in twinning blastomere of sheep, he proceeded with the nuclear transfer of sheep. He was the first biologist to carry out the nuclear transfer in sheep[59]. He described his success in the scientific journal *Nature* 320(1985) 63 - 66. Willadsen transferred nucleus of three and four days old sheep blastocyst into enucleated eggs. He got three lambs from his experiment and two of them were identical twins. When his report was published in the scientific journal *Nature* in 1986[60], he had cloned several more.

The other successful mammalian cloning by nucleus transfer was conducted in 1996 by Ian Wilmut and his team. Wilmut took a nucleus from stem cells of a nine day old embryo of sheep and inserted it into an enucleated ovum. From his experiment, Wilmut produced two sheep and called them Megan and Morag[61]. The way of cloning Megan and Morag was different from the way Steen Willadsen cloned his sheep: first of all the embryo as the donor was older: it was a nine-day embryo; the second: Megan and Morag were multiplied in culture before being transferred; and the third Wilmut paid particular attention to the cell cycles of the donor and recipient cells[62].

However, the most important step in the history of cloning was the birth of Dolly, the first cloning of a mammalian. On February 23, 1997 *The Observer* broke the news that Ian Wilmut, and his team at the Roslin Institute in Edinburgh, Scotland, were about to announce the successful cloning of a sheep. The official announcement was done 5 days later on February 27, 1997 through *Nature* magazine[63]. In actuality, the sheep was born eight months earlier, on July 5, 1996[64]. According to Grahame Bulfield, director and chief executive of the

---

[59] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 132

[60] Steen M. Willadsen, "Nuclear Transplantation in sheep embryos", in *Nature* 320(1986) 63 - 65

[61] K.H.S. Campbell, J. McWhir, W.A. Richie and I. Wilmut, "Sheep cloned by Nuclear transfer from a cultured cell line", in *Nature* 380(1996) 64 – 66

[62] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 133

[63] Ian Wilmut, A.E. Schnieke, J. McWhir, Keith H. Campbell, "Viable offspring derived from fetal and adult mammalian cells", in *Nature* 385(1997) 810 – 813

[64] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 208; Gina Kolata, *Cloni: Da Dolly all'uomo*, p. 5; Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, pp. 100 - 101

Roslin Institute, the delay was caused by normal procedure in scientific research. First of all, the researchers had to repeat the experiment so that they were absolutely certain that their discovery could be verified scientifically before publishing their discovery. Secondly, it took three to six months to present a paper in a credible journal[65]. Many scientists believed that the delay was due to wanting to find the best time to make the announcement.

Dolly was born from the fusion of a nucleus of a somatic cell which was taken from the mammary gland of a six-year-old ewe and then inserted into an enucleated ovum. This technique is known as somatic cell nuclear transfer. The cloning of Dolly is different from the previous success of cloning sheep (Megan and Morag) by the same researchers. The nucleus which produced Megan and Morag came from a nine day old sheep embryo while Dolly came from a somatic nucleus (mammary gland) of an adult sheep.

This success was a big breakthrough in biological research because no one had previously succeeded in reprogramming a specialized somatic cell to be a tottipotens cell so that it can produce a new complete mammalian whose genome is identical to its ancestral being. In order to know exactly whose genes developed into a new ewe, Wilmut and his team took a different type of ewe. The nucleus of somatic cell was taken from a Finn-Dorset[66] ewe and then it was inserted into the ovum of a Scottish Blackface ewe. The new ewe was a Finn-Dorset ewe. In this way, he proved that the genome of the new ewe came from the nucleus cell of a Finn Dorset. Because the new ewe came from the mammary gland, Wilmut called the new ewe Dolly, to remember Dolly Parton, a country-and-western singer who was famous for her breasts[67].

---

[65] Arlene Judith Klotzko (ed.), *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001, p. 16

[66] Since there are many different varieties of sheep, sheep in Britain are generally named after the places where they were first produced. If the animal is the offspring of cross breeding of two different varieties, it is called by all of the two origins. So the sheep of Finn-Dorset is the cross breeding of a Finnish rams and Dorset ewes (the name of a county). Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, p. 133. 216

[67] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, p. 216; Burton Guttman, Anthony Griffiths, David Suzuki, Tara Cullis, *Genetics*, 224; Gina Kolata *Cloni: Da Dolly all'uomo*, p. 7; John Scally, *A Brave New World?*, Veritas Publications, Dublin, 1998, p, 30

Although the birth of Dolly was a very big breakthrough in biological research, on the day of her birth almost no one knew it except some of the strict members of Roslin Institute. There was no celebration of her birth. No one even took a photo of this great event. Ian Wilmut, her creator, was not present either at her birth and he even didn't remember where he was when he heard the news of Dolly's birth[68]. However, it was very different when the birth was officially announced. It created a big sensation. Criticism, praise, anguish, distress, worry and many other comments came from all over the world. Comments came not only from scientists who were startled by this success but also from religious leaders, government leaders, ethicists, and ordinary people.

For days after the announcement by *The Guardian*, newspapers from around the world published the success of cloning Dolly. Their headlines reflected the variety of reactions to the announcement of Dolly. One of the comments came from William Blake, "Small sheep, who created you? The answer: a big breast!"[69]. The British newspaper *The Guardian* on February 26, 1997, citing Joseph Rotblat, a British Nobel Prize winner, said that Dolly's cloning was science out of control 'a means of mass destruction'. The German newspaper *Die Welt* evoking the Third Reich, commented:" The cloning of human beings would fit precisely into Adolph Hitler's world view"[70]. Soon after the announcement, many people wanted to know about cloning. The Center of Bioethics in the University of Pennsylvania had to close its internet site because it was overloaded. Before the announcement of Dolly, the Center received about 500 emails per month but soon after the announcement, the Center received about 1,700 emails everyday[71].

A day after *The Observer* broke the sensational news of Dolly (February 24, 1997), Bill Clinton asked Harold T. Saphiro, the president of the National Bioethics Advisory Commission (NBAC), to review the legal and ethical issues associated with the use of cloning technology and asked him to report back within ninety days with recommendations. In his letter to Saphiro, Clinton expressed his concern that although this technological advance could offer potential benefits in such areas as medical research and agriculture, it also raised

---

[68] Gina Kolata *Cloni: Da Dolly all'uomo*, p. 5
[69] Gina Kolata, *Cloni: Da Dolly all'uomo*, pp. 41 - 43
[70] As reported in *The Guardian* in 28 February 1997
[71] Gina Kolata, *Cloni: Da Dolly all'uomo*, p. 43

serious ethical questions, particularly with respect to the possible use of this technology to clone human beings. A week latter, Clinton made a decision that no federal funds shall be allocated for the cloning of human being. The NBAC started a commission which was composed of scientists, religious experts, bioethicists, and the general public and asked them to give their opinions regarding cloning. Their final report was published on June 9, 1997[72]. Some of the commission's recommendations were, "*a continuation of the current moratorium on the use of federal funding in support of any attempt to create a child by somatic cell nuclear transfer. Federal legislation should be enacted to prohibit anyone from attempting, whether in a research or clinical setting, to create a child through somatic cell nuclear transfer cloning.*"[73]

On July 31, 2001, the United States House of Representatives passed a bill by a wide margin that banned the cloning of human cells for reproduction as well as for research[74]. On February 12, 2003, the House Judiciary Committee approved the ban on human cloning for any purpose, including medical research[75].

The British government also issued a ban on cloning on June 26, 1997, "*We regard the deliberate cloning of human beings as ethically unacceptable. Under United Kingdom law, cloning of individual humans cannot take place whatever the origin of the material and whatever the technique is used*"[76]. This law was revisited on August 16, 2000 in which therapeutic cloning is allowed while reproductive cloning remains illegal[77].

---

[72] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, p. 4 – 5; Gina Kolata, *Cloni: Da Dolly all'uomo*, pp. 44 – 45; Leon Kass, "The Wisdom of Repugnance", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, p. 14; Richard C. Lewontin, "The confusion over cloning", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, pp. 129 – 130

[73] National Bioethics Advisory Commission, "Cloning Human Beings", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, pp. 61 – 62. It appears also in *Hasting Center Report* 27(1997) 7 - 9

[74] Ted Agres, "Cloning Capsized?", in *The Scientist* 15(2001)1

[75] Amy Fagan, "Panel approves ban on Cloning", in *The Washington Times*, February 13, 2003

[76] Department of Health, *Government Response to the recommendations made in the Chief Medical Officer's expert Group Report "Stem cell Research: Medical Progress with Responsibility*, Crown, Norwich, 2000, p. 5

[77] Angelo Serra, "L'embrione umano: Prezioso Stumento Tecnologico?", in *La Civiltà Cattolica* 3636(2001)552 – 565

In Italy, on March 21, 1997, the Minister of Health convoked Comitato Nazionale per la Bioetica (National Bioethics Committee) for a special session to discuss the problems that had arisen with the cloning of Dolly. On October 17, 1997, the commission completed its works and made some recommendations. One of them was the unanimous affirmation that human cloning is unethical[78].

Following the publication of Dolly's cloning, the President of the European Commission, M. Jacques Santer, on February 28, 1997, asked for advice from The Group of Advisers on the Ethical Implications of Biotechnology (GAEIB) regarding the ethical implications of cloning techniques, namely animal cloning and its possible application to human beings. The group finished their work and published it on May 28, 1997. Some of their advice was that cloning animals under strict regulations is permitted. Regarding human cloning, the group said,"... *any attempt to produce a genetically identical human individual by nuclear substitution from a human adult or child ("reproductive cloning") should be prohibited.*"[79]

On September 7, 2000, the European parliament approved a resolution with a large majority (only 7 votes contra) to ban all forms of research on human cloning either for therapeutic cloning or reproductive cloning. The resolution also invited the British government to reexamine its position which legalized therapeutic cloning on August 16, 2000, because this resolution was not binding to the members of the European Community[80].

It is worthwhile to note that although many countries banned reproductive human cloning, no country banned reproductive animal cloning. Therefore, since the success of Dolly's cloning there have been many other successful animal clonings. In 1998 Teruhiko Wakayama produced 50 guinea pigs using a new technique of microinjection in which he injected nucleus from an adult somatic cell.

---

[78] Comitato Nazionale per la Bioetica, *La Clonazione*, Presidenza del Consiglio dei Ministri, Dipartemento per l'informazione e l'edito, Roma, 1997, p. 9

[79] Adviser to the President of the European Commission on the Ethical Implications of Biotechnology, "Ethical Aspect of Cloning Techniques", in *Journal of Medical Ethics* 23(1997) 349 - 352

[80] Mario Capanna, *L'Uomo è più dei suoi geni: La verità sulle biotechnologie*, BUR, Milano, 2001, p. 17; Gilberto Corbelini, "L'Evoluzione del Dialogo tra Scienza e Società sulle aspettative Conoscitive e Applicative dell'Ingegneria Cellulare", in Atti dei Convegni, *Le Cellule Staminali: Problematiche e Prospettive Terapeutiche*, Accademia Nazionale Dei Lincei, Roma, 2002, pp. 53 – 54

Also in 1998 Ryuzo Yanagimachi from the University of Hawaii cloned rats. In 1999 Wells cloned bovines from adult somatic cell. Onishi and his team cloned a pig in 2000[81]. Teruhiko Wakayama and his team cloned mice to six generations[82]. Although there were many successes in cloning animals, there are some animal species whose cloning have not been successful, such as dogs and horses[83].

On May 26, 1999, researchers discovered signs of premature aging in Dolly's cells. There was no exact explanation of this phenomenon but it may have been caused by short telomere[84]. The researchers discovered that Dolly's telomeres were shorter than the average telomeres of three years old sheep, suggesting that she was genetically older that her birth date. Her telomeres were about the same length as those of her mother[85]. On February 15, 2003, Dolly was euthanized after being diagnosed with progressive lung disease. She was only 6.5 years old. Sheep normally can live 11 – 12 years according to Dr. Harry Griffin, head of the Roslin Institute where Dolly was cloned. In January of 2003, Dolly was diagnosed as having arthritis, a condition usually expected in older animals[86]. The first

---

[81] Akira Onishi, Masaki Iwamoto, Tomiji Akita, Satoshi Mikawa, Kumiko Takeda, Takashi Awata, Hirohumi Hanada, and Anthony C. F. Perry, "Pig Cloning by Microinjection of Fetal Fibroblast Nuclei", in *Science* 289(2000) 1188-1190

[82] Teruhiko Wakayama et. Al, "Cloning of mice to six generations", in *Nature* 407(2000) 318 - 319

[83] John B. Gurdon and James A. Byrne, "Storia della Clonazione", in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, pp. 59 – 60; Ernesto Di Mauro, *Annuario Genetico: Genomi, Clonazioni, Cellule Staminali, OGM, Terapia Genetica*, Ediesse, Roma, 2002, p. 60 – 61

[84] Telomere is the end of a chromosome which consists of repeated sequences of DNA that perform the function of ensuring that each cycle of DNA replication has been completed. Each times a cell divides, some sequences of the telomere are lost. Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 648. Telomere comes from Greek word *telos*, meaning "end". Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 91

[85] Paul G. Shiels, Alexander J. Kind, Keith H. S. Campbell, David Waddington, Ian Wilmut, Alan Colman, Angelika E. Schnieke "Analysis of telomere lengths in cloned sheep" in *Nature* 399(1999)316 - 317

[86] Gina Kolata, "First Mammal Clone Dies; Dolly Made Science History", in *The New York Times*, February 15, 2003; http://www.cnn.com/2003/WORLD/europe/02/14/cloned.dolly.dies/index.html

cloned sheep in Australia, Matilda, which was born in the year 2000, died at a very young age on February 7, 2003[87].

In its latest development, animal cloning also was carried out with genetic engineering to produce a special effect in a new animal for xenotransplantation[88] and pharming[89]. For xenotransplantation, scientists are working with pigs. They have modified its genes before cloning so that certain organs of the pig can be transplanted into human beings[90]. There is no satisfactory result for the time being, but in the future it offers great hope. For now, the risk of rejection is still very high and the researchers have even discovered retrovirus in the pig that did not exist before modifying the genes. If they are transplanted into human beings and interact with human virus, they can create super-viruses that have no counter immune system[91]. In pharming, the researchers are working with cows and sheep to produce a certain therapeutic protein in their milk[92]. This technique was also applied to chickens to produce special therapeutic proteins in their eggs[93].

c. Cloning of Human Beings

As we can predict, the success of cloning Dolly has encouraged scientists to clone human beings, although no country in the world permits reproductive human cloning. Human cloning for therapeutic

---

[87] http://www.cnn.com/2003/TECH/science/02/07/aus.matilda.reut/index.html

[88] Xenotransplantation is transplantation of organs from one species into another. Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 713

[89] The word pharming came from *pharmacy* and *Farm*. Pharming indicates farming animals whose genetics had been modified in such a way that they produce medicine for human being. John B. Gurdon and James A. Byrne, "Storia della Clonazione" in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, p. 63

[90] Jocelyn Kaiser " Xenotransplantation: Cloned Pigs May Help Overcome Rejection" in *Science* 295(2002)25-27

[91] Mario Capanna, *L'Uomo è più dei Suoi Geni: La Verità sulle Biotechnologie*, BUR, Milano, 2001, p. 17; Severino Antinori, *Come avere un figlio e la clonazione terapeutica: Una svolta epocale per la salute dell'uomo*, Carmenta Editore, Bologna, 2002, p. 24

[92] Schnieke A. E., "Human Factor IX transgenic sheep produced by transfer of nuclei from transfected foetal fibroblasts" in *Science* 278(1997) 2038 – 2039

[93] Severino Antinori, *Come avere un figlio e la clonazione terapeutica: Una svolta epocale per la salute dell'uomo*, p. 24

purposes receives great support from many groups in society while reproductive cloning receives minimal support.

In 1998, Chicago scientist, Dr. Richard Seed, said he would use the same technology which was used to clone Dolly, to clone human beings with private funding. Although federal regulations did forbid public funding to finance human cloning yet private-sector funding for such a project remains a possibility. In the same year, a group of Korean scientists reported that they had cloned a human being but it was stopped its development only until four cells phase[94].

On March 9, 2001, Panaiotis Zavos, Professor Emeritus of Reproductive Physiology & Andrology from the University of Kentucky and President and CEO of Zavos Diagnostic Laboratories wanted to clone human beings to allow infertile couples to have their own biological children. In order to avoid developmental abnormalities, he proposed to conduct a comprehensive screening. "*Comprehensive screening, although expensive, would ensure that only healthy developmentally normal embryos would be conceived... Screening includes preimplantation screening, postimplanation screening, and additional pre-natal screening.*"[95]

On August 7, 2001, Severino Antinori, Michael Panayotis Zavos and Brigitte Boisellier announced their intention of cloning human beings by November of that same year. They proposed to impregnate up to 200 women with cloned embryos. This news was responded to skeptically because many scientists did not believe in their capability with the recent techniques. There was even a chaotic situation in their exposition which was televised directly by CNN.

On November 24, 2001, Jose Cibelli and colleagues from Advanced Cell Technology, in Massachusetts, announced that they had cloned human beings for therapeutic purposes. They injected eight eggs with cumulus cell (ovarian cells that usually nurture developing eggs in the ovary). Two of them developed into four cells and only one which developed into six cells and then it stopped. In commenting on this step, Robert Lanza, the company's vice president, said: "*This work sets*

---

[94] Anne McLaren, "Progress After Dolly", in Council of Europe, *Cloning: Ethical Eye*, p. 177

[95] P. Zavos and R. Moorgate et al. "Testimony before the House Subcommittee on Oversight and Investigation; Hearing on Issues Raised by Human Cloning Research", March 28, 2001 in http://www.ReproductiveCloning.net/Articles/testimony.htm; http://www.ReproductiveCloning.net/Articles/zavos.htm

the stage for human therapeutic cloning as a potentially limitless source of immune-compatible cells for tissue engineering and transplantation medicine."[96]

Following the regulation of 2001 about human research of stem cells in the United Kingdom, in February 2002, the HFEA of Britain (Human Fertilisation and Embryology Authority) granted the first two licenses for embryo research to create embryonic stem cell lines. The embryos for this research were a donation of unused embryos from *in vitro fertilization* (IVF) treatment. The cell lines were to be used to increase knowledge of embryo development and to enable such knowledge to be applied in the developing treatment of serious diseases such as Parkinsons, other neural diseases, as well as pancreatic diseases[97].

On December 26, 2002, Boisellier, the CEO of Clonaid, a company founded by the Raelian sect, announced that the company had created the first human clone. The baby was a healthy girl and was named Eva, but no mention was made about the baby's whereabouts. The claims have so far met with incredulity and skepticism because the company has no scientific record of doing such research. Furthermore, Boisellier gave no scientific proof in her exposition although she promised to give some scientific proof from an independent expert but it never actualized. In January of 2003, Brigitte Boisellier, was ordered to appear in court in Florida to account for Eve's whereabouts[98].

The latest development of human cloning was announced in the middle of February 2004 by a South Korean scientist team whose base is in the Seoul National University. The team which was led by Woo Suk Hwang of the university's veterinary college and Shin Yong Moon, a gynecologist, succeeded in producing the first human cloning. They used 242 eggs from 16 women donors and used various methods to clone. Finally, the team produced 30 cloned human blastocysts which were created by somatic cell nuclear transfer. From these cloned human blastocysts, they tried 20 times to produce embryonic stem cells lines but they ended up with just one stem cell line, cultivated from a

---

[96] Jose B. Cibelli, Robert P. Lanza, and Michael D. West, "The First Human Cloned Embryo" in *Scientific American* (November 24, 2001)1 – 7. It appeared also in Alex Vaas, "US Scientists clone first human Embryo", in *British Medical Journal* 323(2001)1267

[97] Department of Health, *Government Response to the House of Lords select committee report on Stem Cell Research*, Crown, Norwich, 2002, p. 4

[98] Nature, (03 Feb 2003) http://www.nature.com/nsu/030127/030127-13.html

blastocyst that had been cloned from nuclear material taken from cumulus cells belonging to the woman who had donated the egg in the first place[99]. The success rate to produce embryonic stem cell line is very low. It may be due to the chromosomal abnormalities that appeared in the reprogramming of the cells or possibly because of the subtle variations in the techniques they used[100].

d. Stem Cells Research

Although in the beginning research of stem cells was separate from research on human cloning, eventually they intertwined with each other. Embryonic stem cells research has had difficult problems due to a lack of embryo resources as well as ethical problems regarding the uses of embryos for research. Scientists turned to cloning technology to provide the resources and thus came on the scene the second type of cloning: therapeutic cloning whose objective is to produce embryos to be harvested for its embryonic stem cells.

Research of stem cells is also a new comer in the history of science. This important step happened in 1958 when Leroy Stevens, a developmental biologist at the Jackson Laboratory in Bar Harbor, Maine, found teratomas[101] in the strain 129 of mice. Stevens' team traced the teratomas to primordial germ cells in the genital ridge of 12-day prenatal mice. These cells, which can support differentiation, were called pluripotent embryonic stem cells (ESCs). In 1970 Stevens realized that these primordial germ cells gave rise to teratomas that resemble cells of earlier embryos. This resemblance was not by chance because in 1975 Beatrice Mintz and Karl Illmensee at the Institute of Cancer Research in Philadelphia demonstrated that embryonic stem cells can give rise not only to teratomas, but also to organisms[102].

---

[99] Tim Radford, "Korean scientists clone 30 human embryos" in *British Medical Journal* 328 (2004) 421, February 21, 2004

[100] Tim Radford, "Korean scientists clone 30 human embryos", p. 421

[101] Teratoma is a tumor composed of a number of tissues not usually found at that site. Teratomas most frequently occur in the testis and ovary, possibly derived from remnants of embryological cells that have the ability to differentiate into many types of tissues. Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 650; Massimo Manieri and Emanuele Giacon (eds.), *Nuovo Enciclopedia della Salute* vol 7, Gruppo Editoriale L'Espresso, Roma 2002, p. 886

[102] Ted Agres, "A pending government decision keeps stem cell investigators in limbo", in *The Scientist* 15(2001) 11

In 1981 teams led by Martin Evans at Cambridge University and Gail Martin at the University of California successfully cultured ESCs of mice and showed that inner cell masses can also sustain development. In 1992 Brigid Hogan at Vanderbilt University School of Medicine and Peter Donovan at the National Cancer Institute devised culture methods, which lead to the discovery of embryonic germ (EG) cells[103].

In 1996 James A. Thomson of the University of Wisconsin at Madison cultured embryonic stem cells, which were already being made from pigs, cows, rabbits, and sheep, from rhesus monkeys and marmosets[104].

On November 5, 1998, Geron Corporation, a biotechnology company located in Menlo Park, California, announced that the company had financed two separate research teams which succeeded in isolating and growing *in vitro* human stem cells[105]. One team from the University of Wisconsin Madison led by James A. Thomson, succeeded in isolating and growing embryonic stem cells (ESC) from the inner cell mass of 5 day embryos, called blastocysts. The embryos were donated by couples who had undergone infertility treatment. The following day, November 6, 1998, *Science* magazine published this discovery[106]. The second team from the Johns Hopkins University School of Medicine led by John Gearhart, succeeded in isolating and growing embryonic germ cells (EGC) derived from primordial

---

[103] Ted Agres, "A pending government decision keeps stem cell investigators in limbo", in *The Scientist* 15(2001) 11; Department of Health, *Government Response to the House of Lords select committee report on Stem Cell Research*, Crown, Norwich, 2002, p. 4.

[104] Department of Health, Government Response to the House of Lords select committee report on Stem Cell Research, Crown, Norwich, 2002, p. 4

[105] Geron Ethics Advisory Board, "Research with Human Embryonic Stem Cells: Ethical Considerations", in *Hasting CenterReport* 29(1999) 31 - 36

[106] James A. Thomson et al., "Embryonic Stem Cell Lines Derived from Human Blastocysts", in *Science* 282(1998) 1145

gonadal[107] tissue and mesenchyma[108] of five to nine week fetal tissue which was obtained from elective abortions[109].

These two reports were the landmarks in the stem cell research and raised many polemical questions. To handle this new technology, President Clinton on November 14, 1998, wrote to the National Bioethics Advisory Commission to conduct a thorough review of human stem cells research, balancing all medical and ethical issues. On September 7, 1999, the Commission finished its works and published the result in three volumes under the title *Ethical Issues in Human Stem Cell Research.* The Commission recommended the eligibility of federal funding for research of germ cell using cadaveric fetal tissue and unused embryos from IVF. The Commission also stated illegibility of research involving the derivation or use of human ES cells from embryos made solely for research purposes using IVF or somatic nuclear transfer (cloning)[110].

Along with the new discoveries of isolating and growing embryonic stem cells many scientists, researchers and medical personnel in United Kingdom insisted that the British government establish a committee to examine the advantages and disadvantages of embryonic stem cells research. Their demand was manifested in the Joint Human Fertilization and Embryology Authority/Human Genetics Advisory Commission Report *'Cloning issues in Reproduction Science and Medicine'* published in December of 1998. In response to their demand, in June of 1999 the Government asked the Chief Medical Officer (CMO) to establish an Expert Advisory Group (EAG) and on August 8, 1999, the Expert Advisory Group was established. The EAG "*was asked to assess developments in stem cell research and research involving cell nuclear replacement and the likely timescales of the*

---

[107] Male or female reproductive organs that produce gametes.

[108] The undifferentiated tissue of the early embryo that is formed almost entirely from mesoderm. It is loosely organized and the individual cells migrate to different parts of the body where they form most of the skeletal and connective tissue, the blood and blood system, and the visceral (smooth) muscle. Elizabeth A. Martin, *Oxford Concise Medical Dictionary,* p. 405

[109] Shamblott, M.J., J. Axelman, S. Wang, E.M. Bugg, J.W. Littlefield, P.J. Donovan, P.D. Blumenthal, G.R. Higgins, and J.D. Gearhart "Derivation of Pluripotent Stem Cells from Cultured Human Primordial Germ Cells." *Proceedings of the National Academy of Sciences USA* 95(1998)13726–13731

[110] National Bioethics Advisory Commission, *Ethical Issues in Human Stem Cell Research: Report and Recommendations*, National Bioethics Advisory Commission, Rockville, 1999, pp. 68 - 72

research; to establish more clearly the evidence of potential benefits for human health of such research; to consider possible alternatives to research involving embryos which might achieve the same ends and the potential technical and safety issues which might arise."[111]

On August 14, 2000, the EAG finished their recommendation to the government. In the first recommendation, EAG acknowledged that, "*Research using human embryos (whether created by in vitro fertilisation or cell nuclear replacement) to increase understanding about human disease and disorders and their cell based treatments should be permitted*"[112].

In the fourth recommendation, EAG recommended that, "*Research to increase understanding of and develop treatments for mitochondrial diseases using the cell nuclear replacement technique in human eggs, which are to be fertilised subsequently by human sperm, should be permitted.*"[113]

The government accepted the recommendations, saying "*The Government accepts the Report's recommendations in full and will bring forward legislation where necessary to implement them as soon as the Parliamentary timetable allows.*"[114] Based on the recommendations of the Expert Advisory Group and in line with the Human Fertilization and Embryology Act 1990[115], the British government proposed a law to legalize therapeutic human cloning on August 16, 2000, and to harvest stem cells from human embryo. However reproductive cloning remained banned. Thus, the United Kingdom is the first country in the world that has legalized human

---

[111] Department of Health, *Government Response to the recommendations made in the Chief Medical Officer's expert Group Report "Stem cell Research: Medical Progress with Responsibility*, Crown, Norwich, 2000, p. 1

[112] Department of Health, *Government Response to the recommendations made in the Chief Medical Officer's expert Group Report "Stem cell Research: Medical Progress with Responsibility*, p. 3

[113] Department of Health, *Government Response to the recommendations made in the Chief Medical Officer's expert Group Report "Stem cell Research: Medical Progress with Responsibility*, p. 4

[114] Department of Health, *Government Response to the recommendations made in the Chief Medical Officer's expert Group Report "Stem cell Research: Medical Progress with Responsibility*, p. 1

[115] Human Fertilisation and Embryology Act 1990 is a law that was approved by House of Commons and House of Lords in November 1, 1990 that permits using human embryo for research until 14 days old. cfr. "Human fertilization and Embryo Act" in *Lancet* 336(1990) 184

cloning. It is interesting to note the timing for legalization of cloning. It happened during the long summer vacation while most the parliament members were on vacation. This was done to avoid a polemical situation in parliament. On December 19, 2000, the House of Commons (with 366 pro and 174 contra) approved the law and on January 22, 2001, the House of Lords approved (with 212 pro and 92 contra) the law.

The reason for legalizing therapeutic cloning was for "*the basis of the scientific and medical benefits which could arise from research to extract stem cells from embryos at a very early stage in their development, the Government accepts that such an extension should be made to allow for research to increase understanding about human disease and disorders and their cell-based treatments*[116]".

It is not surprising, though, that the United Kingdom legalized therapeutic cloning because following the recommendations of the Warnock Commission, it enacted legislation that permits fetal experimentation up to fourteen days after fertilization on November 1, 1990 in a law that is called "The Human Fertilisation and Embryology Act 1990". In a certain sense, therapeutic cloning that dealt with five days embryos was covered under that act so that in actuality the new law was not a new law, even it was not required.

Following approval of therapeutic cloning, the House of Lords established a "Select Committee" to study stem cells research. They published their work in February 2002 under the title "Stem Cell Research". The report provided a detailed overview and assessment of the issues that had emerged from the recent developments in embryo and stem cells research. The Select Committee arrived at the same conclusion that cell-based treatment was regarded as a very important step in medical invention because it promised better cures for genetical diseases[117] such as Parkinson's, Alzheimer, diabetes, cancer, heart, etc. which are currently without cures. Medical technologies presently are unable to cure genetic diseases in the real sense because they deal more

---

[116] Department of Health, *Government Response to the recommendations made in the Chief Medical Officer's expert Group Report "Stem cell Research: Medical Progress with Responsibility*, p. 3

[117] The recent research indicates that these genetical diseases depend 70% on the ambiental stimuli other than genetical predisposition. Unfortunately, these kinds of illness are growing rapidly in places where ambiental risks are eminent. That is why systematic health preventions are extremely needed. Mario Capanna, *L'Uomo è più dei suoi geni: La verità sulle biotechnologie*, BUR, Milano, 2001, p. 15

with the symptoms rather than the root causes of the diseases. The real problem of these diseases lies in the abnormality of cells. In the month of July 2002, the United Kingdom government published the Government's Response to the House of Lords Select Committee. The Government approved almost all of their recommendations[118].

The year 2000 was marked by many important discoveries regarding adult stem cells. Prior to this time it was thought that adult stem cells could be directed only to become cells of their origin. But with these discoveries it was proven that adult stem cells could be directed into other tissues. For example, Margaret Goodell (June 2000) at the Baylor College of Medicine turned skeletal muscle stem cells into blood cells. It was the first proof that adult stem cells can not only be directed into tissue of its origin but also can be directed into other tissue. Robert Lavker (August 2000) of the University of Pennsylvania School of Medicine and Tung-Tien Sun of the New York University School of Medicine identified progenitor cells in the "bulge" region of the hair follicle in mice that gives rise to both hair and epidermis; An Israeli team (October 2000) announced that it could turn human ESCs into cells of all three germ layers (ectoderm, mesoderm, and endoderm) using growth factors. Nature Neuroscience published findings that neural ASCs could be directed to differentiate into skeletal muscle cells[119]. In the middle of February 2004, South Korean scientist team (Woo Suk Hwang and Shin Yong Moon) succeeded in producing the first human embryonic stem cell line which was obtained from cloning. They used 242 ova but only succeeded in producing one stem cell lines[120].

---

[118] Department of Health, Government Response to the House of Lords select committee report on Stem Cell Research, Crown, Norwich, 2002, pp. 7 – 18

[119] Ted Agres, "A pending government decision keeps stem cell investigators in limbo", in *The Scientist* 15 (2001) 11

[120] Tim Radford, "Korean scientists clone 30 human embryos" in *British Medical Journal* 328 (2004) 421, February 21, 2004

C. Biology of Human Life

1. Biological Factors of Human Life

The cell is the basic unit of all living organisms that contain a complete set of genetic information[121]. The word cell was used for the first time in biological terminology by English scientist, Robert Hooke in 1655. When he examined a piece of cork with a primitive microscope in his laboratory, he found that the cork was constituted of many small compartments that seemed like cells in monasteries. That is the reason why he called the small compartment a cell. In fact, what he saw were not actual cells like we know them to day but they were the circular walls of long-dead cells inside the cork[122].

All living organisms are composed or made of cells. Simple organisms such as bacteria have only one cell, while complex organisms such as animals and human beings are multi cellular. There are about 3×10^{12} cells in an adult human being[123].

If we incise a cell, we will find many compartments which are separated by membranes. For our purposes, we will focus on the two of them: mitochondrion and nucleus. Mitochondrion (plural: mitochondria) is a structure outside the nucleus that is the site of the cell's energy production and contains a small number of genes[124]. There are from hundreds to several thousands mitochondria within each

---

[121] LeRoy Walters, Julie Gage Palmer, *The Ethics of Human Therapy*, Oxford University Press, Oxford, 1997, p. 4

[122] Renato Dulbecco, *La Mappa della Vita: L'Interpretazione del Codice Genetico*, p. 11; Burton Guttman, Anthony Griffits, David Suzuki, and Tara Cullis, *Genetics*, p. 30; Demetrio Neri, *La Bioëtica in Laboratorio*, Editori Laterza, Roma, 2001, p. 8

[123] John Harris, *Clones, Genes, and Immortality: Ethics and the Genetic Revolution*, Oxford University Press, Oxford, 1998, p. 10; D.J. Weatherall, "The New Genetics", in Jonatan M. Austyn (ed.), *New Prospect for Medicine*, OUP, Oxford, 1988, p. 47: Harold J. Morowitz, James S. Trefil, *The Facts of Life: Science and the Abortion Controversy*, Oxford University Press, New York, 1992, pp. 27 - 29

[124] Until now, geneticists don't know yet exactly how many percent of genes are in mitochondrion but Severino Antinori said that in animal cell, there are 15% of genes in mitochondria. Severino Antinori, *Come avere un figlio e la clonazione terapeutica: Una svolta epocale per la salute dell'uomo*, Carmenta Editore, Bologna, 2002, p. 8

cell and they have their own DNA, called mtDNA (mitochondrial DNA)[125].

The nucleus is the center of a cell and acts as the information center of a cell. Inside the nucleus there are chromosomes. The word chromosome is derived from Greek words *cromo* (color) and *soma* (body), because we can easily recognize it in the microscope by its colorful body. The chromosomes are identified by their length and the position of the centromeres. In 1959 the system of chromosome classification was established in Denver and as such was called the Denver System of Chromosome Classification[126].

The number of chromosomes is usually constant in all individuals of a given species; for example, the house mouse has 40; the fruit fly (*Drosophila melanogaster*) has eight; the maize has 20; the tomato has 24; the potato has 48. In a human cell, there are 46 chromosomes which are inherited from the parents: 23 from the mother and 23 from the father. Based on the number of chromosomes, all human cells are divided into two kinds of cells: somatic cells (*soma* = body; somatic cell = cell of the body) that contain 46 chromosomes (diploid) and germ cells or gametes that contain 23 chromosomes (haploid or monoploid). Human chromosomes are divided into two types: sex chromosomes (X or Y chromosome) and autosome which are all chromosomes except sex chromosomes. Somatic cells are called diploid (from the Greek word *diplous* = double) because each chromosome, except the sex chromosome, is represented twice (paired) in a single cell. So a man has 22 pairs of autosome chromosomes and XY chromosome while a woman has 22 pairs of autosome chromosomes and XX chromosomes. Germ cells are called haploid (from Greek word *aplous* = single) because it has a single set of unpaired chromosomes in a single cell. So the ovum has 22 autosome chromosomes plus X chromosome while the sperm has 22 autosome chromosome plus either Y chromosome or X chromosome[127].

---

[125] Donald S. Rubenstein, David C. Thomasma, Eric A. Schon and Michael J. Zinaman, "Germ-Line Therapy to cure Mitochondrial Disease: Protocol and Ethics of In Vitro Ovum Nuclear Transplantation" in *Cambridge Quarterly of Healthcare Ethics* 4(1995)316 – 339

[126] Renato Dulbecco, *La Mappa della Vita: L'Interpretazione del Codice Genetico*, p. 8

[127] T. W. Sadler, *Medical Embryology*, Williams & Wilkins, Baltimore, 1995. pp. 3 – 9; Burton Guttman, Anthony Griffits, David Suzuki, and Tara Cullis, *Genetics*, pp. 30 – 48; Linda Tagliaferro, *Genetic Engineering: Progress or Peril?*, pp. 11 – 14;

If we unwind chromosomes, we find the chain of DNA (deoxyribonucleic acid) whose shape is like a double helix ladder. There are about two meters long of DNA chain that are tightly packaged and coiled in each cell of the human body. Since the human body is composed of about 3 X 10^{12} cells, if we join together the entire DNA strands in a human being, it would connect the earth and the moon 8,000 times[128].

In 1869, Johann Friedrich Miesher (1844 – 1895) discovered DNA when he was just 25 years old and had just finished his studies in medicine in Basel, Switzerland. When he tried to separate the components in the nucleus of a cell, he discovered DNA but, unfortunately, he did not know the function of the DNA until he died[129].

In 1953 James Watson and Francis Crick discovered the double-helix structures of DNA. The structure of DNA is a molecule that consists of two intertwined strands, wrapped around each other in helical fashion. It is composed of two important parts. The first is the double helix with its backbone which is composed of repeating compounds of phosphate and deoxyribose (a kind of sugar). The second is nucleotide which is located between the two helices and are linked one to another along the backbone of each strand by regularly repeating chemical bonds.

Nucleotide is always composed of paired bases. The first is the paired base between Adenine (A) and Thymine (T) and the second is the paired between Guanine (G) and Cytosine (C). Because of their molecular structure, their pairing is permanent: A can pair only with T and G can pair only with C. The pairing of nucleotide is easily broken, so that A can be separated from T and G can be separated from C. This

---

LeRoy Walters, Julie Gage Palmer, *The Ethics of Human Therapy*, Oxford University Press, Oxford, 1997, pp. 3 – 15; Adriano Bompiani, *Genetica e Medicina Prenatale*, Edizioni Scientifiche Italiane, Napoli, 1999, pp. 11 – 18; Marcello Buiatti, *Le Biotecnologie: L'Ingegneria Genetica fra Biologia, Etica e Mercato*, Il Mulino, Bologna, 2001, p. 11 – 19; Adriano Bompiani, Ennio Brovedani, Carlo Cirotto, *Nuova Genetica nuove responsabilità*, San Paolo, Cinisello Balsamo, 1997, pp. 9 – 24; G. Goglia, *Embriologia Umana*, Piccin, Padova, 1997, p. 46

[128] John Harris, *Clones, Genes, and Immortality: Ethics and the Genetic Revolution*, p. 10; Fyodor D. Urnov, Alan P. Wolffe, "The Nucleus", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 48

[129] Vittorio Sgaramella, "Origine della Vita e Controllo dell'Evoluzione" in *Le Scienze, Dossier* 15 (2003)18

separation happens before cleavage of cells. There are about three billion base pairs in all the human DNA contained in our chromosomes[130].

The composition of a certain sequence of DNA makes up a gene. So the gene is not a point in a certain place of DNA but a certain sequence of DNA. The term gene comes from a German word *Gen* and was used for the first time in 1909 by Danish geneticist Wilhelm L. Johannsen (1857-1927). It is the gene that acts as the unit controlling the formation of a single polypeptide chain and contains genetic information. Although all genes are made of DNA, not all DNA make up genes because there are some places in the DNA strand that contain no genetic information. A single long strand of DNA contains several genes, many structural sequences, and plenty of sequences. Previously it was thought that there were about 50,000 – 100,000 human genes[131] but after finishing the Human Genome Project it was then estimated that there are 25.000 – 40.000 human genes[132].

Genetic information is the same in all somatic cells in a living being. So the genetic information cell of skin is the same in the cell of the heart as it is in the cell of the brain and so on. How can this happen?

This is the mystery of DNA in the cleavage (division) of somatic cells in what is called mitosis[133]. Before the mitotic division, each of the chromosomes duplicates itself by separating the double helix of DNA. The double helix of DNA are separated from one another and each strand brings a part of nucleotides either A or T and either G or C. Since A only pairs with T and G only pairs with C so when A is separated from T before the division of cell, soon A will get a new T and T will get a new A and so do with the others. The result of this division is that the two new sets of chromosomes are identical with each other and have the same genetic information as each other. When the cell divides, each of the daughter cells bears a set of chromosomes

---

[130] Harold J. Morowitz, James S. Trefil, *The Facts of Life: Science and the Abortion Controversy*, Oxford University Press, New York, 1992, p. 35

[131] Ted (ed.) Peters, *Genetics: Issues of Social Justice*, The Pilgrim Press, Cleveland, 1998, p. 52; Cristina Serra, *Il Progetto Genoma Umano: Conoscere i nostri geni potrà cambiarci la vita*, Cuen 2000, Napoli, p. 32; LeRoy Walters, Julie Gage Palmer, *The Ethics of Human Therapy*, p. 5

[132] Burton Guttman, Anthony Griffiths, David Suzuki, Tara Cullis, *Genetics*, p. 207; Renato Dulbeco, *La Mappa della Vita: L'Interpretazione del Codice Genetico*, p. 62

[133] Mitosis come from the Greek word *mit(os)* a thread.

which is identical one to the other. This pattern is repeated in the same way for all mitotic division of cells. Since human beings (living beings) come from one cell, the fusion of ovum and sperm, all the genetic information of each cell is the same in a living being (human being). The genetic information of a hair cell is the same as it is in the heart, in the liver, in the brain and so on. The genetic programs which are carried in DNA makes each living being different from every other living being whether within or outside his species. This is the reason why DNA is called the code of life[134].

2. Hereditary

Heredity is the sum of all biological processes by which particular characteristics are transmitted from parents to their offspring. The study of heredity is trying to answer the question of how and what is transmitted from one generation to another. The most visible hereditary factor is the resemblance between children and their parents. For many centuries, people have wondered why children resemble their parents. The answer to this question has been explored for many centuries and has remained one of the most puzzling and mysterious phenomena of nature for many centuries. It has started to become clear only in the early 21st century.

a. Ancient Answer

In the history of human beings, there have been many theories to explain the natural phenomenon of resemblance between children and their parents. From their observation of plants, when a new plant grows from a seed which is planted into the ground, the ancient people concluded that it was the same for human beings. Similar to the seed that is planted in the ground, it is only the man who has the seed that is planted in the womb of a woman. So the ancient people concluded that the heredity of children came only from their father. In the time of Homer as can be read in his *Iliad*, the ancient Greeks took for granted that the physical features and characters of children were inherited from their father. This is the reason why Homer considered that the origin

[134] T. W. Sadler, *Medical Embryology*, Williams & Wilkins, Baltimore, 1995, pp. 3 – 9; Linda Tagliaferro, *Genetic Engineering: Progress or Peril?*, p. 12

and lineage of a hero and virtuous man were very important for the children. Hence, this is the reason why Homer recorded lineages only through the male ancestor. There were many other Greek philosophers who had the same idea. Pindar (446 BC) wrote, "*The noble spirit of the father/ Shines forth in the nature of his son.*" Euripides, who lived during the same era as Pindar, wrote similarly, "*A noble father sires a noble son/ A base man's son is of his father's kind*"[135].

The person documented for proposing the contribution of woman on the heredity was Alcmaeon of Crotona who lived in the sixth-century B.C. He observed that there were many children who had a greater resemblance to their mother than to their father, so a woman somehow must make a contribution to heredity. He concluded that a woman must also have semen but it remains internal and, therefore, invisible. The semen emanates from the brain and flows from there to the genitals[136].

Others Greek philosophers like Leucippus, Anaxagoras, Democritus and Plato thought that virtually all parts of the body exhibited hereditary differences. Semen must be drawn from each organ and part of the body (*pangenesis*) and is carried via the blood at the moment of sexual intercourse and planted into the womb. Inside the semen, there is a complete human being in a tiny form and it will develop in the womb as the pregnancy progresses. This theory is famous with the name *homunculus* and it lasted for centuries[137].

Aristotle didn't agree with the theory of homunculus[138]. His opinion was based on real observation. He observed a soldier who went to war. Although a soldier lost his arm or leg in the battlefield, he could still produce normal children with arms and legs. Furthermore, there were many children who had a greater resemblance to their grandparents than to their parents. So the semen must not be drawn from each organ and part of the body of their father. Aristotle believed

---

[135] Burton Guttman, Anthony Griffits, David Suzuki, and Tara Cullis, *Genetics*, p. 24

[136] Burton Guttman, Anthony Griffits, David Suzuki, and Tara Cullis, *Genetics*, p. 24

[137] Even Charles Darwin (1808 – 1882) thought about heredity through a model of pangenesis and this kept him from developing a genetic basis for his theory of evolution through natural selection. Burton Guttman, Anthony Griffits, David Suzuki, and Tara Cullis,*Genetics*,p. 24

[138] Aristotle discuss his opinion on heredity in his book Generation of Animals I, 17 – 20. Jonathan Barnes (ed.), *Complete Works of Aristotle: The Revised Oxford Translation*, Princeton University Press, Princeton, 1995, pp. 1120 - 1132. All of references to Aristotle, I take from this book.

that semen was formed from the blood. Since females produce no semen, he believed that their menstrual blood bore hereditary material. Aristotle further believed that semen transmitted, not generative parts of organs, but a kind of non material information that had the capacity to form and which gave the developing embryo the potential for inherited characteristics rather than the characteristic themselves.

Aristotle's theory of blood heredity lasted for centuries and had a wide influence on many prominent figures in history and can even be heard in the vernacular language of to day, such as "Mr. Paolo is half blood of Mr. Pietro." "Prince Charles has blue blood." And so on. These expressions carry with them an assumption that biological heredity is transmitted through blood.

During the course of history, there were many people who challenged the theory of pangenesis. One of them was French essayist Michel de Montaigne (1533 – 1592). He wrote a book "*On the Resemblance of Children to Fathers*" which was based on his own experience. His whole life was full of sickness. Although he professed to be a Catholic, he agreed with euthanasia and even believed that God grants us permission enough to take our lives when He reduces us to such a condition that living is worse than dying[139]. He reflected on his own experience of sickness. It was true that both he and his father suffered from kidney stones, but his father suffered this sickness only when he was in his sixty-seventh year. When Michel de Montaigne was born twenty-five years earlier, his father didn't have any such illness. He enjoyed fine health without kidney stone illness. If the hereditary factors came from all parts of his father's body (*pangenesis*) he should have had a healthy body without any kidney stone problems since at that time, his father's body was healthy. Furthermore, he noted that he was the only one who suffered from kidney stone illness while his other brother and sisters did not. He concluded that the theory of *pangenesis* was wrong and that heredity must not come from all parts of the body but it was a tendency to produce these annoying objects[140].

An English physician William Harvey (1578-1657) who was famous for discovering the circulation of blood proved that

---

[139] Harold Y. Vanderpool, "Death and Dying: Euthanasia and Sustaining life", in Warren Thomas Reich, *Encyclopedia of Bioethics*, Simon & Schuster and Prentice Hall International, New York, 1995

[140] Burton Guttman, Anthony Griffits, David Suzuki, and Tara Cullis, *Genetics*,pp. 26 - 27

Aristotelian's theory of blood heredity was erroneous although he didn't know exactly what the right answer was. In 1633 he observed the copulation of deer in the garden of King Charles I with the intention to incise the deer's uterus a few weeks after copulation. Unfortunately, he could find neither condensed menstrual blood nor fertilized egg nor liquid male semen. It is better to say that he did not see them because he did not have a microscope which did not exist at the time. So he concluded that the new embryo didn't come from blood, or male sperm or female ovum or from mixture of both. It must come from something else but what he did not know exactly. So, he concluded that heredity is not transferred through blood[141].

August Weismann (1834 – 1914), a famous German biologist and professor at the University of Freiburg im Breisgau in the late 1890's, made a famous experiment with mice. He took male and female mice, cut their tails, copulated them but they generated mice with normal tails. He observed five generations of progeny of tailless parents composed of 901 mice in all. Needless to say, they all grew normal tails. So such modification resulted neither in the disappearance nor in the shortening of the tails in their descendants. With this experiment, he stood in opposition to the concept of inheritance of acquired characters and of mutilations that were inherited.

b. Modern Answer

The first scientific explanation of heredity was made by Gregor Mendel (1822 – 1884), an Austrian Augustinian monk who published his discovery in 1865. He conducted research in his monastery garden in Brünn (now Brno in the Czech Republic) using the pea plant (*pisum sativum).* Mendel spent ten years (1854 – 1864) observing in great detail how these characteristics were transferred from one generation to the next. He chose peas for his research because peas auto-fertilize: its fertilization is done by gamete from its own tree so that its pure heredity can be guaranteed and one can control its fertilization more easily, either by cross-fertilization or auto-fertilization.

To observe the line of heredity, Mendel first of all made two purebred strains of peas. The first type was yellow seeded pea plants and the second was green seeded peas. For generations, these strains of peas were bred only with themselves to guarantee the purity of

[141] Demetrio Neri, *La Bioetica in Laboratorio*, Editori Laterza, Roma, 2001, p. 15

[redacted]

heredity. Then Mendel made cross breeding of two different types of purebred strains of peas. Mendel named every generation with F, stand for *filius* (*filius* = child). When he crossedbred the yellow seeded and the green seeded peas, all peas resulting from this cross were yellow seeded. It seemed that the green color disappeared. He named this first generation F_1. When he bred among the F_1 to make F_2 the disappeared color in F_1 (green) appeared again in F_2. So the generation of F_2 consisted of some yellow seeds and some green seeds. Mendel got 6022 yellow seeds and 2001 green seeds. He continued his experiment using other features: white-flowered strain and purple-flowered strain. He got the same pattern: all the F_1 were white flower and the purple color reappeared in the F_2 together with the purple flower. He got 705 purple flowers and 224 white flowers. So the ratio between the two types was almost constant 3:1[142].

From his experiments, Mendel made some conclusions regarding heredity: Heredity is transmitted through factors (now we have a greater understanding and we call them genes) that do not blend but segregate. There are two factors of heredity: *dominant* that is what appeared in the F_1 and *recessive* that is what disappeared in the F_1. Parents transmit only one-half of the genes they have to each child, and they transmit different sets of genes to different children[143].

Since the discovery of the DNA structure by James Watson and Francis Crick in 1953, research of heredity has received a new impetus. Step by step researchers have arrived at a new understanding of

---

[142] This classic explanation of heredity is very famous, so that almost in every book of genetics, we can find its explanation. Adriano Bompiani, *Genetica e Medicina Prenatale*, Edizioni Scientifiche Italiane, Napoli, 1999, pp. 27 - 28; Burton Guttman, Anthony Griffits, David Suzuki, and Tara Cullis, *Genetics*, pp. 50 – 53; Linda Tagliaferro, *Genetic Engineering: Progress or Peril?*, pp. 14 – 16; Gianni Tamino, *Il Bivio Genetico: Salute e Biotecnologie tra Ricerca e Mercato*, Edizioni Ambienti, Milano, 2001, p. 33 – 34; Mae-Wan Ho, *Ingegneria Genetica: Le Biotechnologie tra Scienza e Business*, Derive Aproditi, Roma, 2001, pp. 83 – 90; Enzo Gallori, *Genetica: Atlanti Universali Giunti*, Giunti, Firenze, 1998, pp. 10 – 12; Renato Dulbecco, *La Mappa della Vita: L'Interpretazione del Codice Genetico*, pp. 8 – 9.

[143] Richard Lewontin, *Il Sogno del Genoma Umano: E Altre Illusioni della Scienza*, Editorti La Terza, Roma, 2002, pp. 61 – 86. Burton Guttman, Anthony Griffiths, David Suzuki, Tara Cullis, *Genetics*. pp. 50 – 60; Bernardino Fantini, "100 Anni di Genetica: le Leggi di Mendel e la Filosofia della Vita", in Atti dei Convegni Lincei, *Centenario della Riscoperta delle Leggi di Mendel*, Accademia Nazionale dei Lincei, Roma, 2001, pp. 11 - 20

heredity. In 1902, Walter Stanborough Sutton (1877 – 1916), an American geneticist, provided the first conclusive evidence that chromosomes carry the units of inheritance and occur in distinct pairs. A year before, he discovered sex-determining chromosomes where male have the XY chromosome and female have XX chromosome. So the gender of a baby is determined by the sperm which has either X chromosome or Y chromosome. If X chromosome meets with ovum which has X chromosome, the child is female. If Y chromosome meets Y chromosome who has X chromosome, the child is male.

In 1956 Jo Hin Tjio and Albert Levan discovered that human somatic cells contain 23 pairs of chromosomes. What Mendel called "factors" that were transmitted to children, finally were discovered in chromosomes in the form of genes. It is the gene which carries genetic information that is passed from one generation to the next generation.

It has been explained in the previous chapter that genetic information is the same in all of the somatic cells in a human being, since human beings develop from one cell from the fusion of ovum and sperm of the parents. Each of the biological parents contributes half of the genetic information for their child. The genetic information lies in the chromosome in the form of genes. Since genes in a human being are ranging from 25.000 to 40.000, so the variation of gene combinations from two human beings is immense. That is why no two human beings have the same genetic information as a whole (genome) although they are brother and sister.

In this way, it is understandable that although both the biological father and mother have always the same genome, each child inherits different genome from them because each child has a different set of genetic information.

3. Natural Fertilization of the Human Gametes

Fertilization is the fusion process of a spermatozoon and an ovum. How does it happen? Since puberty, a female begins to undergo regular monthly cycles. During her fertile periods, a woman produces one mature ovum every month which is released from her ovary. Ovum is the biggest cell in the human being that can be seen without microscopes. The fertile period of woman is limited between puberty until menopause which happens around 45 – 50 years old. The same thing happens to the male but is different in the period and number.

Since puberty, males produce sperms for the entirety of life without any limit and in an extraordinary number (billions of sperms).

Unlike the somatic cells who undergo mitotic divisions where one cell divides into two cells and every daughter cell has the same genetic information to each other and to maternal cells, the gametes cells (ovum and sperm) do not undergo mitotic divisions but undergo meiotic divisions[144]. Meiotic division happens during the formation of gametes (gametogenesis). A primitive germ cell (primary oocytes and primary spermatocyte) that has 46 chromosomes divides into four daughter cells. All of the four daughter cells receive only half the number of chromosome (23 chromosomes) and every cell has a different set of genetic information. In the formation of ovum, from the four daughter cells only one develops into a mature ovum while in the formation of sperm, all four daughter cells survive and all become mature sperms. In the process of gametogenesis, it happens crossing over: the exchange of sections of chromatids that occurs between pairs of homologous chromosomes which result in the recombination of genetic material. After this process, the integrity of parental chromosomes is not preserved and each gametes has a novel set of 23 unique chromosomes that is different from each other and from the parental chromosomes. So, all of the four daughter cells of ovum and sperm have different genetic information from each other and different from other gametes resulting from other meiotic divisions. Briefly, every ovum and every sperm has different genetic information although they come from the same person[145].

Soon after the ovum is released from the ovary, it arrives at the ampullary region of the uterine tube. This is the widest part of the tube and is located close to the ovary. If the ovum meets the spermatozoon there, it starts the process of fertilization, otherwise it will die within 12 - 24 hours. The dead ovum will be discarded within the next two weeks together with the menstrual blood[146].

---

[144] The word meiotic comes from the Greek word *meiosis* means diminution, reduction, decrease. This division is named meiotic because there is reduction of chromosome through this division.

[145] T. W. Sadler, *Medical Embryology*, Williams & Wilkins, Baltimore, 1995, pp. 5 – 21; Laureen J. Sweeney, *Basic Concepts in Embryology*, McGraw-Hill, New York, 1998, pp. 28 – 29; G. Goglia, *Embriologia Umana*, Piccin, Padova, 1997, pp. 17 – 20. 61; LeRoy Walters, Julie Gage Palmer, *The Ethics of Human Therapy*, Oxford University Press, Oxford, 1997, pp. 12 - 13

[146] T. W. Sadler, *Medical Embryology*, p. 29; G. Goglia, *Embriologia Umana*, p. 61

The process of fertilization starts by penetration of the sperm into the corona radiata (outer ring membrane of ovum). Though two hundred to three hundred million[147] spermatozoa are deposited in the female genital tract during sexual intercourse, only one is needed for fertilization. The next phase of fertilization is the penetration of the zona pellucida[148]. As soon as the head of the sperm comes in contact with the ovum surface, the ovum membrane becomes impenetrable to other spermatozoa and the zona pellucida alters its structure and composition to prevent the sperm from binding and to continue its penetration. If it happens that two spermatozoa have entered together into the ovum (polyspermy), the embryo will be a miscarriage (spontaneous abortion). The polyspermy is very rare. Now the pronucleus of the sperm is inside the ovum. After this phase, the two nuclei enter the process of pronucleus: the nuclei become bigger and have a diffuse appearance. There are two pronuclei inside the ovum: one from the sperm and the other from the ovum. Then each of pronucleus replicates its DNA to prepare the next phase of DNA fusion. The next phase is the fusion of the ovum and the sperm cell membranes. As soon as a spermatozoon comes in contact with the ovum cell membrane, the two plasma membranes fuse and step by step the two different chromosomes fuse together to build a new genome. The total process of fertilization takes about 20 – 24 hours. The fertilized ovum is called a zygote[149]. The term zygote comes from a Greek root meaning yoke. When it arrives at three day old it is called morula because it resembles a mulberry fruit (Latin: *morum*). It is called blastocyst when it is five day old. The word blastocyst comes from the Greek word *blastos* which means germ[150].

---

[147] Normally, the ejaculate has a volume of 3 – 4 mL with approximately 100 million sperm per mL. 25% – 30% of them are abnormal sperms. Man who has only 20 million sperms per mL or 50 million sperms per total ejaculate is usually infertile. T. W. Sadler, *Medical Embryology*, p. 32

[148] Zona pellucida is a glycoprotein (combination of carbohydrate and protein) shell surrounding the egg that facilitates and maintains sperm binding and induces the cuplike structure on the front end of spermatozoon. T. W. Sadler, *Medical Embryology*, Williams & Wilkins, Baltimore, 1995, p. 30

[149] T. W. Sadler, *Medical Embryology*, pp. 29 – 32; Laureen J. Sweeney, *Basic Concepts in Embryology*, pp. 28 – 29; G. Goglia, *Embriologia Umana*,, pp. 56 – 64

[150] Elizabeth A. Martin (ed.), *Oxford Concise Medical Dictionary*, Oxford, Oxford, 1998, p. 76; *Dizionario Medico*, La Biblioteca di Repubblica, Roma, 2004, p. 193

In general (without stressing the detail of its development), the product of fertilization up to the eighth week of development is called embryo. After eighth week is called fetus[151]. The word embryo comes from the Latin word '*embryon*'. The word embryon itself comes from the Greek words εν (in) + βρυειν (to grow, to swell). In this sense embryo would have meant 'the one swelling or growing inside'[152]. The Greek word εμβρυον itself primarily means 'the young one' and the second meaning is embryo or fetus. So the perception of the word εμβρυον among the Greeks is 'the young one swelling or growing in the womb'[153].

It is important to note that not all of the ova which arrive in the place of fertilization will be fertilized. Among 100 ova in the ampullary region of the uterine tube in the presence of sperm, only 84 of them will be fertilized and only 64 of them implanted into uterine wall. After the first week of gestation, there will remain 42 and only 31 of them will survive after the 6 weeks of pregnancy and be born[154].

Two important things that are determined right in fertilization:

a. Genome of the Child

Both sperm and ovum are haploid; they have only 23 chromosomes. The fusion of the two sets of chromosome builds a new set of genome for the normal human being with 46 chromosomes. The new genome is neither the father's genome nor the mother's genome but it belongs uniquely to their child. Although half of the new genome came from father's genome, the father can not claim that this new genome is his genome, nor can the mother. Since genetic information is different among sperms and among ova, the new genome is never repeated.

The determination of the child's genome happens without the parent's intention (intervention). It happens by chance or by lottery. Parents can not determine that this set of genes or that set of genes

---

[151] Elizabeth A. Martin (ed.), *Oxford Concise Medical Dictionary*, p. 210

[152] Norman M. Ford, *When did I Begin?: Conception of the Human Individual in History, Philosophy and Science*, Cambridge University Press, Cambridge, 1991, p. 9

[153] Norman M. Ford, *When did I Begin?: Conception of the Human Individual in History, Philosophy and Science*, p. 9

[154] G. Goglia, *Embriologia Umana*, p. 68

which have to meet to form a new genome for the child. Certainly a parent can hope that the child will have a beautiful mouth like her mother or have beautiful eyes like her father, but it is only a hope that they can not do anything to actualize. What they can do is wait and accept what the "lottery" does to form the new genome for their child.

In other words, the biological identity of a child is determined in the time of fertilization and it will be brought throughout his life. So, the zygote is not an anonym or someone/something without identity. A zygote has a proper identity that only belongs to him/her alone and there is no other who has the same identity whether from the same species (human species) or from other species.

This genomic identity has an intrinsic program of orientation to develop into a full human being. If there is no human intervention, the zygote will develop according to the inner program ontogenesis to be a full human being. In this way, the zygote of a human being will develop into a full human being, the zygote of monkey will develop into a full monkey, and so on. It happens because when the process of fertilization finishes, the new genome takes over control of the embryonic development so that embryo develops according to the inner program of the embryo[155].

b. Sex of the Child.

It has been explained in the previous chapter (I.C.1) that the ovum has X chromosome while the sperm has either X chromosome or Y chromosome. They are the sex chromosomes. The sex of a child is determined in the fertilization. If a sperm with X chromosome fertilized an ovum which has X chromosome, the child is a daughter. If a sperm with Y chromosome fertilized an ovum which has X chromosome, the child is a son. So the determining factor of the child's sex is the spermatozoon.

In the natural fertilization, parents also can not determine the sex of their child. It happens without the parent's intention (intervention). Although the number of sperms with X chromosomes is bigger than those which have Y chromosome, many of those with X chromosomes are dead before arriving at the place of fertilization so that the chance to

---

[155] Angelo Serra, "L'Embrione umano <<cumulo di cellule>> o <<individuo umano>>", in *La Civiltà Cattolica* 152(2001) 348 – 362

have a daughter or a son is almost equal. Even the new techniques to determine the sex of children do not offer a satisfactory result[156].

4. Natural Development of the Human Embryo[157]

Until the 1970's, the first 14 days of embryo development was usually a forgotten subject. The reason was very simple: a woman usually did not realize that she was pregnant until the absence of the first day of menstruation in the next cycle. When the first day of the period was scheduled to come but it did not, the age of the embryo was approximately 14 days and by then it was implanted totally in the uterine wall (endometrium) and its surface was covered with the endometrium layer. As a consequence, the embryo could not be observed.

This did not mean that no one knew about this period. Some embryologists such as those at the Carnegie Institute of Embryology in Washington actually studied this period. Streeter and his team from the Carnegie Institute studied systematically this period by performing autopsies and hysterectomies. Streeter explained systematically embryo development until it was two months old, including the initial period of fertilization and gestation. Although this knowledge was well known among embryologists, it remained unknown to ordinary people.

The shift happened in 1970 when Robert Edwards succeeded in making animal fertilization *in vitro* and cultured them in vitro for a week to observe their development[158]. Based on this model, they then observed the development of animal embryo *in vivo*. The success of this observation led them to apply it to human embryo[159]. After many

---

[156] G. Goglia, *Embriologia Umana*, pp. 63 - 64

[157] The technical explanation of the natural development of human embryo is a synthesis whose sources are taken mostly from T. W. Sadler, *Medical Embryology*, pp. 29 – 60; Laureen J. Sweeney, *Basic Concepts in Embryology*, pp. 31 – 37; G. Goglia, *Embriologia Umana*, pp. 62 – 91; Janine Pinet, "Le Premier Mois de la Vie: Conférence du 31 Mars 1998 à la Faculté", in Cahiers de la Faculté Libre de Philosophie Comparée", 58(1998)1 – 42; Piero e Alberto Angela, *La Straordinaria Avventura di Una Vita che Nasce: Nove Mesi nel Ventre Materno*, Oscar Mondadori, Milano, 1998, pp. 31 – 54

[158] R. G. Edwards, P. C. Steptoe, and J. M. Purdy, "Fertilization and cleavage in vitro of preovulation human oocytes", in *Nature* 227(1970)307 - 309

[159] R. G. Edwards, P. C. Steptoe, and J. M. Purdy, "Human Blastocysts grown in culture", in *Nature* 229(1971)133

experiments, finally they understood human embryonic development step-by-step from fertilization until birth The first result of this observation was the birth of Louise Brown in 1978, the first baby who was born with in vitro fertilization (IVF)[160]. Since then, knowledge of the first moment of life and its development has been open to the general public. During the last decade researchers have accomplished extraordinary achievements which through means of the media have direct impact the lives of general public as well as raised ethical questions for the general public.

Now we have a better understanding that soon after finishing the process of fertilization, the fertilized ovum (zygote) starts to divide and the first cleavage happens within 30 hours after fertilization and it becomes two cells. While traveling down the fallopian tube, the cells continue their mitotic division. They will become four cells at approximately 40 hours after fertilization and will become eight cells at approximately 56 hours after fertilization.

Until the stage of eight cells, each cell becomes smaller and forms a loosely arranged clump and it is called blastomeres. Until this stage, blastomeres have a special property of totipotent. It comes from the Latin word *totus* = all and *potens* = capacity, ability. It means that if it is separated, each cell of blastomere has the capacity to become a complete living being (human being). The twinning model of cloning, employed by Jerry Hall did, uses this property.

After this stage, blastomeres maximize their contact with each other, forming a compact ball of cells held together by tight junctions. Approximately three days after fertilization, blastomeres divide again to form 16 cells. Now, it is called morula because it resembles a mulberry fruit (Latin: *morum*). At this stage, the morula begins specialization of cells because now it starts to divide into two different groups in the cells: the inner cell mass and the outer cell mass which surrounds the inner cell mass. The inner cell mass will develop to form the embryo proper and the outer cell mass will develop to form the trophoblast which later contributes to the placenta.

In the meantime, the morula continues its journey in the fallopian tube down to the uterus. About the time when the morula enters the uterine cavity which takes approximately four days, fluid begins to penetrate into the intercellular space of the inner cell mass and form a

[160] P. C. Steptoe and R. G. Edwards, "Birth after the reimplantation of a human embryo" in *Lancet* 2(1978)366

single cavity called blastocele. Now the inner cell mass is called embryoblast while the morula is called by a new name: blastocyst. On the fifth day, the blastocyst consists of three different groups: the embryoblast (inner cell), the trophoblast (outer cell), and the blastocele (a cavity full of fluid). This is the time to harvest embryonic stem cells. The embryonic stem cells are taken only from the embryoblast (inner cell) which will gradually develop to be the embryo proper. Approximately on the sixth day, the blastocyst starts the process of implantation in the uterus wall (endometrium).

By the 11th to 12th day of development, the blastocyst is completely embedded in the endometrial stroma and the surface of the uterine wall where the blastocyst implanted, step by step is covered by the original uterine wall. This process will finish usually on the 13th day. By the end of the second weeks (day 14th) the implantation of the blastocyst is completed.

By the 15th day of development, the embryo[161] undergoes an important development with the formation of a primitive streak on the surface of the embryo. Initially the streak is vaguely defined, but on the 16th day it will be clearly visible as a narrow groove with slightly bulging regions on the other side. The primitive streak is the region of the embryo that proliferates rapidly, producing mesoderm (middle layer) cells that spread outward between the layers of the ectoderm (outer layer) and the endoderm (inner layer) of the embryo. It is a precursor of the spinal cord and backbone.

Usually embryological textbooks say that the natural twinning of the embryo happens before the 15th day and with the presence of the primitive streak, twinning is no longer possible. But recent research on mice presents evidence of another indication. K. Pitrowska and his team observed embryonic development of mice and they discovered that since the first cleavage of a mouse zygote, there is a differentiation of cells so that the fate of the two cells can be distinguished[162].

---

[161] Embryo is a general term of the product of conception within the uterus up to eighth week of development without special reference to its development process. After eighth week of development, it is called fetus. In human embryology, there is no term "pre-embryo". The term pre-embryo is used mostly by moralists, jurists, and other researchers but not serious embryologists. Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 210

[162] K. Piotrowska et al., « Blastomeres arising from the first cleavage division have distinguishable fates in normal mouse development", in *Journal in Science and Medicine* 128(2001)19

After this stage, the embryo undergoes a rapid development. One of the first organs that begins to work is the heart. It starts working on the third week of gestation by pumping blood through the primitive artery that appeared during 21 – 23 days of gestation. The central nervous system and cortex appear also in the beginning of the third week although not yet functioning.

Between the sixth and eighth weeks, the embryo resembles a miniature human being with arms, legs, hands, feet, eyes, ears, and nose although not all of them have begun to function. Because of this external human likeness, its name is no longer embryo but fetus (from Latin *foetus*).

It is interesting to note that the formation of ovum (*oogenesis*) occurs in the embryonic stage. The formation of ovum start at the third month of gestation and by the fifth month of gestation, the total number of germ cells in the ovary reaches its maximum, approximately seven million. At the same time, some of the ova begin to die. By the seventh month, the majority of them have degenerated except for a few near the surface which enter in the first meiotic division and then stop their development. They will continue their development only before puberty. At the time of birth, there are approximately 700,000 to two million ovum but many of them will die during childhood. At the time of puberty, there are approximately 400,000 ova but only fewer than 500 will be ovulated in the reproductive lifetime of the individual[163].

In the male, the formation of sperms (*spermatogenesis*) is different from *oogenesis*. In the male, it begins at puberty and continues along the life span of a man with almost an unlimited number[164].

Thanks to the rapid development of modern medical technologies, we know more clearly the first stage of the human embryonic development. In the present state, most of the researchers agree that since the end of the fertilization process, the zygote is alive. Leon Kass, a professor at the University of Chicago and the actual Chairman of the President's Council on Bioethics in the USA, gave a remarkable testimony,

---

[163] T. W. Sadler, *Medical Embryology*, Williams & Wilkins, Baltimore, 1995, pp. 13 – 14

[164] T. W. Sadler, *Medical Embryology*, Williams & Wilkins, Baltimore, 1995, pp. 16 – 19

> *"First of all, the zygote and early embryonic stages are clearly alive. They metabolized respire and respond to changes in the environment; they grow and divide. Second, though not yet organized into distinctive parts or organs, the blastocyst is an organic whole, self-developing, genetically unique and distinct from the egg and sperm whose union marked the beginning of its career as a discrete, unfolding being.... For after fertilization is complete, there exists a new individual, with its unique genetic identity, fully potent for the self-initiated development into a mature human being, if circumstances are cooperative... Any honest biologist must be impressed by these facts, and must be inclined, at least on first glance, to the view that a human life begins at fertilization."*[165]

The above affirmation can perfectly be understood because there are some essential properties that make the embryo develop in such a sequence.

a. Coordination

The above development can not happen without coordination. When the ovum is still inside the ovary, it leaves the ovary because of the ovary's contractions that expulse the ovum. This means that the ovum and its expulsion are under the control of the woman's body (i.e. ovary). It is different when the fertilization is completed. The zygote is under the control of no one. After finishing the process of fertilization, the new genome takes over the control of the zygote so that molecular and cellular activities are controlled and directed by the new genome. The zygote journeys to the uterus through the fallopian tube. Not only does he travel down, but also he develops in a certain order which is impossible without inner coordination[166].

---

[165] Leon R. Kass, *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics*, Encounter Book, San Francisco, 2002, pp. 87 – 88

[166] Angelo Serra, "L'Embrione umano <<cumulo di cellule>> o <<individuo umano>>", in *La Civiltà Cattolica* 152(2001) 359 – 160; Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", in Pontificia Academia Pro Vità, *Identity and Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Città del Vaticano, 1998, p. 163; Angelo Serra, "Dignità dell'embrione umano", in Pontificio Consiglio per la Famiglia, *Lexicon: Termini Ambigui e Discussi su Famiglia, Vita, e Questioni Etiche*, Edizioni Dehoniane Bologna, Bologna, 2003, p. 189; Angelo Serra, *L'Uomo-embrione: Il Grande Misconosciuto*, Cantagalli, Siena, 2003, p. 42

This coordination is impossible without the integrity (unity) of the embryo itself. There are so many developmental genes and cells that have to develop in a certain way so that they can develop together in a harmonic and organized development. Certainly, it needs the integrity of the organizer (zygote). J. Van Blerkom, the director of the Department of Molecular Biology, University of Colorado, underlined this coordination and integrity of the embryo. He said that from the available data of embryonic development, it is clear that the development of early embryo is directed by an intrinsic program that coordinates cellular development[167].

The famous Mary Warnock Committee also affirmed this property in her report 11.6, "*Once fertilization has occurred, the subsequent develop-mental processes follow one another in a systematic and structured order, …*"[168]

b. Autonomy/ Independency

Many people think that there is no autonomy in the early development of the embryo. The autonomy of the zygote is clearly demonstrated in its biological data. The zygote walks down to the womb and develops using inner energy in the mitochondria which has been prepared since the beginning. Its development is controlled by an inner program to organize cellular activity independently from the motherly program. Thanks to these properties, it is possible for in vitro fertilization (IVF) and embryonic development to happen outside the fallopian tube for a couple of days before transferring it into the womb[169]. The fact that the zygote can develop normally outside the womb means that the embryonic development is organized and controlled by an independent inner genomic program of the embryo and it is not controlled by her/his mother. The program of the surrogate mother underlined this property. If the ovum from a pure White woman

---

[167] J. Van Blerkom, "Extragenomic regulation and autonomous expression of a developmental program in the early mammalian embryo", in *Annals of the New York Academy of Sciences* 442(1985)61; Angelo Serra, "L'Embrione umano <<cumulo di cellule>> o <<individuo umano>>", in *La Civiltà Cattolica* 152(2001) 359

[168] Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, p. 59

[169] Brian Kearney, *High-Tech Conception*, Bantam Books, New York, 1998, pp. 90 – 94

is fertilized by the sperm of a pure White man and than is implanted into a Black woman, the baby will be a White baby. Although more than nine months of the important period of physical formation (development) of the White baby happens in the womb of the Black woman, the Black woman doesn't change anything regarding the genomic identity of the child.

c. Continuity

From the above biological data, we can see clearly– biologically speaking – that life starts at fertilization. The zygote is the new being that starts his life cycle. Since the zygote starts its life cycle, it is clear that its development proceeds in an uninterrupted manner. Although embryologists give many names to the embryo during its development (such as zygote, morula, blastocyst etc.), it does not mean that its development is in discontinuity. Embryonic development follows the uninterrupted rigorous cell's development and differentiation (specialization) to come up with a full human being as the finality of its development[170].

The mitotic divisions of somatic cells in the embryo guarantee the continuity of the embryonic development so that it maintains embryonic identity, unity and individuality. In other words, when a one-day old zygote develops into a 14-day old zygote, it is still the same subject, the same person and the same entity.

This continuity of development is affirmed by many embryologists such as Moore and Persaud, the leading human embryologists, who say, *"Human development is a continuous process*

---

170 Angelo Serra, "L'Embrione umano <<cumulo di cellule>> o <<individuo umano>>", in *La Civiltà Cattolica* 152(2001) 361 – 362; Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", in Pontificia Academia Pro Vità, *Identity and Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Città del Vaticano, 1998, p. 164; Angelo Serra, "Dignità dell'embrione umano", in Pontificio Consiglio per la Famiglia, *Lexicon: Termini Ambigui e Discussi su Familgia, Vita, e Questioni Etiche*, Edizioni Dehoniane Bologna, Bologna, 2003, p. 189; Angelo Serra, *L'Uomo-embrione: Il Grande Misconosciuto*, Cantagalli, Siena, 2003, p. 43; Leon R. Kass, *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics*, Encounter Book, San Francisco, 2002, p. 88

that begins when an oocyte (ovum) from female is fertilized by a sperm (spermatozoon) from a male."[171]

The famous Warnock Committee affirmed this property when it said: "*While, as we have seen, the timing of the different stages of development is critical, once the process has begun, there is no particular part of the developmental process that is more important than another; all are part of a continuous process, and unless each stage takes place normally, at the correct time, and in the correct sequence, further development will cease. Thus biologically there is no one single identifiable stage in the development of the embryo beyond which the in vitro embryo should not be kept alive.*"[172]

So the Committee affirmed some important points: continuity of the process, in which there is no particular part more important than the other, and no single identifiable stage in which the embryo should not kept alive. Unfortunately, the Committee made an illogical conclusion when it agreed on research using the embryo, saying, "*If useful results can be obtained from research on embryos, then such research should be permitted. ... though the human embryo is entitled to some added measure of respect... that respect can not be absolute, and may be weighed against the benefits arising from research.*"[173]

Another authoritative person who gave testimony to the continuity of embryonic development is Lee M. Silver, professor at Princeton University in the Department of molecular Biology, Ecology and Evolutionary Biology, and the Program in Neuroscience. He wrote, "*Once fertilization is complete, there are no isolated moments along the way where you can point at an embryo or fetus and say that it is substantially different from the way it was a few minutes, or even hours earlier.*"[174]

This continuity of development has a clear finality. The finality is to develop into a full human being.

---

[171] Keith L. Moore and T.V.N. Persaud, *The Developing Human: Clinically Oriented Embryology* (7th), Saunders, Philadelphia, 2003, p. 2

[172] Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, p. 65

[173] Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, p. 62

[174] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998, p. 48

d. Gradualness

The law of ontogeny (The history of development of an individual from the fertilized egg to maturity) written inside the human genome demonstrates that the final form of development (human being) is achieved gradually. It is a continuing process of gamete replication which starts from a one-cell as the beginning of its life cycle. Because of the continuous development of the human embryo, the final form is achieved gradually while maintaining the proper identity, individuality, and uniqueness of the embryo[175]. It is not like homunculus where everything is contained inside gametes in mini forms and all the organs develop their measure inside the womb. Rather the formation of the organ is achieved in a gradual manner from one cell of zygote it will develop into full a human being.[176]

From these facts, it must be an inner regulation which controls all of the development step by step in order to arrive in the final orientation which is well defined: a human being. So, except when there is human interference or genetical error in embryonic development, the zygote auto-develops gradually with precise orientation and finality to be a full human being with his own complexity.

---

[175] Angelo Serra, "L'Embrione umano <<cumulo di cellule>> o <<individuo umano>>", in *La Civiltà Cattolica* 152(2001)361 – 362; Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", in Pontificia Academia Pro Vità, *Identity and Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Città del Vaticano, 1998, pp. 164 – 165; Angelo Serra, *L'Uomo-embrione: Il Grande Misconosciuto*, Cantagalli, Siena, 2003, pp. 143 – 144

[176] Angelo Serra, "Dignità dell'embrione umano", in Pontificio Consiglio per la Famiglia, *Lexicon: Termini Ambigui e Discussi su Familgia, Vita, e Questioni Etiche*, Edizioni Dehoniane Bologna, Bologna; 2003, p. 190

D. Biological Aspects of Cloning

After discussing the natural fertilization and the development of human embryo, it is indispensable to understand the technical aspect of cloning. This understanding is very important to see clearly why, how, and where the deviation of cloning if we compare with the natural fertilization and its development. Our ethical reflection will have strong base on this biological data. In this chapter, we will discuss the technical and biological aspect of (human) cloning and its consequences for the life of human being.

1. Techniques of Cloning

Reprogramming a highly specialized somatic cell to become a whole living being is not a natural phenomenon. It needs human interference with advanced technologies although, for the time being, the average success is very low. So, the technical aspects play an important role in the overall discussions of cloning. There are two techniques of cloning: Embryonic Splitting or Twinning and Somatic Cell Nuclear Transfer (SCNT)[177].

a. Embryonic Splitting or Twinning

Twinning is a phenomenon in human pregnancy with some risks. Approximately 12% of premature birth infants are caused by twin pregnancy. When the twins are born, there are greater risks of dying (approximately 10 – 20%) than the single birth (2%). Only 29% of woman with a twin pregnancy give birth to two babies. Most of them only give birth to one baby or none at all because one fetus or the two fetuses die usually in the first trimester or early second trimester of the pregnancy[178].

There are two types of twinning naturally: dizygotic twins and monozygotic twins. Dizygotic twins or fraternal twins come from two different ova that mature and are fertilized by two different sperms.

---

[177] Stephen Holland, *Bioethics: A Philosophical Introduction*, Polity Press, Cambridge, 2003, pp. 192; D. Eliot, "Uniqueness, Individuality, and Human Cloning", in *Journal of Applied Philosophy* 15(1998) 217 - 230

[178] T. W. Sadler, *Medical Embryology*, pp. 116 – 117

Because they come from two different ova and two different sperms, their genetic information is not the same. Their physical appearances are not very similar either. Their gender is not always the same: they can be two boys or two girls or a boy and a girl. Their physical similarity is like brothers or sisters. Approximately two-thirds of twins are dizygotic twins[179].

Monozygotic twins come from a single ovum which is fertilized by a single sperm and splits into two embryos in the course of its development. The splitting occurs in various stages of development. The earliest stage happens in the two-cell stage. The exact cause of this splitting is unknown yet, but many scientists believe that it is caused by mitotic crossing over in the embryo so that a single embryo generates another embryo while maintaining its identity and unity. Because the monozygotic twins come from a single zygote, their genetic information is equally the same, their gender is the same, and their physical appearances are very much identical as well. The twinning rate for monozygotic twins is 3 – 4/1000[180].

In the cloning technology, embryonic splitting or twinning is not exactly the same concept as somatic cell nuclear transfers (SCNT) which produced Dolly. In the case of SCNT, the genetic information is the same between the cloned animal and the master (animal being cloned) while in twinning the similarity is only among the cloned animals and they are different from the mother.

The first successful human embryonic splitting (twinning) was done by Jerry Hall and his team from the George Washington University Medical Center, Washington D.C. which was announced on October 13, 1993[181].

---

[179] T. W. Sadler, *Medical Embryology*, p. 114

[180] T. W. Sadler, *Medical Embryology*, p. 114; Norman M. Ford, *When did I Begin?: Conception of the Human Individual in History, Philosophy and Science*, Cambridge University Press, Cambridge, 1991, p. 133

[181] J. L. Hall, D. Engel, P. R. Gindoff, G. L. Mottla, R. J. Stilman, "Experimental cloning of human polyploid embryos using an artificial zona pellucida" in THE AMERICAN FERTILITY SOCIETY, *Abstracts: Scientific paper to be presented at the conjoint meeting of the American Fertility Society and the Canadian Fertility and Andrology Society, October 11 – 14, 1993, Montreal*, Supplement "Fertility and Sterility" (1993)S1 – S225; Jerry Hall and Robert Stillman, "Human embryo cloning reported", in *Science* 262(1993)652 – 653;

In their experiment, Hall and his team used 22 polyploid[182] embryos from IVF patients and grew them until two-cell and eight-cell embryos. They were separated into individual blastomeres. From the 22 embryos, Hall made two different experiments. One group consisted of 17 embryos and the second group consisted of 5 embryos. Then, each of individual blastomere from the first group of 17 embryos was coated with an artificial zona pellucida and cultured in vitro at 37°C in 5%CO2 and human oviduct fluid through their maximum number of cleavages. The second group was the blastomeres from 5 embryos. They were cultured without artificial zona pellucida.

From the first group of 17 embryos, Hall got 48 new totipotent embryos after separation and coated them with artificial zona pellucida. The second group of 5 embryos grew in a different direction. When cultured together, the blastomeres of the second group fused with blastomere of other embryos. This means that in the absence of zona pellucida, either artificial or natural, blastomeres could fuse together to become chimeras.[183]

All the 48 new embryos were not implanted into the womb but destroyed. Theoretically, the new embryos could be implanted into the womb or cryopreserved to be implanted sometime in the future.

Steen M. Willadseen made a series of experiments in 1979, 1982 and 1983. He separated embryos in the stage of two, four, and eight cells. He covered them with zona pellucida of pig and then implanted into the womb. There were some pregnancies with this technique. With

---

[182] Polyploid embryo is an embryo which has three or more complete sets of chromosome because it comes from an ovum which was fertilized by two or more sperms. In the natural fertilization, this event occurs rarely but in IVF is more often.

[183] Jerry Hall and Robert Stillman, "Human embryo cloning reported", in *Science* 262(1993)652 – 653; Jerry L. Hall, Robert J. Stilmann, et al., "Experimental cloning of human polyploid embryos using an artificial zona pellucida" in The American Fertility Society, *Abstracts: Scientific paper to be presented at the conjoint meeting of the American Fertility Society and the Canadian Fertility and Andrology Society, October 11 – 14, 1993, Montreal,* Supplement "Fertility and Sterility" (1993)S1 – S225; Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", in Pontificia Academia Pro Vità, *Identity and Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life,* Libreria Editrice Vaticana, Città del Vaticano, 1998, p. 163, pp. 151 – 152

this technique, he proved that the totipotency of the embryo is maintained until 8-cell stage[184].

Many reproductive specialists are very interested in this twinning technique. This technique is also called "duplication" because it duplicates embryos in the lab without additional sperm and ovum. This attraction of duplicating embryos is due to the poor results of the existing techniques to treat infertile women and men. The statistic indicates that only 15% of women undergoing IVF gave birth to a child. If only one embryo is transferred into the womb, the percentage is lower, only 7%[185]. The twinning technique will reduce the cost, time, and procedures of the treatment and give more chances of success in having a baby. This technique also serves for the women who have difficulty in producing matured ovum. There are some women who produce only one ovum although they undergo infertility treatment. With the twinning techniques, she may have more than one embryo to be transferred into the womb and have more chances of getting pregnant.

In the recent discussions about cloning, the cloning technique of twinning is less discussed because twinning is only dividing the embryo that already exists and the genetical similarity is among the twins and not with the master. Given that embryo duplication already works well in cattle, it is also very likely to work for humans *in vitro fertilization*. It is not surprising that in the year 2000, the American Society of Reproductive Medicine declared that the technique of splitting an embryo was ethically acceptable[186].

b. Somatic Cell Nuclear Transfer

The concept of somatic cell nuclear transfers (SCNT) is quite simple. It starts with an egg. The egg and sperm are haploid cells which have only 23 chromosomes. In natural fertilization, they will unite together to form a new being who has diploid chromosomes (46 chromosomes). In the case of SCNT, the egg is not fertilized by sperm

---

[184] Robert H. Foote, "Historical Perspective", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 7

[185] Jaques Cohen and Giles Tomkin, "The Science, Fiction, and Reality of Embryo Cloning", in Michael C. Brannigan, *Ethical Issues in Human Cloning: Cross-Disciplinary Perspective*, Seven Bridges Press, New York, 2001, p. 16.

[186] John B. Gurdon and James A. Byrne, "The History of Cloning" in Council of Europe, *Cloning: Ethical Eye*, pp. 41

but its nucleus is removed by means of a microscopic glass needle about the diameter of a hair. Then a nucleus of a somatic cell – that has 46 chromosomes – is inserted into the enucleated egg so that the genetic information comes only from a single master. The result is a cloned (human) being, an identical twin, though it is born at a different time from the being it came from (the master)[187].

The idea of doing somatic cell nuclear transfer was introduced for the first time by Hans Spemann in 1938[188] when he wanted to verify Weismann's theory that during the development of the embryo, cells lost genetic information which was not needed in the development. (See the previous chapter I.B.2.a). To prove that genetic information was not lost during embryonic development, Spemann proposed to use the nucleus of a somatic cell and inserted it into an enucleated ovum and cultured it to obtain a new living being. What Spemann did was to divide a 16-cell embryo and he discovered that part of the division could develop into a full living being. Therefore, he concluded that the genetic information is not reduced during embryonic development.

The idea of transferring a somatic cell nucleus into an enucleated ovum came true only by the successful cloning of Dolly in 1997 by Ian Wilmut and his team. In his report[189], Wilmut explained how to make Dolly. To produce Dolly, Wilmut and his team took 277 mammary cells from a six-year-old ewe (Finn-Dorset ewe) and cultured them for 5 days in a nutrient-poor culture medium that forced them to exit the growth cycle and enter into a quiescent state, known as G0 phase of the cell life cycle[190]. In this state, the cells do not make messenger RNA.

---

[187] Michael D. West, *The Immortal Cell: One Scientist's Quest to Solve the Mystery of Human Aging*, Doubleday, New York, 2003, pp. 160 – 161

[188] Hans Spemann, *Embryonic development and Induction*, Yale University Press, New Haven, 1938; Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, p. 51; Arlene Judith Klozko, "Voices from Roslin: The Creators of Dolly Discuss Cloning Science, Ethics, and Social Responsibility", in Arlene Judith Klotzko(ed.), *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001, p. 11

[189] I. Wilmut, A.E. Schnieke, J. McWhir, A.J. Kind, K.H.S. Campbell, "Viable Offspring Derived from Fetal and Adult Mammalian Cells", in *Nature* 385(1997) 810 – 813

[190] "The cell cycle of a growing cell is the period between the formation of the cell by the division of its mother cell and the time when the cell itself divides to form two daughters. It is a fundamental unit of time at the cellular level since it defines the life cycle of a cell" Keith H. S. Campbell, "Cell Cycle Regulation in Cloning", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 391.

Most cells spend much of their life cycle copying DNA sequences into messenger RNA, which guides the production of proteins.

Wilmut and his team also took 247 unfertilized ova from different types of ewe (Scottish Blackface ewe) and removed their nucleus (enucleated) as soon as possible. They were recovered in calcium-free M2 medium containing 10% FCS at 37°C. The function of the enucleated ovum in this process is to provide energy and impulse for the early development of the embryo, since the outside of the nucleus of the ovum has mitochondria as the source of energy to guarantee the vitality of the cell. Only the ovum contains materials that activate the various genes which are indispensable for the activation (development) of the embryo[191].

The nucleus of 277 cells was fused with the enucleated ova by bringing them together and subjecting them to a pulsed electric current between 34 and 36 hours that stimulated the genetic material from the mammary cells to act as if it were inside a normal embryo. After being cultured for 6 days, there were 29 cells which survived longer than a few days and became blastocysts. They were transferred (implanted) into 13 recipient ewes and allowed to develop to term. Each recipient ewe was implanted with one, or two, or three embryo depending on the availability of the embryos which were ready to be implanted. From the 29 embryos implanted into the wombs, only one was carried to term and born as a live lamb, namely Dolly.

Technically, the cloning to create children which was employed to create Dolly was highly inefficient because to produce one sheep, it

---

The cycle life of cell is divided into phases G1 (gap1), S (Synthesis), G2 (Gap2) and M (Mitosis). The discrete period of DNA synthesis is preceded by G1 (the pre-DNA synthetic period) and followed by G2 (the post DNA systetic period). The M phase denotes the mitotic segregation of the duplicated genetic material and is followed by cell division. So G0 is the "switched off" phase where there is almost no activity of the cell. It is quiescent. Cells seem to enter G0 when they are understress. Cultured cell can be put into G0 by reducing their level of growth factors. Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, pp. 168 – 169

[191] David A. Prentice, *Stem Cell and Cloning*, Benjamin Cummings, San Francisco, 2003, p. 26; E.E. Saffman, P. Lasko, "Germline development in vertebrates and invertebrates", in *Cell and Molecular Life Science*, 55(1999)1141 - 1163; R.T. Cox, A.C. Spradling, "A Balbiani body and the fusome mediate mitochondrial inheritance during *Drosophila* oogenesis" in *Development*, 130(2003)1579 – 1590

needed 277 cultured cells and 247 ova[192]. The reported average rate of SCNT of mammalians that produce life offspring ranges between 1% - 3%[193]. John B. Gurdon, the first scientist who cloned amphibians (frog), reported that the average success of nuclear transfer is only 1%. Some cloned animals that survive through birth die shortly afterward[194].

The inefficiency in the cloning of other animals is not much better than Dolly. In cattle, it needed 496 cloned embryo transferred to get 30 cattle but 6 of them died shortly after birth[195]. In mice, it needed 2468 cloned embryo transferred to get 31 mice but 20 of them died at a young age[196]. In pigs, it needed 110 cloned embryos to get 1 pig[197]. In rabbits, it needed 1852 cloned embryos to get six rabbits[198].

Wilmut noted some problems relating to the technique of cloning. The first problem noted is the abnormality in the development of the cloned animal. In the cloned animals, there are many cases of Large Offspring Syndrome where the newborn animals have an excessive weight compared to the normal new born. When John Gurdon cloned frogs, he discovered that the frog was smaller when the

---

[192] I. Wilmut, A.E. Schnieke, J. McWhir, A.J. Kind, K.H.S. Campbell, "Viable Offspring Derived from Fetal and Adult Mammalian Cells", in *Nature* 385(1997) 810 – 813; Keith H. S. Campbell, "La Clonazione di Dolly", in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, 71 – 84; Clarisa Long and Christopher DeMuth, "Introduction", in Leon R. Kass and James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, p. x – xi; Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, pp. 216 – 217

[193] Tanja Dominko, Calvin Simerly, Crista Martinowich, and Gerald Schatten, "Cloning in Nonhuman Primate", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 422

[194] John B. Gurdon and James A. Byrne, "Storia della Clonazione", in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, p. 61

[195] Jose B. Cibelli, Steve L. Stice, Paul J. Golueke, Jeff J. Kane, Joseph Jerry, Cathy Blackwell, F. Abel Ponce de León, and James M. Robl, "Cloned Transgenic Calves Produced from Nonquiescent Fetal Fibroblasts", in *Science* 280(1998) 1256 – 1258

[196] T. Wakayama, A. C. F. Perry, M. Zuccotti, K. R. Johnson, R. Yanagimachi "Full-term development of mice from enucleated oocytes injected with cumulus cell nuclei" in *Nature* 394 (1998) 369 - 374

[197] Akira Onishi, Masaki Iwamoto, Tomiji Akita, Satoshi Mikawa, Kumiko Takeda, Takashi Awata, Hirohumi Hanada, and Anthony C. F. Perry, "Pig Cloning by Microinjection of Fetal Fibroblast Nuclei" in *Science* 289(2000) 1188 – 1190

[198] David A. Prentice, *Stem Cells and Cloning*, Benjamin Cummings, San Francisco, 2003, p. 23

donor cells were taken from animals at amore advanced developmental stage. The results of cloning until now show a similar pattern of defects[199]. The recent observation by Hill and Chavatte-Palmer give a clear overview of the abnormality of cloned animal:[200]

System	Abnormality
Respiratory	Surfactant deficiency, meconium aspiration, pneumonia
Cardiovascular	Pulmonary hypertension, enlarged umbilicus, septicemia
Hematopoietic	Immunodeficiency, anemia
Metabolic	Hypoglycemia, diabetes, obesity, idiopathic hyperthermia
Gastrointestinal	Gastritis/enteritis
Musculoskeletal	Contracted tendons, oversized, joint infection
Reproductive	Placentation: hydroallantois and/or edema, reduced number of placentomes, enlarged placentomes; overweight placenta
Endocrine	Delayed or absent signs of parturition, low postnatal milk production, elevated leptin
Urinary	Hydronephrosis (lambs)

Based on the above data, it is clear that for the time being, SCNT as means for reproduction is not yet safe enough for clinical implementation. The high inefficiency of live birth, the frequent occurrence of perinatal deaths and birth defects (abnormalities) indicate that we do not yet fully understand the process of epigenetic reprogramming that goes on in a reconstructed cloned embryo and can not assure that the process will be accomplished successfully in most cases[201].

---

[199] Ian Wilmut, "Cloning for Medicine", in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, pp. 47 – 48

[200] Jonathan R. Hill and Pascale Chavette-Palmer, "Pregnancy and Neonatal Care of Cloned Animals", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 259

[201] Ronald M. Green, "Ethical Implications of Cloning", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 480

There are still many other problems to be resolved regarding cloning such as the shortened telomere and the risk of passing on somatic cell mutations. Furthermore, for now there is no available technique which can decode exhaustively all of the human genes - about 25,000 – 40,000 – after the reprogramming of the genes. There is a huge danger that not all of those genes are well reprogrammed so that they will become big problems in their further development[202].

The method of nuclear transfer was employed not only with the somatic cell but also with other types of cells. Before the birth of Dolly, Wilmut and his team succeeded in making Megan and Morag, the sheep that were cloned from the nucleus of a nine-day-old sheep embryos[203]. Together with Dolly and with the same technique, Wilmut and his team also cloned two other types of nuclear transfer: nucleus from a 9-day embryo and nucleus from a 26-day fetus.

In the first type, Wilmut used 385 nuclei from 9-day embryo and 231 enucleated ova. From 385 nuclei, after they were fused into enucleated ova, there were 90 which developed to become morula. From those 90 morula, there were only 72 that could be transferred into the womb of ewes. From the 72 embryos which were transferred into the womb, there were only 4 that were born and lived[204].

In the second type, Wilmut used 172 nuclei of fetal fibroblast of a 26-day fetus and 124 ova. From 172 nuclei that were fused into enucleated ova, there were 34 which developed to become morula and all of them were transferred into the womb of the ewes. From the 34 embryos which were transferred into the womb, there were only 2 that were born and lived[205]

The success of somatic cell nuclear transfer was regarded more important than the two others because somatic cell is a highly specialized cell while the other two are not yet highly specialized cells. However, for Wilmut and his team, the real breakthrough was not

---

[202] R. Jaenisch, I. Wilmut, "Don't clone humans!" in *Science* 292(2001)639

[203] K. H. S. Campbell, J. McWhir, W. A. Ritchie & I. Wilmut, "Sheep cloned by nuclear transfer from a cultured cell line", in *Nature* 380(1996)64 – 66

[204] I. Wilmut, A.E. Schnieke, J. McWhir, A.J. Kind, K.H.S. Campbell, "Viable Offspring Derived from Fetal and Adult Mammalian Cells", in *Nature* 385(1997) 811; Ian Wilmut, "Cloning for Medicine", in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, p. 45

[205] I. Wilmut, A.E. Schnieke, J. McWhir, A.J. Kind, K.H.S. Campbell, "Viable Offspring Derived from Fetal and Adult Mammalian Cells", in *Nature* 385(1997) 811

cloning Dolly but the cloning of Megan and Morag in which experiment he succeed in getting viable offspring by transferring the nucleus of sheep embryos[206].

According to Campbell, the co-creator of Dolly, there were many factors which determined the success of SCNT. Some of them are the quality of the donator cell and the receptor cell, the tools and the chemical substance which are used in the process, and the stage of cellular division. On numerous occasions Wilmut stated that the success of making the cell enter into the stage of quiescence is an important point in the overall process of cloning[207] but other scientists rejected this claim[208]. For other researchers the good tools of manipulation are the most important factor. 75% of the success of cloning experiments depends on the good tools the researchers use[209].

The existing cloning technique nowadays (2004) is basically still the same technique which was employed to clone Dolly. "*The procedure that was used in the Korean experiment was essentially the same as that used to produce Dolly.*"[210] The slight improvement is related to technique such as the technique of enucleating the ovum with the telophase enucleation technique and the technique of transferring nucleus with nuclear transfer without micromanipulator[211].

---

[206] Arlene Judith Klozko, "Voices from Roslin: The Creators of Dolly Discuss Cloning Science, Ethics, and Sociai Responsibility", in Arlene Judith Klotzko(ed.), *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001, p. 12

[207] Ian Wilmut, Keith Campbell, and Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 160.168; Keith H. S. Campbell, "La Clonazione di Dolly", in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, p. 73; Arlene Judith Klozko, "Voices from Roslin: The Creators of Dolly Discuss Cloning Science, Ethics, and Social Responsibility", in Arlene Judith Klotzko(ed.), *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001, p. 13

[208] Jose B. Cibelli, S. L. Stice, P. J. Golueke, J. J. Kane, J. Jerry, C. Blackwell, F. A. Ponce de Leon, J. M. Robl, "Cloned transgenic calves produced from nonquiescent fetal fibroblast", in *Science* 280(1998) 1256 – 1258; T. Wakayama and R. Yanagimachi, "Cloning of male mice from adult tail-tip cells", in *Nature Genetics* 22(1999) 127 - 128

[209] Raymond L. Page, "Micromanipulation Techniques for Cloning", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 155

[210] Editorial, "Human cells from cloned embryos in research and therapy: Current methods of cloning are repeatable but remain inefficient", in *British Medical Journal* 328(2004)415 – 416

[211] Raymond L. Page, "Micromanipulation Techniques for Cloning", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 171

The President's Council on Bioethics summarized the process of cloning as follows:[212]

1. *Obtain an egg cell from a female of a mammalian species.*
2. *Remove the nuclear DNA from the egg cell, to produce an enucleated egg.*
3. *Insert the nucleus of a donor adult cell into the enucleated egg, to produce a reconstructed egg.*
4. *Activate the reconstructed egg with chemicals or electric current, to stimulate the reconstructed egg to commence cell division.*
5. *Sustain development of the cloned embryo to a suitable stage in vitro and then transfer the resulting cloned embryo to the uterus of a female host that has been suitably prepared to receive it.*
6. *Bring to live birth a cloned animal that is genetically virtually identical (except for the mitochondrial DNA) to the animal that donated the adult cell nucleus.*

Unlike the natural fertilization where a new living being comes from ovum and sperm with its genetic information, in the SCNT the new living being comes from the nucleus of the donor and the enucleated ovum. So in the SCNT, the new living being gets his/her genetic information almost completely from one source: the donator of the nucleus. It is true that there is a small amount of genetic information in the mitochondrial of the enucleated ovum, but its contribution to the genome of the new living being is very small. In the case that a woman is cloned using her ovum, the genome of the new living being is exactly the same as the woman being cloned.

Because the new living being gets its genome almost completely from one source, the genome of the one being cloned is transferred to the new living being, including its defects or its diseases. This is different from the natural fertilization in which the unification of the two different genomes results mostly in amelioration of the new genome regarding the resistance of the diseases and the normality of the genome[213].

---

[212] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. 69

[213] Ronald M. Green, "I, Clone", in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, p. 93

2. Biological Breakthrough of Cloning

For a long time people have been wondering why hair cells produced only hair, skin cells produced only skin, heart cells produced only the heart in such away, so that there is no hair in the heart and there are no bones in the liver. There were many theories that explained this. One of the famous theories was Weismann's theory. August Friedrich Leopold Weismann (1834 – 1914) was a German biologist and professor of zoology and comparative anatomy at the University of Freiburg im Breisgau. From his observation on Hydrozoa, he concluded that the germ cells of animals contain something essential for the species which must be carefully preserved and passed on from one generation to another. This special hereditary substance resided in germ plasma. That is why his theory was called the theory of the germ plasma.

Weismann was one of the few people of his time who thought that hereditary came from the two parents and mixed together in the fertilized egg. Since heredity came from the two parents, he thought that there must be an accumulation of hereditary traits in the embryo if there is no internal system to reduce it. So Weismann theorized that there must be a form of nuclear division in which each daughter nucleus receives only half of the ancestral germ plasma contained in the original nucleus.

In the case of the embryo, the first cell of the embryo contains all the necessary hereditary (genetic information) to form a whole human being. At the first division of a cell becoming two cells, the cell on the right side will form the right side of the human body and the one on the left side will form the left side of human body. When the two-cells become four cells, each cell will form one forth of the human body and so on. This happens because each cell gets only half of the hereditary information from the original cell so that when the embryo develops by cleavage of the cell, each cell loses a number of genetic information which is not needed for the development of certain human organs. That is the reason why the genetic information of hair is different from that of the skin and also different from that of the heart, and so on. Each cell has genetic information only for what is necessary to carry out its specific task to renew its organ and it loses other capabilities that the

cells do not need in their specialized job to form designated certain tissues (organ)[214].

This is the reason why no hair grows in the heart and no bones grow in the liver since the cells of hair produce only hair and the cells of the skin produce only skin and so on. The cells in the heart do not have genetic material anymore to form the bones and the bones do not have genetic material anymore to form the heart, and so on. So the development of cells is in only one direction and cannot be reversed because cells lose their genetic information to form other tissues or organs. If cells arrive in a stage of specialization to form the heart, for example, they cannot be reversed to form hair and cannot be reversed to form all of the human body[215].

Modern molecular biology explains this phenomenon in a clear and convincing way. It is true that a child receives genetic information from both of his parents like Weismann thought; but unlike Weismann's premise, the genetic materials which the child receives from parents are only half. In the previous chapter (I.C.3) it has been explained that during the gametogenesis, the germ cells undergo meiotic divisions which results in each cell having only half a set of chromosomes (23 chromosomes). So when an ovum is fertilized by a sperm, they unite the two half sets of chromosomes and make a complete set of chromosomes (46 chromosomes).

We also have seen in the previous chapter (I.C.1) that after fertilization, somatic cells undergo the division of the cell called mitotic division. In mitotic division, all daughter cells receive the exact copy of genetic information from the mother cell so that all daughter cells have the same genetic information as each other and as the mother cell. In other words, all the daughter cells receive an exact copy of the 46 chromosomes from their maternal cell so that both mother and daughter cells have exactly the same chromosomes.

Since human beings come from a single cell which is the fusion of ovum and sperm in the fertilization process, so all the cells in a

---

[214] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, pp. 66 – 69

[215] Gina Kolata, pp. 62 – 64; Juan de Dios Vial Correa, "Cloning: between science and ethics", in Juan de Dios Vial Correa, Elio Sgrecia, *Human Genome, human person and the Society of the Future: Proceeding oh 4th assembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Vatican, 1999, p. 319; Vincente Bellver Capella, *Clonare?: Etica e diritto di fronte alla clonazione umana*, G. Giappichelli Editore, Torino, 2002, pp. 23 – 24

human being have the same genetic information. The cells of hair have exactly the same genetic information as the cells of skin, and they have exactly the same genetic information as the brain and so on. This property is used in criminal investigations to identify the culprit of crimes based on the cells that they have left behind in their fingerprints at the place of crimes. One cell suffices to identify the genetic information of a whole human being.

If all the cells have the same genetic information, why then is there no hair in the brain and there is no brain in the hairs?

When the embryo arrives at 15 days old, the embryo starts to undergo specialization or differentiation to form tissues[216]. Specialization is a process in embryonic development in which unspecialized cells become specialized for particular functions, for example, to form the heart, the lungs, the brain, the skin and so forth. Until the eight-cells stage, embryonic cells have the property of *totipotens* because if the cells are separated, each cell can become a full human being.

Normally, the specialization of cells causes reduction in the cell's potentiality to form any tissue. For example, the cells of the outer layer (trophoblast) of the blastocyst will specialize to form the placenta. When the formation of the placenta finishes, these cells lose their potentiality to form other tissues such as heart, kidney, hair and so forth although cells do not lost their genetic information. In performing their duty to form tissue/organs, cells use only a small part of the total genome. Although the total genome of cells is the same for all cells in a living being, each cell uses the different part of the genome so that cells act differently and form tissues/organs differently.

In the embryonic development, the duration of time to finish a cell's specialization is different from one tissue to the other. When a baby is born, most of his cells are highly specialized. Although in human beings almost all of their cells are highly specialized, there are always some cells that are still unspecialized. They are called stem cells whose function is to maintain and regenerate dead cells in order to stay alive[217].

In the process of specialization, unlike Weismann's theory, cells do not lose their genetic information but they also do not use all the

---

[216] Some scientists use the term specialization of cell and others scientists use differentiation of cell. Both terms have the same meaning.

[217] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, p. 50

genetic information they have. They use only the necessary genetic information to carry out their jobs to form special tissues or organs. The different cells which act differently according to their designated functions use the different portions of the same total genetic information. As a result, cells produce tissues differently although they have the same total genetic information.

Naturally, if cells complete their specialization, they become highly specialized and lose their capacity to form other tissues although they still have all the genetic information to form these tissues, even to form a whole human being[218]. In other words, a highly specialized somatic cell can not be reprogrammed or rebooted or reversed to form other tissues or to form a whole living being. Specialization of cells is a one way direction: from unspecialized cells to specialized cells and the direction cannot be reversed.

What Wilmut and his team did in cloning Dolly was exactly the opposite of the above statements. With his advanced technique, he proved that a highly specialized somatic cell (the mammary gland of sheep) could be reprogrammed to form a whole living being (ewe, Dolly). In other words, specialization of cells does not involve the irreversible modification of genetic material required for development to term. Wilmut in his report of cloning Dolly wrote, "*The fact that a lamb was derived from an adult cell confirms that differentiation of that cell did not involve the irreversible modification of genetic material required from development to term.*"[219]

So the success in cloning Dolly which was announced in February 1997, was a very big scientific breakthrough. In the long history of human life, it had never happened before that a specialized somatic cell of a mammalian could become a complete mammalian. The success of reprogramming a specialized somatic cell – called cloning – of a mammalian opens up opportunities for further research to clone human beings, both for reproduction and for therapeutic goals. No wonder that Wilmut commented on his discovery: "*Our method of cloning is a powerful technology, but it also provides wonderful opportunities for scientific insight.*"[220]

---

[218] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, p. 51

[219] I. Wilmut, A.E. Schnieke, J. McWhir, A.J. Kind, K.H.S. Campbell, "Viable Offspring Derived from Fetal and Adult Mammalian Cells", in *Nature* 385(1997) 810

[220] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, p. 9

This discovery is even becoming more powerful as tools of therapy and in enhancing the quality of human life when it is combined with two other modern science and technologies: genetic engineering and the genomic. The genetic engineering transfers of genes from organism to organism, creates quite new genes, and makes it possible to build a new organism at will. The genomic provides the necessary data: knowledge of what genes to transfer, where to find them, and what they do. All of the results of genetic engineering and genomic are multiplied with cloning. So the three technologies have an inseparable connection each other and may give immense benefits for human beings[221].

Hence, cloning is not the final goal itself. It is only a means to achieve further goal. The aim of cloning is to dissect cell potency at the nuclear level and to find experimental conditions that will allow a specialized cell nucleus to substitute for the embryonic genome and drive the formation of all cell lineages[222]. Wilmut and Campbell have a different goal. For them the goal of cloning is not simply to produce facsimiles of existing creatures. "*Cloning for us is and has always been an exercise in science - finding out how cells work – and a technology that enables the genetic transformation of animals.*"[223]

3. Identical Genome of Cloned People

It has been explained before (chapter I.A) that in ancient times the word cloning was originally used by gardeners to produce new plants of the same characteristics as the original mother or a copy of the mother plants.

In the modern scientific research of cloning this aim is not far from the ancient aims. Michele Boiani and Hans R. Schöler stated that the aim of cloning is "*to dissect cell potency at the nuclear level and to find experimental conditions that will allow a specialized cell nucleus to substitute for the embryonic genome and drive the formation of all*

---

[221] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, pp. 6 – 9

[222] Michele Boiani and Hans R. Schöler, "Determinants of Pluripotency in Mammals", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 125

[223] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, p. 45

cell lineages"[224]. The substitution only happens smoothly if the two cells have the same genome, otherwise it will create problems of rejection. The more different the genome of the two cells, the greater the possibility of rejection.

So, it is legitimate to ask the question, "How similar is the genomic identity of the cloned living being and its master?"

There is a variation of the range of the identicalness. The perfect identical genome is achieved in the twinning technique. The genome of a living being is formed when the fertilization is finished (chapter I.C.3) so when the embryo is separating in the twinning technique, the genome of the embryo has been formed. Since every cell in a living being has the same genome, so the children resulting from the separation of the embryo have the perfect identical genome with each other, as well as the genes in mitochondria[225]. But the genomes of the twinning children are not the same as the mother's genome because the genome of the children is the fusion of the father's and mother's genome.

In the somatic cell nuclear transfer (SCNT), it is somewhat different. In the SCNT technique, two cells need to be united to form a cloned living being: a nucleus of a somatic cell and an enucleated ovum. In all kinds of cells there are genes outside the nucleus, in the mitochondria. So the enucleated ovum has its own gene in its mitochondria.

Unfortunately the mechanism and the content of the mitochondria are poorly understood today[226]. One thing that is clear is that only maternal mitochondria with their genes are transmitted to the children because at the time of natural fertilization, the sperm left its mitochondria outside the ovum. The unification between sperm and

---

[224] Michele Boiani and Hans R. Schöler, "Determinants of Pluripotency in Mammals", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 125

[225] Tanja Dominko, Calvin Simerly, Crista Martinowich, and Gerald Schatten, "Cloning in Nonhuman Primate", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press. San Diego, 2002, p. 427

[226] Joe Batemann, "Mitochondrial maternal guidance", in *The Scientist*, March 10, 2003; Takashi Tada, Masako Tada, M. Azim Surani, "Plasticity of Somatic Nucleus by epigenetic Reprogramming via Cell Hybridization" in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 106; John Ahmann, "Therapeutic cloning and Stem Cell Therapy", in *The National Catholic Bioethics Quarterly* 1(2001)147

ovum occurs between the nucleus of the sperm and the nucleus of the ovum. In the SCNT the researchers imitate natural fertilization: it is only the nucleus which is inserted into the ovum. So the formation of the genome of the new living being comes from the genes of the nucleus of the donator and the genes of the ovum which reside in the mitochondria.

The scientists have not understood exactly what percentage of genes resides in the mitochondria. Most of the scientists say that "a small number" of genes or "a very small number" of genes, approximately 1% of genes reside in the mitochondria[227]. According to Severino Antinori, an Italian medical doctor specializing in human reproduction who wants to clone human beings, the percentage of genes in the mitochondria is 15%[228]. But this percentage is doubtful because he mentioned this number to defend his position that the genome of the cloned human being is very different from the one being cloned. Unfortunately, he mentioned it without any scientific reference to the source of his argument.

Since the genome of the new living being is formed by the two genomes (nucleus and mitochondria) so in the SCNT the perfect identicalness of the genome is not achieved except in the case of a woman who is being cloned with her ovum[229]. If the donor of the nucleus and the ovum come from the same person, so the genome of the new living being is perfectly identical. If the donor of the nucleus is a different person than the owner of the ovum, the genome of the new living being is not identical 100% both with the donator of the nucleus

---

[227] David A. Prentice, *Stem Cell and Cloning*, Benjamin Cummings, San Francisco, 2003, p. 26; Burton Guttman, Anthony Griffiths, David Suzuki, Tara Cullis, *Genetics*, Oneworld Publications, Oxford, 2002, p. 262; Leon R. Kass, *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. 61. 67; Anne McLaren, "Introduzione" in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, p. 17; John Ahmann, "Therapeutic cloning and Stem Cell Therapy", in *The National Catholic Bioethics Quarterly* 1(2001)146; Donald S. Rubenstein, David C. Thomasma, Eric A. Schon, Michael J. Zinaman, "Germ-Line Therapy to Cure Mithochondrial Disease: Protocol and Ethics of In Vitro Ovum Nuclear Transplantation", in *Cambridge Quarterly of Healthcare Ethics*, 4(1995)316 - 339

[228] Severino Antinori, *Come Avere un Figlio e la Clonazione Terapeutica: Una Svolta Epocale per la Salute dell'Uomo*, Carmenta Editore, Bologna, 2002, p. 8

[229] George E. Seidel, "Genetic and Phenotypic Similarity among Members of Mammalian Clonal Sets", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 215

and the donator of the ovum. Since the scientists do not know exactly how many percent of genes reside in the mitochondria, we don not know either to what degree the identicalness is between the cloned living being and the donator in the SCNT technique.

Another factor that makes differences between the cloned living being and the donator is the mutation of the mitochondrial genes. The mitochondrial genome has considerable variability and mutates more readily than the chromosomal genes. It is due in part, to poor proofreading during DNA synthesis[230]. In some cases, these mutations are the source of considerable genetic diseases as well as phenotypic variation in normal mitochondrial function[231]. In other words, the mutation of the mitochondrial genes makes the genome of a cloned living being different from the donor of the nucleus.

4. The Beginning of Life in Human Cloning

We have discussed in the previous chapter (I.C.3-4) how the beginning of the life of a human being starts when fertilization finished; that is when the genetic patrimony of the sperm fuses with the genetic patrimony of the ovum and forms a new human being with its unique genome. This single cell which is called a zygote is a totipotent cell which can develop into a full human being because of its totipotency. This new human being has his own complete set of chromosomes (46 chromosomes), character, and identity. Its embryonic development is characterized by some properties, namely, coordination, autonomy (independence), continuity, and gradualness. Because of these characteristic and properties, the human embryo will develop into a full human being.

From natural human fertilization and development, we can establish the prerequisites for the beginning of a new life biologically. Those prerequisites are the completeness of chromosomes, that is the full genetic patrimony of a species, the totipotency of cells to form a

---

[230] J. Cummins, "Mitochondrial DNA in Mammalian Reproduction" in *Review of Reproduction* 3(1998)172 – 182

[231] George E. Seidel, "Genetic and Phenotypic Similarity among Members of Mammalian Clonal Sets", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 216

new living being, and the developmental properties (coordination, autonomy, continuity, and gradualness) which guide the development of the embryo. All of those prerequisites have to be present together. The lack of one of those prerequisites will prevent the start of a new living being biologically and also prevent its development into full human being. For example, although the somatic cells of human beings have complete chromosomes (46 chromosomes), they are not totipotent and they do not have the developmental properties described above so those somatic cells can not start a new human being. The same criteria we can apply to the gametes (ovum and sperm). A gamete has only half the number of normal human chromosomes. A gamete will not start a new human life by itself; ovum and sperm must fuse.

What is to be said about the beginning of life in human cloning?

The nucleus of a somatic cell which is inserted into an enucleated ovum has a complete set of 46 human chromosomes. After the process of cloning, it is neither a mere ovum nor a mere somatic nucleus anymore. This cell is an activated cell through the process of cloning, but it is not a mere an activated ovum or a reconstituted ovum. It has been capacitated for development into a living being (human being) with the full diploid chromosomes of a human being.

Through the process of activation, the egg has undergone a radical change from haploid cell into diploid cell and in its single nucleus contains the full complement of genetic material necessary for producing a new organism (human being). Precisely because of this change the growth of the cells – chromosomal replications, cell division, and differentiation into tissues and organs – are coordinated by their inner programs and their development is directed by internal principles to the fullness of a living being (human being).

An authoritative source, the President's Council on Bioethics, gives a clear description of the direct product of cloning. The Council states, "*The 'reconstituted' egg is more than reconstituted; it has been capacitated for development. Because the egg now has a diploid nucleus, it has become something beyond what it was before: it now contains in a single nucleus the full complement of genetic material necessary for producing a new organism. And being an egg cell, it uniquely offers the cytoplasmic environment that can support this development.*"[232]

---

[232] Leon R. Kass (chairman), *Human Cloning and Human Dignity: The Report of the President's Council on Bioethics*, pp. 53 – 54

Further, the Council states, "*the product of somatic nuclear transfer is an entity that is the first stage of a developing organism – of a determinate species (human), with a full genetic complement, and its own (albeit near-replicated) individual genetic identity. It hence deserves on functional grounds to be called an embryo.*"[233]

It is clear that the beginning of the life of a human being starts at the end of the process of cloning when the nucleus of a somatic cell is capacitated to become an embryo. Although in human cloning there is no fertilization, the initial product of cloning is the same as the initial product of fertilization. The President's Council on Bioethics gives clear testimony in its report: "*The product of SCNT thus resembles and can be made to act like a fertilized egg, a cell that nor only has the full complement of chromosomes but also is capable (in animals) or may be capable (in humans) of developing into a new organism.*"[234] It is important to note that when the Council made the report, there was no report of success in cloning a human being it said "may be capable in human". The latest development, the Korean scientists succeeded in developing the product of SCNT into a new organism (human embryo)[235].

The Council explains clearly the properties of this product of SCNT:

The totipotency of the product of SCNT is explained as follow: "*A fertilized egg is precisely a 'totipotent' cell; the product of human SCNT is, we assume, its equivalent.*"[236]

The coordination by internal principle and its continuing development is explained as follows: The product of SCNT "*is governed by the internal principle of development that shapes and directs its transformation... it is a primordial and unfolding whole that functions as a whole and that is in the process of developing into a mature whole being.*"[237]

---

[233] Leon R. Kass (chairman), *Human Cloning and Human Dignity: The Report of the President's Council on Bioethics*, pp. 58 – 59

[234] Leon R. Kass (chairman), *Human Cloning and Human Dignity: The Report of the President's Council on Bioethics*, p. 54

[235] Tim Radford, "Korean Scientists Clone 30 Human Embryos", in *British Medical Journal* 328 (21 February 2004) 421

[236] Leon R. Kass (chairman), *Human Cloning and Human Dignity: The Report of the President's Council on Bioethics*, p. 55

[237] Leon R. Kass (chairman), *Human Cloning and Human Dignity: The Report of the President's Council on Bioethics*, pp. 55 - 56

Because of the above biological data, the Council rightly draws a logical conclusion, "*The initial product of somatic cell nuclear transfer is a living (one-celled) cloned human embryo.*"[238] After the process of cloning, the product of cloning (embryo) - which is a living human embryo - will be transferred into the woman's womb to develop into a full human being. If it is not a living human being, it will never become a human being because the process in the woman's womb is only developing what has already existed and not creating a new life.

5. New Proposed Terminologies

It has been explained above that cloning is a giant new breakthrough in biological research. As a consequence, cloning creates many facts, or entities, or even situations for which no exact terminologies and exact meanings have been determined. In the previous chapter (I.A) it has been explained that the term cloning itself does not have a single meaning. There are many meanings of this term that the scientists use in their scientific works. If the word cloning itself does not have a single meaning, one can expect that the product of cloning and its related issues are even worse: there is much confusion. In some cases, the confusion of terms and their meanings has its origin not only in the obscurity of the objects but also in the moral position (moral stance) of the users regarding the certain issues behind the terms.

a. The Principal Actor and the Result of Cloning

Confusion may also arise in the use of the derivation of the word clone. As we have seen in the previous chapter (I.A), the word cloning comes from the Greek word κλων *klôn*. It enters into the English vocabulary and becomes "to clone" (verb), clonal (adjective), cloning (noun), clonally (adverb), and cloner (noun).

The President's Council on Bioethics offers a further interesting nuance to the definition. "*To clone is to duplicate or produce a genetic duplicate or duplicates of a molecule, cell, or*

---

[238] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, p. 56

individual organism."[239] So "to clone" (verb) is the act of cloning. In the meantime the word "clone" is also used as a noun (a clone). "*A 'clone' refers to a group of genetically identical molecules, cells, or organism descended from a single common ancestor, as well as to any one of the one or more individual organism that have descended asexually from a common ancestor Both the group and each of its members are 'a clone'.*"[240] So "a clone" is the result of cloning. The Council uses the term "clone" both to designate the act (verb) and the result (noun) of the action.

In addition, the Council also uses the term "progenitor" to describe the common ancestor.[241] There are many people who use the term "child (children)" in place of the term "a clone". This term is designated to name one of the final products of cloning.

I have objections to the use of the terms "a clone" and "progenitor" by The President's Council on Bioethics. I also have an objection to the use of the term "child /children". Before the birth of Dolly, these terminologies may have been quite clear for everybody and were even used worldwide[242], but now they are less clear in how they are understood.

Until now we do not have a term which describes the final result of the act of cloning. In spite of the term "a clone (human) being" I will use the term "a cloned (human) being or a cloned person". Stephen Holland, a lecturer in Philosophy and Health Sciences at the University of York, United Kingdom, used the same term although he did not state the reason why he used this term[243]. I believe that this term describes better and more clearly the fact that not only the existence of the new (human) being is caused by being cloned and not by being born but also the fact that the coming into being of the (human) being is a passive act from the point of view of the one being cloned (the result).

---

[239] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. 47

[240] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, p. 47

[241] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, p. 49

[242] William Bains, *Biotechnology from A to Z*, Oxford University Press, London, 1998, pp. 103 – 104

[243] Stephen Holland, *Bioethics: A Philosophical Introduction*, Polity Press, Cambridge, 2003, p. 195

It also distinguishes more concisely between the word "clone" as the verb (to clone) and the noun (a clone).

To describe the common ancestor of the cloned being, instead of using the term "progenitor", I will use the term "master". The Random House Webster dictionary offers the definition of "progenitor" as "*a person or thing that originates something or serves as a model; precursor.*" Before the birth of Dolly, it was clear for all involved how a person originated a person because at that time it was done only by birth. After the birth of Dolly, another possibility of originating another being evolved. Thus it is evident that the term "progenitor" does not fit to describe the ancestor of the cloned being. The same dictionary presents one of the meanings of the word "master" as "*an original document, drawing, manuscript etc., from which copies are made. A tape or disk from which duplicates may be made.*" In this definition, the specificity of cloning is more aptly described because it clarifies how to originate the other being, that is, by copying or duplicating and not by birth.

Regarding the term "child (children)", we have to notice that this term is different from the terms zygote, fetus, or embryo. The terms zygote, fetus, and embryo are biological terminology. These terms were coined when people knew the fetal development in the woman's womb step by step. The term child (children), on the contrary, has been known long before people understood the fetal development. Unlike the term zygote, fetus, and embryo which are biological terms, the term "children" is not first of all biological term but rather a familial or sociological term. This term describes traditionaiiy the genealogical relationship between the parent and offspring where two people (woman and man) who engage in matrimoniai relationship generate a new human being who is called "child". Any other existence of a new human being that does not belong to these categories, traditionally will be expressed by an additional information such as "adoptive", "step", or "surrogate". Thus, in familial and sociological term, we are familiar with the terms adoptive parent and adoptive children or stepfather or stepmother and stepchildren or surrogate mother. Those terms are used to designate the different relation between natural-matrimonial begetting of children and any other type of relation in producing children.

The cloned human being has a different familial or sociological relationship from the children as described above. The cloned human being has no parent like those children. The cloned human being is not

the fruit of sexual relationship between (married) people. In the final analysis, cloned people do not have the same genealogical relationship as the children who are begotten by husband and wife. That is the reason, cloned human beings cannot be called "child (children)". They have to have a different name from that of a child (children) or we can add some additional information. Unfortunately, until now we don't have the name to designate a cloned human being. In order not to be trapped into this confusion, I will use the term "human being" in spite of "child (children)". We will explore this case further when we discuss the familial relationship in the next chapter.

The common use of the ending "*er*" in English is to describe the actor of the action or the one who does the job. For example: someone who farms is a farmer; someone who drives is a driver; someone who writes is a writer, someone who presents a lecture is a lecturer, and so on. The same rule may be applied to the word clone. Someone who does cloning is a cloner.

Hence, throughout this entire dissertation I will use the term "cloned (human) being" to describe the result of cloning; the term "master" to describe the common ancestor (origin) of the cloned (human) being; the term "cloner" to describe the people who perform the job of cloning.

b. The Direct Product of Cloning

The first difficulty is related to the direct product of cloning, especially the product of somatic cell nuclear transfer. In human embryology, it is known that the product of fertilization is the "zygote" or in general "embryo". The modern usage of the term embryo is clear and most people agree to it and to the content within the term. What then should we name the product of cloning?

Although most of the scientists like John B. Gurdon and James A Byrne[244], *Comitato Nazionale per la Bioetica* (Italian National Committee for Bioethics)[245], European Council[246], National Bioethics

---

[244] John B. Gurdon and James A Byrne, "Storia della Clonazione", in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, p. 55

[245] Comitato Nazionale per la Bioetica, *La Clonazione*, Presidenza del Consiglio dei Ministri - dipartimento per l'informazione e l'editoria, Roma 1997, p. 10

[246] Comitato Nazionale per la Bioetica, *La Clonazione*, Presidenza del Consiglio dei Ministri - dipartimento per l'informazione e l'editoria, Roma 1997, p. 88

Advisory Commission[247], Severino Antinori[248], etc., use the term embryo to describe the direct product of cloning, but not all the scientists agree with the use of this term. Other scientists, like Wilmut, use the term "reconstructed embryo"[249]. Jose B. Cibelli and Robert Lanza from Advanced Cell Technology who claimed to clone the first human being, use the term "early embryo"[250]. Other scientists use other terms such as reconstructed egg, zygote-like-entity, zygote equivalent, and activated cell[251].

There are some reasons why some scientists object to the term embryo and simply do not use it. These objections are related to the origin, the uncertainty about the extent of its developmental potential, and the fact that it is a morally loaded term. For many people, the term embryo is exclusively the product of fertilization of the ovum by sperm while the product of cloning is not a fertilization; it is an activated ovum and it is completely produced by human artifice (artifact). To the present, we do not know for sure that the product of cloning will develop into a full human being, although in animal cloning it does become a full animal and the Korean scientists have already succeed in producing 30 human blastocysts[252] but it is not clear that if they are implanted to the womb they can become a full human being.

The next objection is related to the term itself. For some scientists, the term embryo is a morally loaded term. The term embryo gives the popular imagination a miniature baby. Because of this popular

---

[247] National Bioethics Advisory Commission, "Human Cloning: report and Recommendations of the National Bioethics Advisory Commission", in Richard Sherlock and John D. Morrey, *Ethical Issues in Biotechnology*, Rowman & Littlefield, Lamham, 2002, p.528

[248] Severino Antinori, *Come avere un figlio e la clonazione terapeutica: Una svolta epocale per la salute dell'uomo*, Carmenta Editore, Bologna, 2002, p. 10

[249] I. Wilmut, A.E. Schnieke, J. McWhir, A.J. Kind, K.H.S. Campbell, "Viable Offspring Derived from Fetal and Adult Mammalian Cells", in *Nature* 385(1997) 810 – 813

[250] Jose B. Cibelli, Robert P. Lanza, and Michael D. West, "The First Human Cloned Embryo" in *Scientific American* (November 24, 2001)1 – 7; Jose B. Cibelli, Ann A. Kiessling, Kerrianne Cunniff, Charlotte Richards, Robert P. Lanza, and Michael D. West, "Somatic Cell Nuclear Transfer in Humans: Pronuclear and Early Embryonic Development" in *e-Biomed The Journal of Regenerative Medicine* 2(2001) 25 - 31

[251] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, pp. 53 - 55

[252] Tim Radford, "Korean scientists clone 30 human embryos" in *British Medical Journal* 328 (2004) 421, February 21, 2004

imagination, it is unfair to say that in therapeutic cloning, stem cells are harvested from an embryo which is a miniature baby[253].

When we discuss the beginning of life in human cloning (I.D.4), we see that the nature of the product of SCNT has precise properties. It is an egg with an inserted diploid nucleus and is activated through the process of cloning. It has been capacitated for development into a living being (human being) with the full diploid chromosomes of a human being.

Through the process of activation, the egg has undergone a radical changing from haploid cell into diploid cell and in its single nucleus contains the full complement of genetic material necessary for producing a new organism (human being). Precisely because of this change that the growth of the cells – chromosomal replications, cell division and differentiation into tissues and organs – are coordinated by its inner programs and their development is directed by internal principles toward becoming full living being (human being)[254].

The President's council on Bioethics stated that "*the product of somatic nuclear transfer is an entity that is the first stage of a developing organism -- of a determinate species (human), with a full genetic complement, and its own (albeit near-replicated) individual genetic identity. It hence deserves on functional grounds to be called an embryo.*"[255].

So, this direct product of cloning has exactly the same characteristics as an embryo (cfr. Chapter I. C. 3 - 4). For this reason, I prefer to use the term "embryo" to describe the direct product of cloning since it has the same nature and essence as the direct product of fertilization. The origin does not determine the thing but it is the nature and the essence that make up a thing. It is true that there are many things which are not clear enough for us now, but I agree with the affirmation of the President's Council on Bioethics, "*Yet because something is ambiguous to us does not mean that it is ambiguous in itself.*"[256]

---

[253] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, pp. 53 – 56

[254] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, pp. 53 - 58

[255] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, pp. 58 – 59

[256] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, p. 60

c. Inner Cell Mass

It is interesting to observe the various uses of the term "inner cell mass". In the human embryology textbooks, the most common term employed is embryoblast with a short explanation that an embryoblast is a group of inner cells of the blastocyst or merely the inner cell mass that will develop into an embryo[257]. But those who favor using embryonic stem cells use the term inner cell mass (ICM) and tend to forget the term embryoblast although in some cases they still use trophoblast and blastocele[258]. I believe that the change of terminology has the background of a moral position or is morally motivated than merely the technical term which is interchangeble. The term "inner cell mass" is an euphemism to reduce the moral status of the embryo by saying that the origin of stem cells is only a mass of cells. It is a strategy to weaken the moral significance of the human embryo. When it is mentioned that the origin of the stem cells is the embryoblast, the reader will know precisely that the origin of stem cells is a part of the embryo that eventually will develop into a proper human being (embryo). In this case, the reader may be immediately opposed to the stem cells research. I prefer to use the term embryoblast because it indicates clearly and precisely the nature of this group of cells: If the development is going on naturally, it will develop into an embryo. The

---

[257] T. W. Sadler, *Medical Embryology*, p. 33, G. Goglia, *Embriologia Umana*, p. 72, Keith L. Moore - T.V.N. Persaud, *The Developing Human: Clinically Oriented Embryology*, p. 37

[258] P. C. Steptoe, R. G. Edwards, J.M. Purdy, "Human Blastocysts grown in Culture", in *Nature* 229(1971)132 – 133; M. J. Evans and M. H. Kaufman, "Establishment in Culture of Pluripotential Cells from Mouse Embryos", in *Nature* 292(1981)154 – 155; Thomson, J.A., J. Itskovitz-Eldor, S.S. Shapiro, M.A. Waknitz J.J. Swiergiel, V.S. Marshall, and J.M. Jones, "Embryonic Stem Cell Lines Derived from Human Blastocysts" in *Science* 282(1998)1145–1147; James A. Thomson, "Human Embryonic Stem cells" in Suzanne Holland, *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy*, MIT Press, Cambridge, 2001, pp. 15 – 24; M.J.H. Hendrix, "Testimony before the Senate Labor/HHS Appropriations Subcommittee", in *FASEB News*, 35(2001)1 – 4); Jose B. Cibelli, Robert P. Lanza, and Michael D. West, "The First Human Cloned Embryo" in *Scientific American* (November 24, 2001)1 – 7; Stanley Shostak, *Becoming Immortal: Combining Cloning and Stem Cell Therapy*, State University of New York Press, Albany, 2002, p. 175

suffix "*blast*" means formative cell[259]. So embryoblast is the formative cell of the embryo.

d. Types of Cloning

As is usual in the scientific world, new inventions cause chaos in the terminology so that people often experience difficulty in grasping the exact meanings. Sometimes it occurs deliberately in such a way as to camouflage the real activities in order to minimize negative reaction from society. This same phenomenon happens with the cloning of human beings. Terminologies are often so unclear that confusion exists, even among the scientists involved.

Types of cloning are classified according to their final goal[260]. If its final goal is to produce a child then it is usually called reproductive cloning, and if its final goal is to provide tissue/organs for therapy it is usually called therapeutic cloning.

Serious critiques emerge with these terminologies. The President's Council on Bioethics has objections to the terminology of reproductive cloning and therapeutic cloning. The council argues that all cloning is reproductive in the sense that all types of cloning produce a cloned human embryo. The fact that only some of them will be implanted into the womb and carried in pregnancy, does not change the nature of the product of cloning. The other reason is that the cloning is only an initial part of the total process and the rest is a natural process in producing children. After being transferred to the womb, "*all new influences that act upon the new human organism cease to be "genetic" (nature) and are now "environmental" (nurture)*".[261] For this reason, the President's Council on Bioethics proposed to use the term "cloning-to-produce-children"[262].

Another objection of the Council is the use of the term "therapeutic cloning". The President's Council on Bioethics argued that although the motive to clone is therapeutic, the cloning itself is not an act of healing or therapy. On the contrary, it destroys the product of

---

[259] Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 75

[260] Leon. R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, p. 49

[261] Leon. R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, p. 50

[262] Leon. R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, p. 50

cloning (embryo) so that the embryo itself does not enjoy the benefit of any therapy. Because of this reason, the Council proposed to use the term "cloning for research"[263].

I disagree with the terms "reproductive cloning – therapeutic cloning" and I also have a critique on the terms which were proposed by The President's Council on Bioethics: "cloning-to-produce-children" and "cloning for research". My critique will be based on the original meaning of the words cloning, reproduction, children, and therapy and their common applications in the field of medical terminology

First of all we have to make clear the meaning of the term of cloning itself. Most of the scientists agree – and so does the President's Council on Bioethics – that the product of cloning is an embryo whose genetic information is identical to the one being cloned. So, the term cloning itself has to be understood as producing an embryo asexually which has the identical genetic information as the one being cloned. The difference is in the process after the cloning and its final goal. Up until now, there have been two major final goals: to produce human beings and to create a means of research or therapeutic means. So the types of cloning have to be classified not based on the act of cloning itself – since there is no difference between them – but based on the final goal of the act (cloning).

The next critique to be examined is the term reproductive cloning. The noun of the word reproductive (adjective) is reproduction. The Random House Webster's presents the definition of the word reproduction *"the process among organisms by which new individuals of the same kind are generated."*[264] The American Heritage Dictionary offers the definition in the biological field *"the sexual or asexual process by which organisms generate others of the same kind."*[265] From these meanings we can see that every type of cloning is reproductive cloning because every type of cloning produces other organisms (individuals) of the same kind[266]. The difference is not the direct product of cloning but the fate of the embryo. In the so-called

---

[263] Leon. R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, p. 50

[264] *Random House Webster's Electronic Dictionary and Thesaurus*, College Edition, version 1.0, Reference Software International, 1992.

[265] *The American Heritage Dictionary* (3rd edition), Softkey International Inc., 1994

[266] Roberto Colombo, "La Clonazione Umana: Aspetti Scientifici e Clinici" in *L'Osservatore Romano* Wednesday August 13, 2003, p. 4

reproductive cloning, the embryo – as the direct product of cloning – is implanted in the womb of a woman in order to produce a child; while in the so-called therapeutic cloning, the embryo – as the direct product of cloning – is killed in order to harvest the stem cells. So the term reproductive cloning is not appropriate because every type of cloning is reproductive[267].

I also have critique of the terminology proposed by The President's Council on Bioethics: Cloning-to-Produce-Children. As we have seen in the previous chapter (I.D.5.a) that the term "child (children)" is not a suitable designation for the final product of cloning. I propose the term "human being" in place of the term "child (children)" since the genealogical relationship of the product of cloning is very different from the product of begetting. Although I agree to the use of the term embryo as the direct product of cloning (see chapter I.D.5.b) I do not agree with the familial and sociological term of child and children to name the final product of cloning.

In place of the term "reproductive cloning" or "cloning-to-produce-children", I will use a non-biased and transparent terminology: "cloning to create human beings". This term describes the final purpose of the cloning in a clear and frank way although it may be a little bit blunt.

The next critique to be examined is the term therapeutic cloning. The word therapy comes from the Greek word *therapeía* which means healing. The original meaning of this word was 'service to God' but later it meant 'service to human being'[268]. It has similarities with the Greek word *therápon* which means attendant[269]. From this word then comes the word therapy (noun), therapeutic or therapeutical (adjective), and therapeutically (adverb). The Random House Webster Dictionary presents the definition "*the treatment of disease or disorders, as by some remedial, rehabilitative, or curative process: speech therapy.*" The American Heritage Dictionary offers a similar definition *"Treatment of illness or disability."* From the original meaning of the Greek word through its derivative in English, there exists consistency: healing of patients. The patients who have the diseases or disorders or disabilities are treated with some remedial, rehabilitative, or curative

---

[267] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. 49
[268] John Scally, *A Brave New World?*, Veritas Publication, Dublin, 1998, p. 93
[269] Random House Webster

process so that their diseases or disorders or disabilities disappear and they regain health. For example: in speech therapy, a patient who has a disorder in speaking is treated in order to speak well; in psychotherapy, the treatment of mental and emotional disorders through the use of psychological techniques is designed to encourage communication to resolved conflictual behavior and to gain insights into problems, with the resulting goal being personality growth and behavior modification. The most important point in this case is that the patient – who receive the therapy – receives the benefit of the medical interventions and continues to live in a (more) healthy condition. We will see that in the so-called therapeutic cloning, the embryo does not receive any therapy or treatment; the embryo is even destroyed and killed in order to harvest its stem cells for therapeutic means or to be used as a means of research. The therapy – which may happen in the future – is not applied to the embryo as the product of the cloning but is applied to another individual. Thus the embryo as the product of cloning does not receive any benefit from the act of therapy. It is clear that the term "therapeutic cloning" is not appropriate. In the place of the term "therapeutic cloning", I will use the term "cloning to create therapeutic means". This term describes the final purpose of this type of cloning in a transparent and frank (blunt) way.

The objection to the term proposed by the President's Council on Bioethics: "cloning-for-biomedical-research" lays in the fact that the biomedical research is not the final goal of cloning. If producing children is the final goal of the first type of cloning, the biomedical research is not the final goal of the second type of cloning. The biomedical research is only the intermediary goal of the second type of cloning because the biomedical research does not end in itself but serves for a further (final) goal. The final goal is to provide the therapeutic means in order to cure those who have problems with genetic diseases or organ replacements.

Alan Tounson proposed the term "Nuclear transfer for stem cell". He argued that the term therapeutic cloning does not adequately describe the manipulations or intentions involved. His term adequately describes the manipulations and the intention of the act[270]. Again, making the stem cells is only an intermediary step to achieve the final goal. The final goal is making therapeutic means. So I prefer the term

[270] Alan Trounson, "Nuclear Transfer for Stem Cell", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 435

cloning to create therapeutic means, since it clearly describes the final goal of the research on stem cells.

There is also an attempt to confuse the terminology of therapeutic cloning. Some people try to include cloning to create a human being as part of therapeutic cloning[271]. They say that the couples who can not conceive through ordinary means of conception, have an infertility disorder[272]. They contend that medical technologies need to overcome this disorder. Cloning may be the only means to overcome this infertility disorder and that is the reason why employing cloning techniques to create a child is a therapeutic cloning. Classifying cloning to create children into therapeutic cloning is misleading and only yields to confusion because with that type of cloning, the infertility disorder of a man or woman is not cured. She/he may have a child through the technique of cloning but her/his infertility is not cured. She/he is still infertile reproductively.

6. Types of Cloning

As we have seen in the previous chapter (I.D.5.d), the type of cloning is classified by the final goal of the cloning. There are two types of cloning: cloning to create human beings and cloning to create therapeutic means.

a. Cloning to Create Human Beings

Cloning to create human beings is performed by removing the nucleus from an ovum and by replacing it with the nucleus from

---

[271] Cf. Jose B. Cibelli, Robert P. Lanza, and Michael D. West, "The First Human Cloned Embryo" in *Scientific American* (November 24, 2001)1 – 7.

[272] In medical terminology: infertility is measured by the ability of a man to impregnate a woman or ability a woman to conceive. The WHO's definition of infertility of a couple is if after one year of unprotected coitus of average frequency, no pregnancy has resulted. See Anthony Dyson, *The Ethics of IVF*, Mowbay, London, 1995, p. 12. Maria Luisa di Pietro made some distinctions: Fertile is the capacity to have pregnancy. Subfertile is the reduction of fertility temporarily and can be modified. Infertile is incapacity to continue pregnancy until the time of viability of the fetus. Sterile is incapacity to get pregnant after one year or two year of sexual intercourse which have potentiality to impregnant. See Maria Luisa Di Pietro, Elio Sgreccia, *Procreazione Assistita e Fecondazione Artificiale: Tra Scienza, Bioetica e Diritto*, La Scuola, Brescia, 1999, p. 8

another somatic cell. The eggs which contain the new nucleus are then activated and allowed to develop right through to the embryo stage. They are then implanted into the womb of a woman in order to develop in a normal pregnancy and to be born as a new individual. Therefore, cloning to create human being is a cloning to produce a live birth, either of an animal or of a human being. The resulting living being either animal or person has virtually the same nuclear DNA as the one who donated the nucleus[273].

The important point in the cloning to create human being is that after the activation of the nucleus with the pulsed electric current, the embryo is implanted into the uterus of a woman (either the donator of the nucleus or surrogate mother) to be carried out to full term.

b. Cloning to Create Therapeutic Means

Cloning to create therapeutic means is a cloning technique to produce tissues and ultimately organs for replacement therapy or a means of research in order to understand more fully the human cell[274]. For this purpose, the donator of the nucleus can be a human cell, or an animal cell. The first step in this type of cloning is the same as in the cloning to create children. The nucleus of a somatic cell is inserted into an enucleated egg and then it is activated and allowed to develop right through to the embryo stage. The difference lies in the fact that when the embryo arrives at approximately five days old (the stage of blastocyst), it is not implanted into the woman's womb but it is destroyed in order to harvest its stem cells for further needs. Because there is no way to harvest the stem cells without destroying it, in practicality the embryo is destroyed and killed without being implanted in the woman's womb.

- Cloning to Create Therapeutic Means Using Human Cells

Cloning to create therapeutic means involves removing the nucleus from an ovum and replacing it with the DNA from a body cell from another adult. The egg is then activated with the pulsed electric

---

[273] Susan Mayor, "Ban on Human Reproductive cloning demanded", in *British Medical Journal* 1566(2001) 322

[274] John Ahmann, "Therapeutic cloning and Stem Cell Therapy", in *The National Catholic Bioethics Quarterly* 1(2001)145

current to develop to become embryo. The embryo is not implanted into the womb of a woman but the development of the embryo will be stopped in the stage of blastocyst (5-days old) so that its stem cells can be harvested. These stem cells will be genetically identical to the adult being cloned[275]. In short, the therapeutic cloning is a cloning to get stem cells for therapy.

The idea of doing cloning to create therapeutic means using human cells is to reduce or eliminate rejection from the immune system of the receiver in cell-based therapy or transplantation. If the therapy uses the stem cells from another person (whether embryonic stem cells or adult stem cells), there is a great risk of rejection from the immune system of the receiver because the genome of the donor is different from the receiver. While in cloning to create therapeutic means, the donator of the nucleus being cloned is the nucleus of the patient himself, so the stem cells which are harvested from the cloning, will genetically match exactly the patient's genome because they are her/his cell. But this assumption needs verification in further research because there is still another obstacle to be overcome. David A Prentice explained this obstacle, "*even though there are only 13 genes in human mitochondria, some of the proteins made from these genes do end up on the surface of the cell, where there is the possibility that they could trigger an immune response.*"[276]

Cloning to create therapeutic means is also done with immature ovum. Before maturation of the ovum, the ovum undergoes meiotic division which results in the ovum having a half set of chromosomes. Cloning is done by activating the chromosomes in the immature eggs which still have a complete set. The exact technical name of this process is parthenogenesis[277]. Jose B. Cibelli and his team tried to activate this immature egg by exposing it to a chemical substance so that it could develop as a normal embryo develops. In his experiment, Cibelli exposed 22 eggs to chemicals that changed the

---

[275] Susan Mayor, "Ban on Human Reproductive cloning demanded", in *British Medical Journal* 1566(2001) 322

[276] David A. Prentice, *Stem Cells and Cloning*, Benjamin Cummings, San Francisco, 2003, p. 26

[277] Parthenogenesis comes from the Greek word *parthenos* (virgin) + *génesis*. It means that the origin of a new living being comes only from the "virgin" (unfertilized) egg alone without being fertilized by sperm. Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. 54

concentration of charged atoms called ions inside the cells. After five days of growing in culture dishes, six eggs had developed into what appeared to be blastocyst but none clearly contained the so-called inner cell mass that yields stem cells[278]. The last experiment gave hope of the success of this parthenogenesis. On April 22, 2004, *Nature* Magazine On Line[279] reported that the Japanese scientist, led by Tomohiro Kono of Tokyo University of Agriculture, success in making a mouse without father (parthenogenesis). They made 460 attempts at growing embryos by combining two eggs to get normal chromosomes of a mouse; ten live pups were born and just one of those survived to adulthood. Now the mouse is 14 months old and has babies of her own. But *The Scientist* magazine reported that this report did not convince many people. "*A leading researcher called the results very confusing, saying they raise more questions than answers.*"[280]

With this method of parthenogenesis Cibelli and his team want to reduce rejection from the immune system of the receiver. For example, if a woman has a heart disease, she can collect her own eggs and activate them in the laboratory to yield blastocyst. From this blastocyst, stem can be collected to be implanted into the heart to cure it. In this scenario, there is no rejection from her immune system because both donor and receiver have the same genome. Another deficiency of this method is that it can be used only with fertile woman who still produce ovum. Men, children, and unfertile women cannot use this method because it needs an ovum as its raw material.

- Cloning to Create Therapeutic Means Using Animal Cells

There are two goals of this type of cloning in using animal cells. The first is the pharming. Pharming comes from two words pharmacy and farm. The term pharming implies two techniques:

---

[278] Jose B. Cibelli, Robert P. Lanza, and Michael D. West, "The First Human Cloned Embryo" in *Scientific American* (November 24, 2001)1 – 7; Jose B. Cibelli, Ann A. Kiessling, Kerrianne Cunniff. Charlotte Richards, Robert P. Lanza, and Michael D. West, "Somatic Cell Nuclear Transfer in Humans: Pronuclear and Early Embryonic Development" in *e-Biomed The Journal of Regenerative Medicine* 2(2001) 25 – 31; It appeared also in Alex Vaas, "US Scientists clone first human Embryo", in *British Medical Journal* 323(2001)1267

[279] http://www.nature.com/nsu/040419/040419-8.html

[280] Cathy Holding, "1st mouse by parthenogenesis?", in *The Scientist,* April 21, 2004. http://www.biomedcentral.com/news/20040421/01

genetic engineering and cloning. The genes of animals are modified and cloned in order to produce special protein for a certain therapeutic effect. For example, Schnieke and his team make a pharming of sheep to produce special therapeutic milk[281]. After this success of transgenic sheep, there are others animals such as cows, goats, pigs which were also pharmed to produce special therapeutic proteins[282]. Aiso there is the pharming of chickens to produce a larger quantity of therapeutic protein in their eggs[283].

The second is xenotransplantation[284]. Clinical Xenotransplantation is the transplantation of cells, tissues, and organs from non human to humans or from one species of animal into another species.[285]

The research of xenotransplantation is driven by the shortage of human donor organs. Those who need organs for transplantation far exceed the available organs so that the successful xenotransplantation would provide almost unlimited numbers of organs. In 1996, more than 150,000 people around the world were on waiting list for organs. Unfortunately, only less than a third of them actually received a transplant. The demand of organs for transplantation is growing at 15% per year[286].

---

[281] A. E. Schnieke et al., "Human Factor IX transgenic sheep produced by transfer of nuclei from transfected foetal fibroblast", in *Science* 278(1997)2038 – 2039; Ian Wilmut, Cloning for Medicine, in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, p. 49

[282] Esmail Behboodi, Li How Chen, Margaret M. Destrempes, Harry M. Meade, Yann Echelard, "Transgenic Cloned Goats and the Production of Therapeutic proteins", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 459

[283] John B. Gurdon and James A. Byrne, "Storia della Clonazione", in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, p. 63; Severino Antinori, *Come avere un figlio e la clonazione terapeutica: Una svolta epocale per la salute dell'uomo*, Carmenta Editore, Bologna, 2002, p. 24

[284] Xeno means "foreign". Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 253

[285] F. H. Bach, L. A. Fishman, N. Daniels, J. Proimos, B. Anderson, C. B. Carpenter, L.Forrow, S. C. Robson, H.V. Fineberg, "Uncertainty in Xenotransplantation: Individual Benefit versus Collective Risk", in Richard Sherlock and John D. Morrey (eds.), *Ethical Issues in Biotechnology*, Rowman & Littlefield, Lamham, 2002, p. 341

[286] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 253

To provide organs for transplantation, researchers also employ genetic engineering and cloning. A certain animal's genes are modified and cloned so that its cell, tissues, and organs can be transplanted into a human being. For the time being, the researchers work mainly with pigs in order to provide organs for transplantation[287]. Pigs have been favored as potential sources of xenotransplantation because their organs are physiologically similar to those of human and their size are almost the same both in infancy and as adult[288]. Even porcine cells are already being transplanted into the brain of patients with Parkinson's diseases[289].

For the time being, these organs serve only as a temporary organ while waiting for the appropriate human organs because the risk of rejection by the immune system of the receiver is still very high. Furthermore the researchers have even discovered retrovirus in the pig that did not exist before modification of the genes. If they are transplanted into human beings and interact with human virus, they can create super-viruses that have no counter immune system[290]. The next step will be the mutation of viruses so that there will be human diseases which come from animal diseases (xenosis) that spread out among humans (epidemic) and create collective risks for humans[291].

The other problem regarding xenotransplantation is the high cost of its procurement. The PPL Therapeutics, a Scottish firm that worked with the Roslin Institute to produce Dolly, estimated that "*the market for transplantable cellular therapies, such as for treating diabetes, and for solid organs derived from animals (e.g., pigs) using xenotransplantation can reach $12 billion.*"[292]

---

[287] Ian Wilmut, "Cloning for Medicine", in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, p. 50

[288] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 255

[289] T. Deacon, J. Schumacher, J. Dinimore, "Histological evidence of fetal pig neural cell survival after transplantation into a patient with a Parkinson's disease", in *Nat. Med* 3(2907) 350 - 353

[290] Mario Capanna, *L'Uomo è più dei Suoi Geni: La Verità sulle Biotechnologie*, BUR, Milano, 2001, p. 17

[291] F. H. Bach, L. A. Fishman, N. Daniels, J. Proimos, B. Anderson, C. B. Carpenter, L.Forrow, S. C. Robson, H.V. Fineberg, "Uncertainty in Xenotransplantation: Individual Benefit versus Collective Risk", in Richard Sherlock and John D. Morrey (eds.), *Ethical Issues in Biotechnology*, Rowman & Littlefield, Lanham, 2002, pp. 343 - 344

[292] Ted Agres, "Cloning Capsized?" in *The Scientist* August 20, 2001

7. Description of Stem Cells

It is important to note that cloning and the research on stem cells originally were two different and separate researches. The aim of stem cells research is to identify environmental conditions that will lead stem cells to differentiate into one specific cell type; while the aim of cloning is to dissect cell potency at the nuclear level and to find experimental conditions that will allow a specialized cell nucleus to substitute for the embryonic genome and drive the formation of all cell lineages[293]. In the further development, the research on stem cells experiences a problem regarding "the raw material" and finds a perfect solution in cloning to provide it. So cloning inherits another new goal: therapy. Thus is born the therapeutic cloning which is the matrimony between cloning and stem cells research to achieve a common goal: therapy[294].

One of the most fascinating discoveries in medical research at the end of the 21st century is the stem cells. It is fascinating because theoretically stem cells promise to cure many incurable diseases nowadays such as Parkinson's, diabetes, Alzheimer's and many more. Since the first success of isolating and culturing human stem cells by biologist James Thomson and his team from the University of Wisconsin-Madison, many hopes have been placed upon this discovery although it has raised numerous discussions of ethical issues regarding the origin of the stem cells and its therapeutic promises. Thomson and his team used 14 blastocysts obtained from donated embryos. These embryos were created originally for infertility treatment (IVF). From the 14 blastocysts, Thomson established five independent stem cell lines in 1998. These stem cells grow indefinitely in culture and show no evidence of a diminished ability to make more cells[295].

The ultimate goal of stem cells research is the generation of cells and tissues that could be used for organ replacement and cell-based therapy by substituting human body cell populations that are

---

293 Michele Boiani and Hans R. Schöler, "Determinants of Pluripotency in Mammals", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 125

294 Stanley Shostak, *Becoming Immortal: Combining Cloning and Stem Cell Therapy*, State University of New York Press, Albany, 2002, pp. 15 – 16

295 Thomson, J.A., J. Itskovitz-Eldor, S.S. Shapiro, M.A. Wakritz, J.J. Swiergiel, V.S. Marshall, and J.M. Jones, "Embryonic Stem Cell Lines Derived from Human Blastocysts" in *Science* 282(1998)1145–1147

destroyed by diseases[296]. Although there are some reports regarding the successful experiments to develop stem cells, for the time being the real merit of it has not been obtained. Stem cells might have merit someday, but presently it is a theory because it is extremely difficult to direct their development to form the desired cell such as neuron or heart cells[297].

a. Definition

Morphologically stem cell means the sprout of a cell or the origin of a cell. It is named thus because the stem cells can give rise to all types of cells. So the stem cell is a self-renewing cell line that gives rise to all cells and tissues in the body[298]. When the stem cells divide, they can both divide themselves in the unspecialized cells as well as specialized cells to generate special tissue. These capacities belong exclusively to the stem cells because the specialized cells give rise only to the specialized cells. In other words, the stem cell is a very special cell because stem cells have three special characteristics that other cells do not have. The first characteristic is that they can renew themselves (replicate) for long periods through cell division and still maintain their unspecialized state and maintain their diploid chromosome. The second is that they are unspecialized cells. The third characteristic is their capacity to develop into specialized cells[299].

The cell's capacity to replicates itself many times is called proliferation. Stem cells that proliferate for many months in a laboratory can yield millions of cells. If the resulting cells from the process of proliferation continue to be unspecialized, the cells are said to be capable of long-term self-renewal. Scientists are trying to discover the factors in living organisms that normally regulate stem

---

[296] Michele Boiani and Hans R. Schöler, "Determinants of Pluripotency in Mammals", in Jose Cibelli, *Principles of Cloning,* Academic Press, San Diego, 2002, p. 124

[297] David A. Prentice, *Stem Cells and Cloning*, Benjamin Cummings, San Francisco, 2003, p. 9; C. Ward Kischer, "Cloning, Stem Cell Research and Some Historic Parallels", in *Linacre Quarterly*, 69(2002) 340

[298] Thomas B. Okarma, "Human Embryonic Stem Cells: A Primer on the Technology and Its Medical Applications", in Suzanne Holland, *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy*, MIT Press, Cambridge, 2001, p. 3

[299] National Institute of Health, "Stem Cell: A Primer" in http://www.nih.gov/news/stemcell/primer.htm

cells proliferation and self-renewal. The discovery of these factors may lead scientists to grow stem cells more efficiently in the laboratory[300].

The stem cell is an unspecialized cell and it does not have any tissue-specific structures that allow it to perform specialized functions such as pumping blood through the body or carrying molecules of oxygen through the bloodstream and so on. However, with certain signals, the unspecialized stem cells can give rise to specialized cells which can perform such action.

Almost all of the cells in the human body are specialized cells which are committed themselves to produce only the specialized cells to which they are designated. Stem cells are different. Stem cells are uncommitted and remain uncommitted until they receive signals to develop into specialized cells. Not all of these signals are known clearly by the researchers at this time. The scientists are just beginning to understand the signals inside and outside the stem cells that make them to be specialized. When the researchers know exactly what kind of signals to develop from unspecialized cells into specialized cells, they will be able to direct the development of stem cells to form the specialized cells or special tissues of the human body to replace or to repair the damaged tissues/organs or the defective cells.

One of the most interesting properties of the stem cell is its potency to specialize into specialized cells. In this case, the potency is defined as the range of developmental capabilities of a cell that is in a permissive or supportive environment[301].

Based on their potency, the stem cells' potency is classified as follows:

Totipotent is the potentiality of the cell which is total or unlimited, i.e., it is capable of forming all tissues and organs to form a human being, including the infrastructure for embryo development such as the placenta, umbilical cord, and amniotic fluid. The very early embryos have this capability[302].

---

[300] National Institute of Health, "Stem Cell: A Primer" in http://www.nih.gov/news/stemcell/primer.htm

[301] Michele Boiani and Hans R. Schöler, "Determinants of Pluripotency in Mammals", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 110

[302] National Institutes of Health, *Stem Cells: Scientific Progress and Future Research Directions*, Department of Health and Human Services, 2001, p. f-10; Michele Boiani and Hans R. Schöler, "Determinant of Pluripotency in Mammals", in Jose

Pluripotent is the capability of a single stem cell to give rise to types of cells that develop from three germ layers (mesoderm, endoderm, and ectoderm) from which all the cells of the body arise. So, it is capable of forming all embryonic tissues but unable to form a complete organism (living being) because it can not give rise to the placenta and supporting tissues necessary for development in the human uterus. Until now, the only cells that have this capability are the embryonic stem cells[303].

Multipotent is the capability of a stem cell to give rise to a limited or small number of different specialized cells. The blood stem cells can give rise to red blood cells, white blood cells and platelets. Skin stem cells can give rise to the various types of skin cells. Usually, a pluripotent cell will undergo further specialization into multipotent cells[304].

Unipotent is the capability of stem cells to form only one differentiated cell[305].

Plasticity is the ability of the stem cell from one adult tissue to generate the differentiated cell types of another tissue[306]. Other scientists use the term "transdifferentiation" for the same meaning[307].

b. Types of Stem Cells

The types and the names of stem cells are classified according to the origin of the stem cells: embryonic stem cells are derived from the embryo and adult stem cells are harvested among adult cells which have been specialized (somatic cells).

Cibelli and Robert P. Lanza, Keith H.S. Campbell, Michael D. West, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 110

[303] National Institutes of Health, *Stem Cells: Scientific Progress and Future Research Directions*, Department of Health and Human Services, 2001, p. 6

[304] David A. Prentice, *Stem Cell and Cloning*, Benjamin Cummings, San Francisco, 2003, p. 3

[305] David A. Prentice, *Stem Cell and Cloning*, p. 3; Michele Boiani and Hans R. Scöler, "Determinant of Pluripotency in Mammals", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 110

[306] National Institute of Health, "Stem Cell: A Primer" in http://www.nih.gov/news/stemcell/primer.htm.

[307] National Institute of Health, *Stem Cells: Scientific Progress and Future Research Directions*, National Institutes of Health, London, 2001, p. 26

- Embryonic stem cells

The first derivation of embryonic stem cells from mice was reported by two independent groups in 1981: the first group by Evans and Kaufman[308] and the second group by Martin[309].

In the previous chapter regarding the natural development of the human embryo (I.C.4), it has been explained that in the stage of five days old before implantation, the embryo is called a blastocyst and consists of approximately 100 – 150 cells. The first differentiation occurs in this stage of blastocyst where the cells form 3 different groups of cells: the embryoblast (inner cell mass that will develop into the embryo), the trophoblast (outer cell mass that will develop into the placenta and the umbilical cord), and the blastocele (a cavity full of fluid that will develop into amniotic fluid). Embryonic stem cells are harvested from the embryoblast of the blastocyst in this stage. In this stage the embryoblast consist of approximately 30 cells which are not yet specialized and maintain the capabilities to form any type of cells in the human body (pluripotent)[310].

To get human embryonic stem cell lines, the National Institute of Health explained the process as follow:

> *Growing cells in the laboratory is known as cell culture. Human embryonic stem cells are isolated by transferring the inner cell mass into a plastic laboratory culture dish that contains a nutrient broth known as culture medium. The cells divide and spread over the surface of the dish. The inner surface of the culture dish is typically coated with mouse embryonic skin cells that have been treated so they will not divide. This coating layer of cells is called a feeder layer. The reason for having the mouse cells in the bottom of the culture dish is to give the inner cell mass cells a sticky surface to which they can attach. Also, the feeder cells release nutrients into the culture medium. Recently, scientists have begun to devise ways of growing embryonic stem cells without the mouse feeder cells. This is a significant scientific advancement because of the risk that*

---

308 M. Evans and M. Kaufman, "Establishment in culture of pluripotential cells from mouse embryos", in *Nature* 292(1981)154 - 156

309 G. Martin, "Isolation of a pluripotent cell line from early mouse embryos cultured in medium conditioned by teratocarcinoma stem cells", in *Proceeding of the National Academy of Sciences of the USA* 78(1981)7634 – 7638

310 National Institute of Health, "Stem Cell: A Primer" in http://www.nih.gov/news/stemcell/primer.htm

viruses or other macromolecules in the mouse cells may be transmitted to the human cells.
Over the course of several days, the cells of the inner cell mass proliferate and begin to crowd the culture dish. When this occurs, they are removed gently and plated into several fresh culture dishes. The process of replating the cells is repeated many times and for many months, and is called subculturing. Each cycle of subculturing the cells is referred to as a passage. After six months or more, the original 30 cells of the inner cell mass yield millions of embryonic stem cells. Embryonic stem cells that have proliferated in cell culture for six or more months without differentiating, are pluripotent, and appear genetically normal, are referred to as an embryonic stem cell line.
Once cell lines are established, or even before that stage, batches of them can be frozen and shipped to other laboratories for further culture and experimentation[311].

Briefly, the embryo is destroyed in order to harvest embryonic stem cells because the most important parts of the embryo are taken away so that the embryo cannot continue to live.

For the time being, most of the experiments of stem cells are done with the embryonic stem cells of a mouse. From those experiments using mice, embryonic stem cells have been shown to differentiate into a variety of cell types, such as vascular structures[312], neurons that release dopamine and serotonin[313], and endocrine pancreatic islet cells[314]. When cultured embryonic stem cells are inserted into a blastocyst to replace the original embryoblast, they can grow normally and produce a normal embryo[315]. All these experiments prove that embryonic stem cells are pluripotent, that is they produce many types of cells.

---

[311] National Institute of Health, "Stem Cells: A Primer", in http://www.nih.gov/news/stemcell/primer.htm

[312] J. Yamashita, H. Itoh, M. Hirashima, M. Ogawa, S. Nishikawa, T. Yurugi, M. Naito, K. Nakao, and S. Nishikawa, "Flk1-positive cells derived from embryonic stem cells serve as vascular progenitors", in *Nature 408* (2000)92 – 96

[313] S. H. Lee, N. Lumelsky, L. Studer, J. M. Auerbach, and R. D. McKay, "Efficient generation of midbrain and hindbrain neurons from mouse embryonic stem cells", in *National Biotechnology 18*, (2000) 675 – 679

[314] N. Lumelsky, O. Blondel, P. Laeng, I. Velasco, R. Ravin, and R. McKay "Differentiation of Embryonic Stem Cells to Insulin-Secreting Structures Similar to Pancreatic Islets" in *Science 292*(2001)1389 – 1394

[315] National Institutes of Health, *Stem Cells: Scientific Progress and Future Research Directions*, Department of Health and Human Services, 2001, p. 6

Embryonic stem cells are more problematic than others types of stem cells because harvesting stem cells means killing the embryo. To reduce the controversy, researchers use the excess embryos from assisted reproduction technologies, such as *in vitro fertilization* (IVF). The women who are in fertility treatment are stimulated to produce more ova (super ovulation). Usually they produce approximately six ova. All of the ova are fertilized and some of them – usually three zygotes – are implanted into the womb and the rest are stored with cryopreservation (frozen embryos). In many cases, if a woman has a baby, she will leave the rest of the frozen embryos in the lab and not want them to be implanted. The researchers use these "leftover" embryos for stem cells research with the couple's consent. They argue that it is better to use these embryos for research than discard them without any advantage.

- Adult stem cells

The adult stem cell is an unspecialized cell that is found among specialized somatic cells[316]. They share the characteristic of stem cells, the adult stem cells can renew themselves (self-renewal) without becoming specialized for the lifetime of the organism. They can divide themselves and specialize to yield the major specialized cell types of the organs or tissue. They are responsible for generating damaged tissue and maintaining tissue homeostasis, such as replenishment of skin and blood cells. Typically they are localized in specific compartments or niches and are committed naturally to differentiate into the tissues in which they reside, for example in the niches of epidermal (skin), follicular (hair), intestinal (crypts), neural (brain and nerve) and hematopoietic (bone marrow and blood) niches, central nervous system, liver, and skeletal muscle[317]. Adult stem cells also reside in the umbilical cord and placenta of the fetus[318]. Many scientists

---

316 National Institutes of Health, *Stem Cells: Scientific Progress and Future Research Directions*, Department of Health and Human Services, 2001, p. 23

317 Michele Boiani and Hans R. Schöler, "Determinants of Pluripotency in Mammals", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 129; H. M. Blau, T. R. Brazelton, J. M. Weiman, "The Evolving concept of a stem cell: Entity or Function?" in *Cell* 105(2001)829 - 841

318 David A. Prentice, *Stem Cell and Cloning*, Benjamin Cummings, San Francisco, 2003, p. 5; S. Mancuso et all, "Prospettive nell'uso di Cellule Staminali da

call these stem cells fetal stem cells. In fact there is no different between fetal stem cells and adult stem cell because fetal stem cells are founded among the specialized somatic cells. So there is no need to classify differently.

For a long time, researchers have known about adult stem cells in blood which are known as hematopoietic stem cells (HSCs). This is the most studied type of stem cells. Currently, the HSCs are the only type of stem cells commonly used for therapy.[319] The HSCs are used to restore various blood and immune component to the bone marrow through the bone marrow transplantation such as in leukemia, lymphoma, diabetes, etc[320].

In the past, it was thought that the adult stem cells could be developed only to the designate cells where they reside, but the recent research shows that they can be cultured in vitro and developed into other tissues. This capacity is called transdetermination (other researchers use the term: plasticity). Some examples of transdetermination: Eglitis and Mezey transformed adult stem cells of the bone marrow (blood cell) into brain cells[321]. Jackson and his team changed the skeletal muscle cells of adult mice into blood[322]. It appears that in some situations, adult stem cells show plasticity although for the time being the basis for transdetermination is still unclear. The research on adult stem cells seems more promising[323].

Many scientists use the term somatic stem cells instead of adult stem cells because this type of stem cells is derived from specialized

---

Cordone Ombelicale", in Gianni Astrei and Antonella Bevere, *Vita Prenatale e Sviluppo della Personalità*, Cantagalli, Siena, 2003, pp. 49 - 57

[319] National Institutes of Health, Stem Cells, in http://www.nih.gov/news/stemcell/index.htm

[320] National Institutes of Health, *Stem Cells: Scientific Progress and Future Research Directions*, Department of Health and Human Services, 2001, pp. 51 – 52

[321] M. A. Eglitis and E. Mezey, "Hematopoietic cells differentiate into both microglia and macroglia in the brains of adult mice", in *Proceeding National Academy of Science U.S.A* 94(1997)4080 - 4085

[322] K. A. Jackson and M. A. Goodel, "Hematopoietic potential of stem cells isolated from murine skeletal muscle", in *Proceeding National Academy of Science U.S.A* 96(1999) 14482 – 14486

[323] Michele Boiani and Hans R. Schöler, "Determinants of Pluripotency in Mammals", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 129

cells or somatic cells[324]. This variance is understandable to minimize the confusion as if the adult stem cells come only from adult people. In fact, they also come from young people and even babies (umbilical cord) whose somatic cells have undergone specialization. Evidence to date shows that umbilical cord blood is an abundant source of hematopoietic stem cells[325].

c. Advantages and Disadvantages of Each Type of Stem Cells

- ***Embryonic Stem Cells***

Advantages

- The large number of stem cells that can be obtained from a blastocyst (30 cells).
- The pluripotency of the stem cells. So far there is evidence that embryonic stem cells in the lab culture dish can be persuaded to form various cell types, such as blood, muscle, nerve cells and so on. Theoretically the embryonic stem cells can be cultured and their development can be directed into almost all kinds of human cells. In the human body, there are about 210 cell types[326].
- They are relatively easy to identify and relatively easy to grow in culture[327].
- They can be grown indefinitely in laboratory cultures[328].

Disadvantages

- Harvesting embryonic stem cells means killing the embryo.

---

[324] Angelo Vescovi, "Cellule Staminali" in, Amedeo Santosuosso, *Le Tecniche della Biologia e Gli Arnesi del Diritto:* , Collegio Ghislieri, Pavia, 2003, p. 70

[325] Giuseppe Leone and Salvatore Manduso, "Le Cellule Staminali: Stato delle conosenze e applicazioni terapeutiche", in Sergio Zaninelli, *Scienza, Tecnica e Rispetto dell'uomo: Il Caso delle Cellule Staminali*, Vita e Pensiero, Milano, 2001, pp. 104 – 106

[326] David A. Prentice, *Stem Cell and Cloning*, pp. 3 - 6

[327] Thomson, J.A., J. Itskovitz-Eldor, S.S. Shapiro, M.A. Waknitz, J.J. Swiergiel, V.S. Marshall, and J.M. Jones, "Embryonic Stem Cell Lines Derived from Human Blastocysts" in *Science* 282(1998)1145–1147

[328] David A. Prentice, *Stem Cell and Cloning*, p. 6

- There are great risks of rejection from those who receive transplantation because both donator and the receiver have different genome or immune systems[329].
- There is inefficiency in getting them to start growing and keep growing in the laboratory. Only about 1 in 10 of the embryos used actually provide useable stem cells that will take hold in culture and grow[330].
- Instability of the gene expression. There are approximately 25.000 – 40.000 different genes in a human body[331]. All of the genes must work together in a precise time and in an exact place so that the development of the tissue and organs of the embryo can be guaranteed its normality. In the experiment with the embryonic stem cells of mice the researchers discovered the variability.
- Making embryonic stem cell lines through cloning is very inefficient. It needs a lot of human ova, since it is likely that only 1 of 10 ova fusions will develop into a blastocyst and only 1 of 10 blastocysts will develop to an embryonic stem cell line. So it needs 100 ova or more to get one embryonic stem cell line[332]. The Korean scientists who succeeded in making one stem cells line even used more ova than above prognoses. In order to get one stems line, they used 242 ova[333]. In the future, even if substantially improved, it will still need 20 – 50 ova from each embryonic stem cell line. So each patient needs many ova and that means that the cost of the cure is very high[334].

---

[329] David A. Prentice, *Stem Cell and Cloning*, p. 10

[330] David A. Prentice, *Stem Cell and Cloning*, p. 9; C. Ward Kischer, "Cloning, Stem cell Research and Some Historic Parallels", in *Linacre Quarterly*, 69(2002)338 - 343

[331] Burton Guttman, Anthony Griffiths, David Suzuki, Tara Cullis,*Genetics*, p. 207; Renato Dulbeco, *La Mappa della Vita: L'Interpretazione del Codice Genetico*, p. 62

[332] Alan Trounson, "Nuclear Transfer for Stem Cells", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 439

[333] Tim Radford, "Korean scientists clone 30 human embryos", in *British Medical Journal* 328 (2004) 415

[334] Alan Trounson, "Nuclear Transfer for Stem Cells", p. 439

- Adult Stem Cells

Advantages

- There would be no problem with immune rejection since the stem cells have the same genome as the receiver.[335]
- Adult stem cells may be less prone to promote tumors.
- A ready supply of stem cells in adult tissue so that we don't have to clone somatic cells to harvest their stem cells.[336]
- Recent research demonstrated that adult stem cells could be grown in culture indefinitely.[337]

Disadvantages

- Adult stem cells are rare and difficult to obtain. It is estimated that there is only one in 10.000 to 15.000 cells in the bone marrow[338].
- Adult stem cells are dispersed in tissues throughout the body and behave very differently depending on the local environment. For example: the stem cells of the bone marrow (blood stem cells) are constantly being generated and specialized into blood cells, while stem cells in the small intestine are stationary[339].
- Less plasticity. Unlike the embryonic stem cells which can generate all kinds of specialized cell, the adult stem cells can generate only some specialized cells other than their designated cells[340]. For example: blood stem cells can generate skeletal muscle and neurons.
- Today, the adult stem cells are difficult to identify and to distinguish from progenitor cells, which are found in fetal

[335] National Institute of Health, *Stem cells: A Primer* in http://www.nih.gov/news/stemcell/primer.htm
[336] David A. Prentice, *Stem Cell and Cloning*, p. 11
[337] David A. Prentice, *Stem Cell and Cloning*, p. 14
[338] National Institute of Health, *Stem Cell: Scientific Progress and Future Research Directions*, Department of Health and Human Services, 2001, p. 23
[339] National Institute of Health, *Stem Cell: Scientific Progress and Future Research Directions*, p. 23
[340] National Institute of Health, *Stem Cell: Scientific Progress and Future Research Directions*, p. 26

or adult tissues and are partly differentiated cells that divide and give rise to differentiated cells[341].

- They appear to decrease in numbers as a person ages[342].

E. The Objectives of Human Cloning

1. Reproduction

In modern society, the problem of reproduction is becoming more and more serious problem since presently the infertility of modern couples is increasing. This increasing infertility challenges many scientists to resolve this problem. One of the solutions which is offered by scientific community is cloning.

There is no exact data regarding the infertility of heterosexual couples worldwide, but it is estimated that it is approximately 18%[343]. In the western hemisphere, the infertility of couples is approximately 20%[344]. In Italy in 1996 the percentage of infertile couples was approximately 12% - 13%[345]. The most recent data show that each year, there are approximately 60.000 new Italian couples who are infertile and in the year 2003 there were approximately 20% of Italian couples who were infertile[346]. Of those who have an infertility problem, approximately 70% could have a pregnancy if they received a good

---

[341] National Institute of Health, *Stem Cell: Scientific Progress and Future Research Directions,* p. 25

[342] Angelo Vescovi, "Cellule Staminali" in, Amedeo Santosuosso, *Le Tecniche della Biologia e Gli Arnesi del Diritto:* , Collegio Ghislieri, Pavia, 2003, p. 70

[343] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998, p. 116. Sadler said that the infertility of couple is approximately 15 – 30%. (T.W. Sadler, *Medical Embryology*, Williams & Wilkins, Baltimore, 1995, p 32). Simon Fishel said that the infertility of couple is approximately 14% (S. Fishel, K. Dowell and S. Thornton, "Reproductive Possibilities for Infertile Couples: Present and Future", in Bentley, Gillian R. and C.G. Nicholas Mascie-Taylor, *Infertility in the Modern World: Present and Future Prospects*, Cambridge University Press, Cambridge, 2000, p. 14)

[344] Angelo Serra, "La Riproduzione Medicalmente Assistita", in *La Civiltà Cattolica* III(1999)225

[345] Maria Luisa Di Pietro, Elio Sgreccia, *Procreazione Assistita e Fecondazione Artificiale: Tra Scienza, Bioetica e Diritto*, La Scuola, Brescia, 1999, p. 11

[346] Le Scienze, 416(April 2003) 30

fertility treatment and approximately 30% of them are permanently infertile[347].

For the couples who are infertile, most of them have recourse to the in vitro fertilization (IVF) program to have a baby. Unfortunately, the average success of IVF is not satisfying. In the USA, in 1988 the average rate was 10.8%[348]. In 1993 there was a small amelioration. In the USA the average rate was 14% and in Great Britain it was 12.5%[349]. In 1998 there was a slight amelioration. In the USA the average rate is about 15%[350]. Another expert of IVF, Ermanno Greco, said that after three or four attempts, approximately 80 – 90% of the women would become pregnant[351]. Certainly, one of the most important elements of the success of IVF is the age of the women. For women aged 30 years, 20% of them can expect to have a baby if they are treated in a good fertility clinic, but for women in their mid-forties there is only a 3% chance[352].

Although the inefficiency of IVF is still high, the data shows that there were many couples who have had recourse to IVF to have a baby. In 1994, it was estimated that there were 150,000 IVF babies worldwide[353]. Five years later in 1999, it was estimated that there were approximately 300,000 IVF babies worldwide[354]. Lee M. Silver, a professor at Princeton University, predicted that the number would increase annually. By the year 2005, he predicted that there could be

---

[347] Maria Luisa di Pietro and Roberta Minaconi, "Il Ricorso alle Tecniche di Fecondazione Artificiale: Un'Analisi quantitative", in Eugenia Scabini and Giovanna Rossi, *Famiglia Generativa o Famiglia Riproduttiva: Il Dilemma Etico nelle Tecnologie di Fecondazione Assistita*, Vita e Pensiero, Milano, 1999, p. 151

[348] Angelo Serra, , "La Riproduzione Medicalmente Assistita", in *La Civiltà Cattolica* III(1999)229

[349] Angelo Serra, "La Sperimentazione sulla embryone umano: Un dibattito fra Scienza ed Etica", in *La Civiltà Cattolica* II(1998)438; Angelo Serra, *L'Uomo-embrione: Il Grande Misconosciuto*, Cantagalli, Siena, 2003, p. 65

[350] Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 117

[351] Ermanno Greco, *Genitori in Provetta: Le Certezze, I Confini e Limiti Normativi della Fecondazione in Vitro in Italia e nel Mondo*, L'Airone Editrice, Roma, 2003, p. 80

[352] Roger Gosden, *Designing Babies: The Brave New World of Reproductive Technology*, W.H. Freeman and Company, New York, 1999, p. 218

[353] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998, p. 69

[354] Roger Gosden, *Designing Babies: The Brave New World of Reproductive Technology*, W.H. Freeman and Company, New York, 1999, p. 26

more than 500,000 IVF babies born annually in the USA alone and millions more in other countries[355].

If we compare the above data regarding the IVF babies and the low success rates, it means that there are millions of couples worldwide who do not have a baby after receiving fertility treatment. In the United States alone in 1998, there were more than two million couples who wanted to conceive and were unable to do so[356]. Certainly, it is not hard to imagine that some of them are good prospective candidates for reproductive cloning, if reproductive cloning is legal and safe enough.

In addition to the above prospective candidates, there are still several candidates who are likely to avail themselves of reproductive cloning:

a. To replace a loved one. There are people who can not be separated from their loved ones and even can not live without him. The death of the loved one is so unbearable that they try to make a way to get him back. Their dream to get him back may come true through cloning technology.
   Biologically speaking, their aim to get him back is seriously questionable. As we have discussed before (I.D.3) the cloned human being is different from the one being cloned. The cloned human being is not the perfect continuation of the one being cloned. Furthermore, the brain can not be cloned[357] so that the two persons have different brains. They are different persons. It may look like the same person physically, but their genome (personality) is different.
b. A sterile couple whose husband does not have sperm so that the couple can not have fertilization either naturally or through IVF. They may want to have a biological baby but they do not want to introduce a third party in their child through the use of in vitro fertilization by donor. They may clone the nucleus of the husband and insert it into the enucleated ovum of the wife so that both husband and wife contribute biologically to their child.
c. A couple who have a terminally ill child who can be cured only by a bone marrow transplant but for whom they can not find

---

[355] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, p. 69
[356] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, p. 71
[357] Gorge Johnson, "Don't Worry: a Brain still can't be cloned" in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, pp. 9 – 11

available compatible donor. The couple can clone the dying child and if the cloning is successful, the cloned child will be a perfect donor for the dying child. The couple can have two healthy children who are identical twins of different ages[358].

d. Homosexual couples (either lesbian or gay) who want to have children. They may proceed to cloning to have biological children, although it may be only one partner who contributes biologically to their children[359]. For many feminists (lesbian), cloning can be a good proof of a woman's autonomy in reproduction without the intervention of a man. A woman can reproduce by cloning using her nucleus and her ovum so that a man is no longer needed in the process, whereas a man can not reproduce without a woman because he needs an ovum to clone him self[360].

e. To avoid genetic diseases. If both husband and wife are the carriers of one copy of a recessive gene for the same inheritable disorder, mating between husband and wife will produce a child with a serious gene disorder. It is possible that the gene disorders do not create a noticeable health impact on each of the carriers (husband or wife) but uniting the two persons can produce accumulations of the defects which create serious health problems for the child. Reproductive cloning can resolve this problem by cloning only the mother or the father so that the couple can have a healthy child[361].

Certainly there are still many prospective candidates for reproductive cloning with their special motives, such as to have a perfect baby, to reproduce famous people or geniuses and so forth.

---

[358] Robert Wachbroit, "Genetic Encores: The Ethics of Human Cloning", in Richard Sherlock and John D. Morrey (eds.), *Ethical Issues in Biotechnology*, Rowman & Littlefield, Lamham, 2002, pp. 579; Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998, p. 127

[359] Michael Tooley, "The Moral Status of the Cloning of Humans", in James M. Humber and Robert F. Almeder, *Human Cloning*, Humana Press, Totowa, 1998, p. 90

[360] Lori Andrews, "Mom, Dad, Clone: Implications for Reproductive Privacy", in Arlene Judith Klotzko (ed.), *The Cloning Sourcebook*, Cxford University Press, Oxford 2001, p. 248

[361] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. 87

2. Therapy

Briefly, the aim of this type of cloning is to develop cell-lines, which can be induced in the laboratory to develop from their pluripotent state into a specific type of cells which can be transplanted into damaged human organs to replace or rebuild them[362]. Although for the moment there is no actual therapy resulting from using cloning to create therapeutic means (stem cells), the prospect of curing many now incurable diseases is likely, though probably not in the immediate future. It needs further research and huge capital investment to realized these promising therapeutic benefits.

a. Regenerative Medicine

Therapeutic cloning will promote regenerative medicine in the near future. Regenerative medicine is "*a unifying theme for a diverse set of technologies that have the opportunity to transform health, to have a major impact on the human body, to repair and restore our bodies to normal functioning health.*"[363]

There are many diseases which are related to degeneration of cells and their genes such as Alzheimer's, Parkinson's, arthritis, diabetes, spinal cord injuries, blood disorder such as hemophilia, heart diseases and so on. In other words, those diseases are not caused by virus which can be killed by drugs or other chemical substances. The real problems of those diseases lay in the disorder, or alteration, or damage of genes, cells, or tissues so that the therapies have to be addressed directly to the cells themselves by regeneration of the cells. This kind of therapy is called cell-based therapy. Unfortunately, there are no effective treatments for those diseases at this time[364].

There are many people who suffer from those kinds of diseases worldwide. In the USA alone, those who suffer from heart diseases are approximately 6.5 million with approximately 400,000 new cases diagnosed each year. Those who suffer from diabetes are

---

[362] Mary Warnock, *Making Babies: Is There a Right to Have Children?*, Oxford University Press, Oxford, 2002, p. 99

[363] William A. Haseltine, "Regenerative Medicine 2003: An Overview", in e-biomed: The Journal of Regenerative Medicine 4(February 28, 2003) 15

[364] National Institute of Health, "Stem Cell: A Primer" in http://www.nih.gov/news/stemcell/primer.htm

approximately 1.4 million; Parkinson's diseases = 1 million; stroke = 500,000; Alzheimer's = 4 million[365].

The aim of cell-based therapy is to regenerate the damaged cells or to replace the damaged cells with the healthy cells by inserting the stem cells into the problematic cells/tissues. The stem cells will grow and replace or regenerate the problematic cells/tissues. There were reported successes for this regenerative medicine in mice: McDonald et al succeeded in regenerating spinal cord by injecting embryonic stem cells in the damaged tissues[366]. Freed et al succeeded in curing Parkinson's disease[367]. Soria et al succeeded in treating diabetes by injecting insulin from stem cells[368]. Fumihiko Nishimura et al succeeded in curing Parkinson's with embryonic stem cells in mice[369].

b. Transplantations

If regenerative medicine is still in the future, cloning for organs/tissue transplantation is more so. In the future when scientists know better what are the stimulating factors and how undifferentiated stem cells become differentiated, how to turn genes on and off, they can direct development of stem cell into desired tissue/organs. If this happens stem cells offer the possibility of a renewable source of transplantation or replacement cells and tissues to treat diseases.

---

[365] Thomas B. Okarma, " Human Embryonic Stem Cells: A Primer on the Technology and Its Medical Applications", in Suzanne Holland, *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy*, MIT Press, Cambridge, 2001, pp. 8 – 9

[366] J. W. McDonald, X. Z. Liu, Y Qu, "Transplanted Embryonic Stem Cells survive, differentiate and promote recovery in injured rat spinal cord", in *Nature Medicine* 5(1999)1410 – 1412

[367] C. R. Freed, P. E. Greene, R. E Breeze, "Transplantation of embryonic dopamine neurons for severe Parkinson's disease", in *New England Journal of Medicine* 344(2001)710 - 719

[368] B. Soria, E. Roche, G. Berna, T. Leon-Quinto. J. A. Reig, F. Martin, "Insulinsecreting cells derived from Embryonis Stem Cells Normalize Glicemia in Streptozotocin-induced diabetic mice," in *Diabetes* 49(2000) 157 - 162

[369] Fumihiro Nishimura, Masahide Yoshikawa, Seiji Kanda, Masahiro Nonaka, Hiroshi Yokota, Akira Shiroi, Hiroyuki Nakase, Hidehiro Hirabayashi, Yukiteru Ouji, Jun-Ichi Biromachi, Shigeaki Ishizaka, Toshisuke Sakaki, "Potential Use of Embryonic Stem Cell for the Treatment of Mouse Parkinsonian Model: Improved Behavior by Transplantation of In Vitro Differentiated Dopaminergic Neurons from Embryonic Stem Cell", in *Stem Cell* 21(2003)171 - 180

Today, donated organs and tissues are often used to replace ailing or destroyed tissue, but the need for transplantable tissues and organs far outweighs the available supply. Organs/tissues donations have the risks of rejection and to reduce it, the patient will have to take medication for his whole life. Cloning to create therapeutic means with the nucleus of the patient can overcome this rejection.

c. Testing New Drugs

The existing protocol of testing new drugs is gradual testing. First of all the new drugs have to be tested on experimental animals. If testing using animals gives good results, then it can be tested using human beings. The problem is that the two species have different biological systems so that in many cases, the drug gives good results when it is applied to animals and gives no good results when it is applied to human beings. Sometimes there are unpredictable side effects when it is applied to human beings. In consequence, those persons have to suffer from the unpredictable side effects of the drug test.

Cloning gives a good solution to this problem. In the future when researchers succeed in directing stem cells into certain tissues or organs, they can be used for testing new drugs before applying them to human beings. Since the tissues and organs are human tissues/organs, the good results which are obtained from drug testing on them, will perfectly match human beings. Drug testing using those tissues/organs will be very beneficial in getting good results without causing harmful side effects or irrelevant actions not necessary to achieve the therapeutic objectives[370].

3. Eternal Life/Immortality

There is a religious sect that uses cloning as a means to achieve immortality. The religious sect is a Canadian cult known as Raël. The sect was founded and run by former French journalist Claude Vorilhon who now calls himself Raël. He claims to be a direct descendant of

---

[370] Thomas B. Okarma, " Human Embryonic Stem Cells: A Primer on the Technology and Its Medical Applications", in Suzanne Holland, *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy*, MIT Press, Cambridge, 2001, p. 7

extraterrestrials (aliens) who created human life on earth through genetic engineering and who effected the resurrection of Christ by cloning[371].

Raël explained some steps to achieve immortality:[372]

a. Research demonstrated that twin children have the same basic personality although they are grown separately. Cloned human beings will have the same things because personality and intelligence are genetically predisposed.
b. Using a technology called "accelerated growth process (agp)" human beings are cloned directly into adulthood. The cloned human beings are only physical copies which do not have memory and personality, like computer hardware without programs.
c. Using modern technology which is now being developed in Japan, the memory and personality of human beings are downloaded into computers and then reinserted into the cloned human beings so that the cloned human beings have the same memory and personality with the person being cloned. Because the memory and personality are inserted into the young body (the body of the cloned person) the young cloned person can start another cycle of life. This process can be repeated indefinitely so that human beings will live for ever in eternity.

To make it possible for his teaching on immortality to prove itself, Vorilhon created an instant company called Clonaid[373] which offered to clone clients for $ 200,000.[374] Raël predicted that "*by the end of the year 2001, or early 2002 at the latest, all the TV screens in the world will be showing a happy family with an exceptionally beautiful smiling baby, the first cloned human baby*"[375].

---

[371] Raël, *Yes to Human Cloning: Immortality Thanks to Science!*, The Tagman Press, Norwich, 2001, p. 87; Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, p. 223

[372] Raël, *Yes to Human Cloning: Immortality Thanks to Science!*, pp. 35 - 37

[373] The original name of this company is Valient Ventures. This is an offshore company in the Bahamas from an American firm in San Francisco. Raël bought this company for a few dollars and transfered it into Clonaid to realize his teaching of eternity through cloning. This company is finally dissolved by the government of Bahamas and now this company is operating somewhere in the USA. Raël, *Yes to Human Cloning: Immortality Thanks to Science!*, pp. 87 – 92

[374] Raël, *Yes to Human Cloning: Immortality Thanks to Science!*, p. 88; Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, p. 223

[375] Raël, *Yes to Human Cloning: Immortality Thanks to Science!*, p. 92

On December 26, 2002, Brigitte Boisellier – the CEO of Clonaid – announced that the company had created the first human clone. The baby was a healthy girl and was named Eva. In his interview with CNN on December 28, 2002, Raël said "*Cloning a baby is just the first step. For me, it's not so important. It's a good step, but my ultimate goal is to give humanity eternal life through cloning.*"[376]

Biologically speaking, the aim to get eternal life through cloning is seriously questionable. From the cloned animals that already exist, we can be sure that the cloned human being is not only physical copy which does not have memory and personality but the cloned human being is a full person with new personality and memory. It needs further technology – if ever such technology exists - to completely remove the memory and personality of the cloned human so that the memory and personality of the one being cloned can be inserted into the new body.

4. Business

One of the most important motivations that drives many people in the modern era to engage in biotechnologies and especially cloning is business in hopes of a profit[377]. We can observe that biomedical research is not the monopoly of universities or governmental institutions but more and more it is privately funded institutions (companies) which get involved in the research. There are many examples of such companies: The famous Human Genome Project which led the biomedical research was a government-funded institution whose original name was American Human Genome Project (founded in 1988)[378]. But finally it was two privately funded institutions (Celera Genomic and Advanced Cell Technology) that made the most significant headway. The research of stem cells by Thompson and his team was financed by a private company, Geron Corporation. We can make a long list of private companies which conduct research in biotechnologies. An Italian newspaper, *Il Giornale* reported that at the end of the year 1997 there were 1036 private companies in Europe

---

[376] http://www.cnn.com/2002/HEALTH/12/27/cloning.raelians.ap/index.html
[377] David A. Prenyice, *Stem Cell and Cloning*, p. 31
[378] Tom Wilkie, *Perilous Knowledge: The Human Genome Project and its implications*, University of California Press, Los Angeles, 1993, p. 6

which are active in biotechnologies and the numbers are increasing approximately 44% per year[379]. In the year 2000 the investment from the pharmaceutical industries for research and development is US $ 26.6 million. It is a 20% growth from the previous year and it makes up 20% of all the circulated money in this business[380]. No wonder that many experts call the present era the era of biotechnology[381].

The actual data regarding companies which are active in human cloning technology is not available yet, since cloning technology is new. There is even only one report of success in human cloning by Korean scientist[382]. We do not know exactly the data of companies which work in human cloning but there are many companies that do research for animal cloning.

Based on the prospective candidates who will use cloning technology and the therapeutic benefits of cloning, it is not difficult to imagine that cloning will be a big industry. Wilmut, the first scientist to clone mammalians, said that cloning and genetic engineering is a perfect example of biotechnology that is rapidly becoming one of the world's greatest industries[383].

Since there is no available data from the human cloning industries, we will use the paradigm of the IFV (*In Vitro Fertilization*) industry to illustrate human cloning.

Andrews and Silver in their books gave an overview of the *In Vitro* fertilization business. Infertility services have been transformed from a small medical specialty to a $ 2-billion-a-year industry. Couples seeking IVF are spending $ 44,000 – $ 200,000 to achieve a single pregnancy[384]. In England, single cycle of treatment in a British clinic costs £ 2,000 - £ 3,000 or more[385]. While in the USA, each attempt of

---

379 *Il Giornale* April 3, 1999

380 Jean-François Mattei, *Il Genoma Umano: Uno Sguardo Etico,* Sapere 2000, Roma, 2002, p. 105

381 There are many books that describe this tendency. One of the famous book is Jeremy Rifkin, *The Biotech Century: Harnessing the Gene and Remaking the World*, J. P. Tarcher, 1999.

382 Tim Radford, "Korean Scientists Clone 30 Human Embryos", in *British Medical Journal* 328 (21 February 2004) 421

383 Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control,* Harvard University Press, Cambridge, 2000, p. 10

384 Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998, p. 69

385 Roger Gosden, *Designing Babies: The Brave New World of Reproductive Technology*, W.H. Freeman and Company, New York, 1999, p. 49

IVF costs about $ 8,000 and usually it needs more than one attempt since the chance of success in only 15%[386]. Robert M. Veatch reported that the cost on average a live birth is $ 72,000[387].

The cost of IVF services will not decrease, but it will increase because most of its cost is accounted for not in buying equipment but mainly for the cost of the labors of highly skilled medical professionals. Certainly, they will always insist on a high fee for their highly specialized services. Infertility specialists are now the highest-paid doctors, with experienced specialists making an average of $ 625,000 per year[388].

This tendency of increasing the cost and demand of IVF is never diminished; even it will increase because the rate of infertility is going up in the modern life. There are many causes of infertility but many researches indicate that modern life style with its stress, life style, pollution, exposure to the chemical ambience and so forth contribute significantly to the increasing of the infertility of the couples.

The increasing cost of IVF is clearly described by Andrews: *"When egg donation began in 1984, Richard Seed paid donors just $ 250. By 1994 the going rate was $1,500. In 1998 St. Barnabas Hospital in Livingston, New Jersey, boosted its rate from $ 2,500 to $ 5,000 during an egg donation bidding war. But the largest fee - $ 35,000 – is being offered by an anonymous couple who specifically want an attractive, intelligent, Princeton woman's egg.*[389]*"*

David A. Prentice reported that to get one stem cell line it required 100 ova[390], John B. Gurdon and James A Byrne reported that the same amount of ova (100) is needed to get one cloned animal[391], and if the success of cloning is similar with the success of mammalian:

---

386 Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 117

387 Robert M. Veatch, *The Basics of Bioethics*, Prentice Hall, Upper Saddle River, 2003, p. 149

388 L. B. Andrews, *The Clone Age: Adventures in the new in the New World of Reproductive Technology*, Henry Holt, New York, 1999, p. 48; Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998, p. 69

389 L. B. Andrews, *The Clone Age: Adventures in the new in the New World of Reproductive Technology*, Henry Holt, New York, 1999, p. 95

390 David A. Prentice, *Stem Cell and Cloning*, p. 11

391 John B. Gurdon and James A Byrne, "The History of Cloning" in Council of Europe, *Ethical Eye: Cloning*, Council of Europe Publishing, Strasbourg, 2002, p. 45

only 1%[392], to produce one baby it needs 100 ova, so the cost only for ovum itself is approximately 100 X $ 5,000 = $500,000. The Korean scientists who succeeded in making one stem cell line used more ova than that. They used 242 ova to get one stem cell line[393].

If someone wants to clone, there are still many others costs that need to be added such as the cryopreservation, the process of cloning, the surrogacy and so forth. Roger Gosden reported that in 1999, the cost of surrogacy was approximately £ 10,000 in Britain and $ 50,000 or more in the USA[394].

From the above raw calculation, we can imagine that human cloning may be an expensive giant industry. It seems to me that the offer of Clonaid to clone a human being for $ 200,000[395] is too cheap. With this data, it is logically valid what Daniel Calahan and Laurie Andrews predicted that economic incentives will control human cloning if cloning human being is not banned[396].

[392] John B. Gurdon and James A. Byrne, "Storia della Clonazione", in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, p. 61

[393] Tim Radford, "Korean scientists clone 30 human embryos", in *British Medical Journal* 328 (2004) 415

[394] Roger Gosden, *Designing Babies: The Brave New World of Reproductive Technology*, W.H. Freeman and Company, New York, 1999, p. 191

[395] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, p. 223

[396] As referred by Lisa Cahill in Lisa Cahill, "Religion-based Perspectives on Cloning of Humans" in *Ethics & Medicine* 14(1998)8

CHAPTER II

THE PROPERTY OF HUMAN LIFE

A. Identity and Status of Human Embryo

The modern sciences have a great propensity toward taking holistic approaches in explaining certain scientific objects. These holistic approaches are even more urgent regarding the human sciences which deal closely with the life of human beings because the life of human beings is multidimensional so that a partial approach will impoverish the fruit of scientific explanations regarding the life of human beings. Under certain circumstances, these many human life sciences make important contributions to the holistic understanding of human life while still maintaining the autonomy and competency of each science.

In the reflection on human life, the mutual enrichment and dialogue between philosophy and the natural sciences is regarded as a prerequisite for a better and holistic understanding of the life of human beings so that there will be no dichotomy between philosophy and the natural sciences. The two different approaches regarding the life of human beings can give a mutual enrichment. The natural sciences can give natural data upon which philosophy can reflect and the philosophy can give an inner reflection and direction upon which the natural sciences can proceed.

Certainly, there are conditions when mutual enrichment and a holistic approach can bear good fruit. First of all it is related to the biological data and its interpretations. Both philosophers and natural scientists must have a clear vision and understanding of biological data and the interpretations which are given by the scientists themselves.

Then, the philosophers can be involved in selecting the more consistent and convincing of those explanatory hypotheses which deal with the empirical aspects of reality[1].

The second condition is regarding the process of analyses. Certainly, the natural scientists need to follow a scrupulous scientific logic in explaining their collected data, but there is a need for them to go further in concluding their findings. They must have a willingness to employ the process of philosophical analysis and of inference from the human sciences. This process is important in acknowledging the value of the conclusions which were drawn through the process itself, a value which is of a speculative as well as operative order[2].

Regarding the holistic understanding of the human embryo – especially the reflection of the identity and status of a human embryo – the contribution of biology, especially human embryology, is an important and decisive contributions. The philosophers not only interpret deeply the objective scientific data that the embryologists discover but also its actual and speculative implications for human beings.

While respecting the autonomy and competency of each science, embryology can not answer for the personhood of the embryo since the personhood is not the formal object of the study of embryology but by reflecting philosophically on the embryologists' data, the philosophers can arrive at a conclusion about the personhood of the embryo. So, biology (embryology, genetics, biochemistry, obstetrics and so on) and philosophy can sit together and enrich each other in arriving at a holistic understanding of the human embryo.

[1] Angelo Serra and Roberto Colombo, "Identity and Status of the Human Embryo: the Contribution of Biology", in Juan de Dios Vial Correa and Elio Sgreccia (eds.), *Identity and Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Città del Vaticano, 1998, pp. 128 - 129

[2] Angelo Serra and Roberto Colombo, , "Identity and Status of the Human Embryo: the Contribution of Biology", p. 129

1. Biological Base

a. Beginning of Life

The beginning of life is one of the most ancient questions regarding the life of human beings: When does the life of a human being actually begin? There is no single answer from the time of the ancient Greeks until now. One of the ancient writings regarding the human embryo is that of Pseudo-Galeno (III B.C.) in his work *Ei zoon to kata gastrós*. In it he affirmed that the embryo is a living being and therefore transgressors of the embryo needed to be punished[3]. The ancient Egyptians believed that the soul entered the child at birth through the placenta[4].

The ancient Greek philosophers did not have the same answer regarding the exact day of the beginning of the human life although they shared almost the same view on the biology of human beings.

In his book *Procreation/ Nature of the Children*, Hippocrates (460 – 377 B.C.) said that the animation of a male occurred on the 30th day of pregnancy and the female occurred on the 42nd day of pregnancy. The difference of time was caused by the fact that female semen was weaker and more humid than the male semen[5].

According to Aristotle (348 – 322 B.C), the animation of a male embryo occurred on the 40th day of pregnancy and the animation of a female embryo occurred on the 90th day of pregnancy.[6] The female embryo is weaker than the male embryo therefore the development of a female fetus in the womb takes more time for animation.[7]

---

[3] Paolo Sardi, *L'Aborto Ieri e Oggi*, Paideia Editrice, Brescia, 1975, pp. 11 – 12

[4] Keith L Moore and T.V.N. Persaud, *The Developing Human: Clinically Oriented Embryology* (7th), Saunders, Philadelphia, 2003, p. 9

[5] Jacques Jouanna, *Ippocrate*, Società Editrice Internazionale, Torino, 1994, p. 276

[6] In his book History of Animals (VII, 583b, 3-5), Aristotle wrote, *"In the case of male children the first movement usually occurs on the right-hand side of the womb and about the fortieth day, but if the child be a female then on the left-hand side and about the ninetieth day."* Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, Princeton University Press, Princeton, 1998, p. 914

[7] In his book, Generation of Animals (IV, 775a.4 – 11), Aristotle wrote, *"In man males are more often born defective than females, but in the other animals this is not the case. The reason is that in man the male is much superior to the female in natural heat, and so the male foetus moves about more than the female, and on account of moving is more liable to injury, for what is young is easily injured since it is weak. For this same reason also the female foetus is not perfected equally with*

The above idea is based on the observation of animal and human reproduction. From his observation, Aristotle got some interesting data. The first data is regarding the menstrual blood of woman: he observed that the monthly menstrual blood of women ceased when a woman became pregnant. The second data is regarding the sexual intercourse: A woman only became pregnant after she had sexual intercourse with a man in at which time a man deposited his semen in her vagina.

With his philosophical background Aristotle reflected on the above data and he concluded that there must be an active agent to start the process of procreation. He believed that the active agent was the male semen and that women did not contribute semen in the coitus[8]. Women, however, provided the material which was the menstrual blood[9] in which the male semen could work on it. He said, "*the male contributes to generation is the form and the efficient cause, while the female contributes the material.*"[10]

In the further development, the female's contribution will become the body of the embryo and the male's contribution will be the soul. He said, "*While the body is from the female, it is the soul that is from the male, for the soul is the substance of a particular body.*"[11]

For Aristotle, therefore, the women's role in reproduction was passive: only providing the material on which the male's semen – the soul – worked. In his eyes the children came from the male because the soul of the children came from the father.[12] Aristotle stressed that by

---

the male in women (but they are so in the other animals, for in them the female is not later in developing than the male). For while within the mother the female takes longer in developing." Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, Princeton University Press, Princeton, 1998, p. 1199

[8] In his book *Generation of Animal* (I.727b.35) Aristotle wrote: "*Some think that the female contributes semen in coition because the pleasure she experiences is sometimes similar to that of the male, and also is attended by a liquid discharge. But this discharge is not seminal; it is merely proper to the part concerned in each case.*" Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, Princeton Univertity Press, Princeton, 1998, p. 1130

[9] Aristotle, *Generation of Animals* I.738b.1 - 3. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, p. 1146

[10] Aristotle, *Generation of Animals* I.729a.10. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, p. 1132

[11] Aristotle, *Generation of Animals* I.738b.25. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, p. 1146

[12] Aristotle, *Generation of Animals* I.729b.1. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, p. 1132

definition "*male is that which is able to generate in another*" while "*female is that which is able to generate in itself and out of which comes into being the offspring previously existing in the generator*"[13].

Because the male semen had to work on the female matter to initiate a new human being, that is the reason why there was body first and then came the human soul which was the principle of movement: "*We find that, whenever one thing is made from two of which one is active and the other passive, the active agent does not exist in that which is made; and, still more generally, the same applies when one thing moves and another is moved. But the female, as female, is passive, and the male, as male, is active, and the principle of the movement comes from him.*"[14]

Therefore, we can summarize Aristotle's thinking as follow: In the generation of children, a woman contributed the material (the body) and a man infused his creative power (the soul) in his semen so that the new life of a human being emerged. The process of entering the soul into the body took time so that it did not take place at the time of coitus or conception but it took place many days after. One can recognize the existence of the soul in the embryo through the movement of the embryo for the first time, since the human soul was the principle of the movement. The conception only made an embryo which was the first mixture between semen and menstrual blood.[15]

So, according to the ancient Greek philosophers, the life of a human being started with the ingression of soul into the body (embryo). Before the ingression of the soul, there was no human life although there may exist another form of life[16]. The ingression of the soul in the

---

[13] Aristotle, *Generation of Animals* I.716a.20 - 23. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, p. 1112

[14] Aristotle, *Generation of Animals* I.729b.10 – 14. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, p. 1132

[15] Aristotle, *Generation of Animals* I.728b.34. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, p. 1131

[16] There is an exception of this view. The Pythagoreans' view of the beginning of human life was different from the majority of Greek philosophers. According to the Pythagoreans, the soul entered in the body in the time of conception and not latter. So the abortion at any time was considered a murder. It is Pythagoreans and not Hippocrates was believed to have been responsible for the passage of Hippocratic Oath that prohibit abortion. The doubt that Hippocrates composed the oath was due to the fact that Hippocrates believed that soul enter in the body in the thirtieth day of gestation for male fetus and the forty-second day for females fetus.

fetus is technically called animation. The presence of the soul in the body was detected by the movement of the fetus in the uterus as felt by the mother. Technically, the first movement of the fetus is called quickening. In other words, the beginning of human life is the animation of the fetus (the ingression of the soul) which can be detected by the quickening of the embryo. In the further discussion, since the animation of embryos occurred many days after fertilization, this animation was called late animation in contrast to the immediate animation which is when the soul entered at the time of fertilization.

The late animation was a logical conclusion to the biological data which was available in that time as well as the philosophical reflection on this information. Accordingly, the development of human life followed the cycle of life on the earth which starts from the lowest form to the highest form of life (soul): vegetative life and then sensitive life and finally intellective life.[17] Vegetative life was assigned to the plants; sensitive life was assigned to the animals and the highest level of life – intellective life – was assigned exclusively to the human beings. The higher level of life was achieved through the lower level of life.

So in the first step of embryo's life, the embryo had vegetative life, and then sensitive life and finally intellective live. "*For at first all such embryos seem to live the life of a plant. And it is clear that we must be guided by this in speaking of the sensitive and the rational soul. For all three kinds of soul, not only the nutritive, must be possessed potentially before they are possessed in actuality.*"[18] There were special prerequisites for the intellective life (soul), such as a brain and nerves which had to be prepared (developed) before being capable of receiving the intellective soul. These prerequisites were formed only after many days of development so that the ensoulment takes place many days after fertilization.

Most of the ancient Greek philosophers shared the same view on the above nature of the development of human life. This view lasted for almost two thousand years until the era of St. Thomas Aquinas (1226-

---

Jeffrey Reiman, *Abortion and the Ways We Value Human Life*, Rowman & Littlefield Publishers, Inc., Lanham, 1999, p. 17

17 Aristotle, *Generation of Animals* I.736a and 736b. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, pp. 1142 - 1143

18 Aristotle, *Generation of Animals* I.736b.14-15. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, p. 1143

1274) and the Christian tradition which then followed for many centuries[19].

In the discussion about the beginning of life, especially in relation to early abortion, many people[20] cited St. Thomas Aquinas. According to them, St. Thomas also agreed that the animation occurred

---

[19] In the history of Catholic Church, although abortion at any stage of development is always regarded as a grave immoral, there was no monolithic opinion regarding unanimated and animated fetus. For example: The Didache 2:2 and the Epistle of Barnabas made no distinction between animated and unanimated fetus and affirmed that all kind of abortion was regarded as a grave sin. But there were fathers of the Church who did make distinction between animated and unanimated fetus. St. Jerome and St. Augustine explicitly acknowledged that only the destruction of animated fetus could be considered as destruction of a human person. The Gratian's Decretum (*Concordia Discordantium Canonum*) which was promulgated in 1140, made a clear distinction between unanimated and animated fetus. Abortion that was performed before the soul entered in the body was not a murderer but a "quasi murder". Penalties were assessed according to the degree of fetal formation. Thomas Aquinas said that someone who strikes a woman and wherefore results the death either of the woman or of the animated fetus, he will not be excused from homicide (Summa Theologica I.64.8.2). In 1591 Pope Gregory XIV promulgated *Constitution Sedes Apostolica.* The pope made a clear distinction between unanimated and animated fetus although he did not define precisely the moment of animation. The excommunication was applied exclusively only to the abortion of animated fetus while abortion which was done before animated fetus was "only" a grave sin without being excommunicated. It was Pope Pius IX who removed the distinction between animated and unanimated fetuses in the case of abortion in the promulgation of the *Constitution Apostolocae Sedis* on October 12, 1869. With the promulgation of *Apostolocae Sedis,* excommunication was applied for any kind of abortion regardless the stage of fetal development and without any distinction of animated and unanimated fetus. Although in the case of abortion there was no more distinction of punishment between animated and unanimated fetus, that distinction was still maintained in further official Church's document. In 1914, the Sacred Congregation of Studies published a guideline for the study of philosophy in Catholic Seminaries and Universities, called the Twenty-four Thomistic Theses. In that theses was mentioned that the human soul which is created by God may be infused into a subject that is sufficiently disposed (theses no. 14). In human beings, the soul requires an organic disposition, that is heterogeneous parts (theses no. 13). It means that in the time when a fetus had not had heterogeneous parts was considered unanimated fetus. See AAS 6 (1914) 383 – 386.

[20] Olivier de Dinechin and Yves de Gentil-Baichis, , *L'homme de la bioéthique: Entretiens avec Yves de Gentil-Baichis,* p. 52; Norman M. Ford, *When did I Begin?: Conception of the Human Individual in History, Philosophy and Science*, p. 41

at the 40th day of gestation for male and at the 90th day for the female embryo. We will look at a glance at this problem.

St. Thomas Aquinas was heavily influenced by Aristotle and in many ways he developed Aristotle's view of human animation. Aquinas' view of embryological development was based on the Aristotelian biology with a slight difference. According to Aquinas, during intercourse men deposited semen as the active power while the woman provided the matter[21]. This semen contained the active power of motion while the female's matter – menstrual secretion – contained a vegetative soul which existed since the beginning.[22] Although the female matter was composed of living cells, it could not become a fetus by itself because there was no internal development guide or power. The male semen provided this internal power. After the fertilization, Aquinas followed Aristotle's human development who said that a human being developed from vegetative (nutritive) soul into a sensitive soul and finally into an intellective soul[23]. This development does not follow a linear development, however, but a discontinuous development because upon the arrival of the higher soul, the lower soul is destroyed, although the higher level has the characteristic of the lower level[24]. The passage from sensitive to intellective soul is different

---

[21] "*In perfect animals, generated by coition, the active force is in the semen of the male, as the Philosopher says (De Generatione Animalium ii,3); but the foetal matter is provided by the female.*" Thomas Aquinas, Summa Theologica, I.118.1.4 All the citations of the works of St. Thomas Aquinas are taken from the electronic edition of *St. Thomas Aquinas & The Summa Theologica* (in CD ROM) from Harmony Media, Inc, P.O. Box 138, Gervais, Oregon, USA.

[22] Thomas Aquinas, *Summa Theologica*, I.118.1.4, wrote, "*the active force is in the semen of the male ... . In this matter, the vegetative soul exists from the very beginning.*"

[23] Thomas Aquinas *Summa Contra Gentiles* 2,89, wrote, "*Therefore the vegetative soul, which comes first, when the embryo lives of the life of a plant, is corrupted, and is succeeded by a more perfect soul, which is both nutritive and sensitive, and then the embryo lives an animal life; and when this is corrupted it is succeeded by the rational soul introduced from without.*"

[24] Thomas Aquinas, *Summa Theologica* I.118.2.2, "*We must therefore say that since the generation of one thing is the corruption of another, it follows of necessity that both in men and in other animals, when a more perfect form supervenes the previous form is corrupted: yet so that the supervening form contains the perfection of the previous form, and something in addition. It is in this way that through many generations and corruptions we arrive at the ultimate substantial form, both in man and other animals. This indeed is apparent to the senses in animals generated from putrefaction. We conclude therefore that the intellectual*

in the thinking of Aristotle. He maintained that the intellective soul came from without[25] whereas Aquinas affirmed that the intellective soul (human soul) came from the power of God[26].

The active power of the male worked at a distance or immediately through the power in the semen to form the female matter into the body of a human fetus.[27] It continued to work until the first principal part – the heart - was present within the embryo and it organized the body parts so that the human body was ready to receive the human soul (intellective soul). The organization of the body took time and occurred after fertilization but before birth[28]. Because the preparation of the body to receive the human soul took time, Aquinas believed that God imposed the human soul when the fetus was ready to receive it. Furthermore, according to Thomas, the nature of human beings as the image of God is in his intellectual nature[29] and that is the reason it is only after the presence of *ratio* that human being can receive soul (intellective soul).

It is interesting to note that St. Thomas Aquinas never mentioned the exact time of animation. When he spoke about the sanctification of Mary, he stated that Mary was sanctified after animation because sanctification is the cleansing from original sin and only an animated human being has original sin. Before animation, the fetus does not have

---

soul is created by God at the end of human generation, and this soul is at the same time sensitive and nutritive, the pre-existing forms being corrupted."

[25] Aristotle, *Generation of Animals* II.736a.31 – 3736b.13. *The Complete Works of Aristotle: The Revised Oxford Translation*, pp. 1142 – 1143

[26] Thomas Aquinas, *Summa Theologica* I.118.2.2 "*Therefore others say that the same soul which was at first merely vegetative, afterwards through the action of the seminal power, becomes a sensitive soul; and finally this same soul becomes intellectual, not indeed through the active seminal power, but by the power of a higher agent, namely God enlightening (the soul) from without.*"

[27] Thomas Aquinas, *Summa Contra Gentiles*, 2.89.8

[28] Aquinas discussed this case when he discussed about the sanctification of Blessed Virgin Mary. He said, "*The Lord says that He 'knew' Jeremiah before he was formed in the womb, by knowledge, that is to say, of predestination: but He says that He 'sanctified' him, not before formation, but before he 'came forth out of the womb', etc.*", Thomas Aquinas, *Summa Theologica*, III.27.2.1

[29] Thomas Aquinas, *Summa Theologica*, I.93.4.1, "*Since man is said to be the image of God by reason of his intellectual nature, he is the most perfectly like God according to that in which he can best imitate God in his intellectual nature.... The image of God, in its principal signification, namely the intellectual nature, is found both in man and in woman.*"

sin[30]. So the cleansing of sin happened after animation and before birth[31]. Unfortunately Aquinas did not know exactly when the sanctification took place[32].

Certainly when Aquinas formulated his opinion, he did not know about the modern human embryology as described in the previous chapter (I.C) as the basis of his reflection. He had no knowledge about the sperm and ovum and how they function. He did not know about the chromosomes, the DNA, and the genes which play an important role in the fertilization process. Neither did he know about what happens in the fertilization as described in the previous chapter (I.C.3). These are his serious drawbacks in his reflection on the human embryo.

As the common rule in logic states: a false premise cannot be followed by a right conclusion. The science of modern embryology proves clearly that Aristotelian and Thomistic view on the development of the human embryo is wrong. Because of his complete lack of factual biological knowledge as the basis of his reflection, Aquinas made an erroneous conclusion regarding the beginning of human life.

If Aquinas had known that

- the active power which forms a human embryo is both the sperm and the ovum and that there is no "female matter" on which the active power needs to work on it to start a new embryo,

---

[30] Thomas Aquinas, *Summa Theologica* III.27.2, "*I answer that, the sanctification of the Blessed Virgin cannot be understood as having taken place before animation, for two reasons. First, because the sanctification of which we are speaking, is nothing but the cleansing from original sin: for sanctification is a "perfect cleansing," as Dionysius says (De Divinis Nominibus xii). Now sin cannot be taken away except by grace, the subject of which is the rational creature alone. Therefore before the infusion of the rational soul, the Blessed Virgin was not sanctified. Secondly, because, since the rational creature alone can be the subject of sin; before the infusion of the rational soul, the offspring conceived is not liable to sin.*"

[31] Thomas Aquinas, *Summa Theologica* III.27.2.2, "*But the Blessed Virgin did indeed contract original sin, but was cleansed therefrom before her birth from the womb.*"

[32] Aquinas did not know exactly the time of sanctification took place. That is the reason, the Church tolerates the celebration of sanctification of Mary in her conception although he affirmed that the sanctification did not take place in her conception. Thomas Aquinas, *Summa Theologica* III.27.2.3, "*But since it is not known when she was sanctified, the feast of her Sanctification, rather than the feast of her Conception, is kept on the day of her conception.*"

- the formatting elements of an embryo is the fusion of ovum and sperm with their genetic materials and this happens at fertilization,
- that at the end of the fertilization have formed the genome of the child which lead and control further embryonic development until the person dies,
- that the man and the woman contribute equally in the genome of their child,
- that the embryonic development is continuous without any discontinuity,

he would have concluded that the life of a human being has existed since the fertilization.

Unfortunately, the controversy about the beginning of life of a human being remains until the present time. It may be true that a human embryo is a sign of contradiction as the title of Jerome Lejeune's book states.[33] Some people have said that there is no set time for the beginning of life of a human being whereas other people have said that the beginning of life occurs many days after fertilization. In his famous book, *Remaking Eden: Cloning and Beyond in a Brave New World*, Lee M. Silver, a professor at Princeton University, in the USA, said, "*What science tells us is that there is no single moment that marks your beginning. No single moment that can be isolated away from so many other important moments and that we can all agree upon. Instead, a scientist will tell you that you emerged slowly over time from the genetic information and molecules that made up your developing body.*"[34]

Silver argued that the moment of fertilization is not the beginning of human existence. The genetic materials in our body have already existed long before fertilization in the mother's egg, and the grandmother's egg, and so forth. So if a woman is pregnant, she not only has her child within her womb but also her grand children and great-grand children. If we trace back our beginning, there may be no stopping until we come to the first cell some 3.5 billion years ago[35].

In responding to this argument let us return to the biological data of the embryo. It is true that the genetic materials of our bodies are not

---

[33] Jérôme Lejeune, *L'Embrione Segno di Contraddizione*, Edizione Orizzonte Medico, 1992

[34] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, p. 58

[35] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, p. 58

made from nothing (*creatio ex nihilo*) in the time of fertilization. The elements of the genetic materials have existed for millions years and have been transmitted from generation to generation as heredity as explained in the previous chapter on the topic of heredity (I.C.2). With the help of modern technology, one can trace his ancestors based on their DNA. Some researchers have concluded that the origin of modern people occurred somewhere in Africa approximately 180.000 – 360.000 years ago[36]. So, in this case, Silver's statement is true because some genetic materials are inherited and have existed in the world for many generations.

It is also true that the formation of the ovum (oogenesis) occurs in the embryo so that when a woman is pregnant, inside her womb there is not only her daughter (embryo) but also the primitive gametes which eventually may become her grand-children. The formation of the ovum starts at third month of gestation, and by the fifth month of gestation, the total number of germ cell cells in the ovary reaches its maximum of approximately 7 million cells[37].

But it has to be noted carefully that these genetic materials are only a part of the genome of a person[38] and the primitive gamete cells with their haploid chromosomes are not a human being. In the previous chapter (I.C.3) it is explained that the whole sum of genetic materials (genome) of a person are created at the time of fertilization. The genome of a child is completely new. It has never existed before although some of the forming elements are not new. Although the genomes of the mother and father are the same, they transmit a different set of genetic material to each of their children so that one child's genome is different from another child's genome. Biologically speaking, the genome of a human being is formed at the time of fertilization and it starts its life cycle from the time of fertilization.

In this case, Silver made some generalizations regarding all types of life and he failed to make a distinction between cell, organism, population, and species. Although all of these are the forms of living beings and they may exist in the same subject, but each of them is a different category.

---

[36] Angelo Serra, "Le Origini Biologiche dell'Uomo", in *La Civiltà Cattolica* 3559(1998)16 - 30

[37] T. W. Sadler, *Medical Embryology*, Williams & Wilkins, Baltimore, 1995, p. 13

[38] Genome is the total genetic material of an organism, comprising of all the genes contained in its chromosome. Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 270

A cell is the basic unit of all living organisms that can reproduce itself. It has to be noted well that there are differences among a one-cell zygote, one cell of a somatic cell, and one cell of a germ cell. In his above statement, Lee Silver actually spoke about genetic information in the primitive gamete (germ) cells. The gametes cells are haploid cells that have only 23 chromosomes while a cell which is a zygote is diploid which has 46 chromosomes. A haploid cell is not a form of life of a human being because a normal human being has 46 chromosomes (diploid). A gamete cell alone never develops naturally into a human being. Secondly, a cell which is part of a living being (somatic cell) is very different from a cell which comes from the fusion of ovum and sperm (zygote). Although both kinds of cells have the same number of chromosomes (46 chromosomes) and both of them are living, there are big differences. As we have discussed in the previous chapter (I.C.3-4), a cell which is a zygote has a completely new genome, has totipotency to develop into all organs which are needed to be a human being, and has the inner program which leads its development into a full human being, whereas a cell as a part of a living being (somatic cell) does not have these characteristics. These facts have immense differences and consequences. In their natural development, a zygote develops into a human being whereas a somatic cell will never develop into a human being.

Except for a few living beings such as bacteria and algae which have only one cell, most of all the living beings are multi cellular. All of the multi cellular beings are recognized through their individual form of existence. This form of individual existence is characterized and constituted throughout their life and is called an organism. This organism represents the integration, the coordination and the ultimate expression of the structures and functions of a living being, which make it this single living being and not another one of the same species[39].

A species is a sequence of ancestral and descendant populations closely related to each other and, therefore, more or less similar in essential characteristics. Among the same species, they can actually or

---

[39] Angelo Serra and Roberto Colombo, "Identity and Status of the Human Embryo: the Contribution of Biology", in Pontificia Academia Pro Vità, *Identity and Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Città del Vaticano, 1998, p. 132

potentially interbreed to produce natural populations that are genetically similar and reproductively isolated from other such group[40].

A population is a group of organisms of the same species which live in the same environment or in the same territorial sphere[41].

So when we apply the above categorization onto human beings, it means that the human being as an organism is a certain human being, that human being or this human being (individual). A species of human beings refers to all human beings as a whole regardless of where they live and when they lived. A population of human beings is a group of human beings who live in a certain place, for example a group of human beings who live at the North Pole.

So when Lee Silver said, "*there is no single moment that marks your beginning*,"[42] it can be applied to the human being as a species, or as population or as a carier of certain genetic information. It cannot be applied to a human being as an organism or an individual. It may be true that human beings as species and their genetic information have been in the world for 3.5 billion years ago. It may be true that human beings as a population – like those in the Iraq (formerly Babylon) – may have been there for more than three thousand years ago. Such a category cannot be applied to a human being as an organism or individual.

In the bioethical discussion, the attention is more focused on the beginning of human life as an individual (organism) rather than as a species or population or as certain genetic information because the beginning of life as an organism is closely related to the embryonic treatment: how do we have to treat embryos in their first days of development? Can we kill them? Can we make them tools of research? Can we freeze them?

All living beings – including human beings – which reproduce sexually, start their life as an organism (an individual life) from one-cell as the fruit of the fusion between sperm and ovum at the end of the fertilization process. There are some reasons to affirm that the beginning of the life cycle of a human being as an organism starts at

---

[40] Angelo Serra and Roberto Colombo, "Identity and Status of the Human Embryo: the Contribution of Biology", p. 133

[41] Angelo Serra and Roberto Colombo, "Identity and Status of the Human Embryo: the Contribution of Biology", p. 132

[42] Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998, p. 58

fertilization. The one-cell zygote – as the fruit of fertilization – has properties that other types of cells do not have:

- Once fertilization has occurred, the subsequent developmental processes follows one another in a systematic and structured order[43]. The fertilized egg (zygote) develops continuously without any discontinuity until it reaches its final goal: a human being. Right after the fertilization is completed, the zygote starts the preparation for the first development (mitotic cleavage) and the first development occurs only a couple of hours later. From that time on, the zygote develops uninterruptedly to become a human being and continues until the death of the subject. It means that the life cycle of a human being as an organism starts at the time of fertilization and finishes at the death of the organism (person). Before the fertilization, gametes do not have this capacity of starting the life cycle of a human being. Gametes will always remain gametes, die as gametes, and will never become a human being.

- Right after the fertilization, the new one-cell zygote organizes a completely new genome as the information center for the whole human development and activity[44]. This new complete genome of the human being becomes his biological identity throughout his life. Therefore, the zygote is not a mass of cells without any identity; on the contrary, the zygote has her own proper identity with no one identical to it anywhere or at anytime. This proper and unique identity is formed at the time of the fertilization and such genomic identity has never existed before this fertilization. The sex of the future human being is determined right in the time of the fertilization.

- The zygote has an inner program which leads, shapes, directs, and controls the development of the zygote into a specific and predetermined final goal: a human being[45]. So it is an active cell that

---

[43] Warnock Committee Reports no. 11.6. See Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, p. 59

[44] Angelo Serra, "L'Embrione Umano 'cumulo di Cellule ' o 'Individuo Umano '? in La Civiltà Cattolica 3616(2001)348 - 362

[45] G. M. Kiddler, "The genetic program for preimplantation development", in *Developmental Genetics*, 13(1992) 320; G. A. Schultz, "Utilization of genetic information in the preimplantation mouse embryo", in J. Rossant and R. A. Pedersen (eds.), Experimental approach to mammalian embryonic development, Cambridge, University Press, 1986, pp. 239-259; A. W. Murray and N. W

possesses the inner capacity to develop into its precise final goal. In their natural development (without any external interferences or disruptions), human zygotes will develop into human beings and never become monkeys. This inner genomic program takes control of the development so that the stimulus from the outside will be accepted and responded to according to the criteria that are established by this inner program. For example: the alimentation which the embryo receives from the mother through the umbilical cord, is processed and secreted according to the zygote's program. The control of zygote genome over his development is clearer in the case of a surrogate mother. If an ovum of a pure white woman is fertilized by the sperm of a pure white man, although after the fertilization the zygote is transferred into a womb of a black woman, the child will remain a white child. Although the embryonic development was sustained and fed by the black mother and circulated by the black mother's apparatus, but the child remains a white child because the control of the development is done not by the mother's genome but by the genome of the child which has completed its formation at the fertilization.

Fertilization as the beginning of life of a human being as an organism was also stated by one of the best developmental biologists, Scott F. Gilbert. In his very famous book, *Developmental Biology*, Gilbert dedicated one chapter on fertilization which he entitled "Fertilization: Beginning a New Organism". In this chapter, he states, "*Fertilization is the process whereby two sex cells (gametes) fuse together to create a new individual with genetic potentials derived from both parents. Fertilization, then, accomplishes two separate activities: sex (the combining of genes derived from two parents) and reproduction (the creation of a new organism).*"[46] Although there are many new developments and discoveries in biology and Gilbert has changed the placement of this chapter in his book, he has never changed his statement about fertilization since the first edition of his book in 1985 until the seventh edition in 2003.

Regardless of the origin and the way of their existence, all human cells that have the properties explained above have to be considered as the beginning of the life of a human being. So, in the future, if it ever

---

Kirschner, "Cyclin syntheses drives the early embryonic cell cyle), in *Nature*, 33(1989) 275-280

[46] Scott F. Gilbert, *Developmental Biology*, Sinauer Associates, Inc, Sunderland, 1991, p. 33. In his sixth edition (2002) on page 185

happens that cloning technologies succeeds in making such cells, without any doubt that those cells have to be regarded as the beginning of life of a human being as an organism.

Although, for the time being, there is no proof that cloning has succeeded in producing a living human being, all of the discussions in this study have the basic assumption that cloning will eventually arrive at a point of creating such cells that will develop into human beings.

b. Pre-Embryo

- Pre-embryo and Clifford Grobstein

The term of "pre-embryo" was introduced by Clifford Grobstein[47], an amphibian embryologist from the University of California, San Diego, in his article in *Scientific American* in 1979[48]. In this article, Grobstein introduced the term pre-embryo to respond the new developments in fertilization technologies. What he referred to was the success of R. G. Edward, B. D. Bavister, and P. C. Steptoe in achieving fertilization outside the body of a woman – *In Vitro Fertilization* (IVF) – which was followed by the birth of Louise Brown in July, 1978, as the first "test-tube baby" born from the IVF process.

According to Grobstein, the success of this new technique of fertilization outside the body changed the way we see the fertilization of the ovum by the sperm. Fertilization is no more a decisive point in starting the life of a human being. Furthermore, the starting point of a new life does not always begin with the fertilization of the ovum by a sperm. It may start with the activation of the egg cortex without being fertilized by the sperm (parthenogenesis)[49]. In some animal eggs, if the cortex of the egg is activated, the development of a new animal is begun.

---

[47] Benedict Ashley, "Delayed Hominization: Catholic Theological Perspective", in Russel E. (ed) Smith, *The Interaction of Catholic Bioethics and Secular: Proceeding of the 11 Bishops' Workshop*, The Pope John Center, Braintree, 1992, p. 166; C. Ward Kischer, "The Big Lie in Human Embryology: The Case of the Pre-embryo", in *Linacre Quarterly*, vol. 64. No. 4 (1997) 53 – 61

[48] Clifford Grobstein, "External Human Fertilization", in *Scientific American* 240 (1979) 57 – 67

[49] Parthenogenesis is the reproduction in which an organism develops from an untertilized ovum. It is common in plants and occurs in some lower animal such as aphids. Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, pp. 488 - 489

Based on this data, Grobstein invoked the philosophical concept of "person" and "individual" and speculated on the time when a zygote fulfilled the criteria of a person in an ethical and a legal sense[50]. He found that it happened only after 14 days of gestation because before that day, the zygote still has the possibility of becoming two (twinning). But this cannot happen after the 14 days. Based on this possibility of twinning, Grobstein concluded that an embryo before 14 days is not a person because the embryo lacks the unity of an individual. He named the non-person embryo the pre-embryo. This term pre-embryo then was used by many people and by numerous institutions.

C. Ward Kischer, an associate professor Emeritus of Anatomy at the University of Arizona, College of Medicine, Tucson, and Dianne N. Irving, a professor of Bioethics at the Catholic University of America, Washington D.C., made an interesting observation about the uses of the term pre-embryo[51]. They observed that the term pre-embryo is used more by the ethicists and fertility therapists such as Richard A. McCormick[52], Howard Jones[53], and John A. Robertson[54] rather than by human embryologists. The more important embryologists such as Carlson, Sadler, Patten, and so on, do not use the term pre-embryo in their books.

According to C. Ward Kischer the human embryologists do not use this term pre-embryo because it does not have any embryological basis[55]. He even he cited Ronan O'Rahilly and Fabiola Mueller who have said, "*The ill-defined and inaccurate term pre-embryo, which includes the embryonic disc, is said either to end with the appearance*

---

[50] In his further book, Grobstein made no differences between "person" and "individual". They are interchangeable. Clifford Grobstein *Science and the Unborn: Choosing Human Futures*, Basic Books, New York, 1988

[51] C. Ward Kischer, "The Big Lie in Human Embryology: The Case of the Pre-embryo", in *Linacre Quarterly*, vol. 64. No. 4 (1997) 53 – 61; C. Ward Kischer and Dianne N. Irving, *The Human Development Hoax: Time to Tell the Truth*, Gold Leaf Press, 1997

[52] Richard A. McCormick, "Who or What is the Pre-embryo?" in *Kennedy Institute of Ethics* 1(1996)1 - 15

[53] Howard w. Jones, "And Just What is a Pre-embryo?" in *Fertility and Sterility* 52(1991)189 - 191

[54] John A. Robertson, "Extracorporeal embryos and the Abortion Debate" in Journal of Contemporary Health Law and Policy, vol. 2, no. 52 (1986) 53 - 70

[55] C. Ward Kischer, "The Big Lie in Human Embryology: The Case of the Pre-embryo", in *Linacre Quarterly*, vol. 64. No. 4 (1997) 53 – 61

of the primitive streak or (in the Nomina Embryologica) to include neurulation. The term is not used in this book"[56].

The lack of embryological basis can be seen clearly in the Grobstein's article which promoted the term pre-embryo. Grobstein stated that the IVF changed the nature of the fertilization. Actually the IVF does not change the nature of fertilization. Fertilization is "*the fusion of a spermatozoon and an ovum*"[57]. What happens in IVF is the fusion of a spermatozoon and an ovum. The difference is only in the place of fertilization. Naturally, the fertilization occurs in the falopian tube while in the IVF it occurs *in vitro*. Except for the place of fertilization, the other elements are exactly the same between natural fertilization and in vitro fertilization.

Grobstein also cited two unnatural events in the embryonic development. The first was regarding the parthenogenesis. It is true that there are plants and simple animals which can procreate without a sperm. This is part of their nature to procreate in such way, but this cannot be applied to human procreation. The normal and natural way of human procreation is through the fusion of sperm and ovum. The unusual (uncommon) situation cannot be used as a criterion for judging the usual (common) situation. The opposite is true: the common situation has to be used as the criterion to judge the uncommon situation.

Regarding the twinning of the embryo, there are some interesting researches which shed light on this case. According to the statistics, monozygotic twinning occurs at a very low percentage or infrequently. It occurs only about once in every 270 births[58]. Thus, it occurs in not even 0.5% of all births. It means also that each zygote is designated to become only one human being[59]. So the case of twinning has to be

---

[56] Ronan O'Rahilly and Fabiola Mueller, *Human Embryology and Teratology*, Wiley-Liss, New York, 1992, p. 55

[57] Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, p. 243

[58] C. Ward Kischer, "The Big Lie in Human Embryology: The Case of the Pre-embryo", in *Linacre Quarterly*, vol. 64. No. 4 (1997) 56; T. W. Sadler said that the twinning rate for monozygotic twins is 3-4/1000 of cases. T.W. Sadler, *Longman's Medical Embryology*, p. 114. Norman Ford say the same number as Sadler. Norman M. Ford, *When did I Begin?: Conception of the Human Individual in History, Philosophy and Science*, Cambridge University Press, Cambridge, 1991, p. 133

[59] Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", in Pontificia Academia Pro Vità, *Identity and*

regarded as an unusual event, an extraordinary event. Again we reiterate that an unusual event can not be used as a criterion for judging the usual event.

For a long time the embryologists have tried to resolve the question of why there is only one out of 270 births which produce monozygotic twin? The recent researches set more light on this point. T. W. Sadler, a human embryologist, affirmed that twinning is the "*result from splitting of the zygote at various stages of development. The earliest separation is believed to occur at the two-cell stage, in which case two separate zygotes develop.*"[60] Other embryologists such as Moore and Persaud affirmed the same point[61]. This study was reaffirmed by the study by K. Pitrowska and his team[62]. Pitrowska observed the embryonic development of mice and they discovered that since the first cleavage of the mouse zygote, there is a differentiation of cells so that the fate of the two cells can be distinguished. It means that if the personhood is connected to the possibility of twinning, the personhood of the embryo can be determined in a very early stage of embryonic development, even as early as 30 hours after fertilization when the first cleavage occurs. The recent study on the embryo which was reported by Helen Pearson affirmed this position. Pearson opened her report by saying, "*Your world was shaped in the first 24 hours after conception. Where your head and feet would sprout, and which side would form your back and which your belly, were being defined in the minutes and hours after sperm and egg united. Just five years ago, this statement would have been heresy.*"[63]

On the other hand, another study has shows that monozygotic twinning does occurs after the 14th day of fertilization. Since the zygote in these fourteen days starts the process of specialization of its cells, twinning at this stage may result in Siamese Twins (conjoined twins)[64].

Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life, Libreria Editrice Vaticana, Città del Vaticano, 1998, p. 148

[60] T.W. Sadler, *Longman's Medical Embryology*, p. 114.

[61] Keith L. Moore and T.V.N. Persaud, *The Developing Human: Clinically Oriented Embryology*, W. B. Saunders, Philadelphia, 2003, p. 148

[62] K. Piotrowska et al., "Blastomeres arising from the first cleavage division have distinguishable fates in normal mouse development", in *Journal in Science and Medicine* 128(2001) 15

[63] Helen Pearson, "Your Destiny from One Day", in *Nature* 418(2002)14 – 15

[64] C. Ward Kischer, "The Big Lie in Human Embryology The Case of the Pre-embryo", in *Linacre Quarterly*, vol. 64. No. 4 (1997) 56

From these studies it can be concluded that Grobstein's claim of the 14th day as the decisive day to determine the personhood of the embryo has no human embryological bases. Consequently, there is also no embryological basis using the term pre-embryo.

- Pre-embryo and Individuality

There are some people who still use the term pre-embryo with different arguments. Their claims are based on the argument that until the 14th day of gestation, the embryo lacks individuality (unity as an individual) because of its totipotency and chimera. Among the scientists, Anne McLaren is the most famous promoter of the term pre-embryo. She bases her perception on the lack of individuality of the embryo before the 14th day of gestation[65].

+ Individuality and "totipotent"

We have discussed in the previous chapter (I.C.4) until the stage of 8 cells, an embryo has a special property of totipotency. Totipotent means the capacity of each cell of the embryo to become a full human being. If all the cells of the embryo are separated, each of them will become a full human being. On the other hand, the same property can be employed reversely: two different embryos can be merged to become one (chimera). In the previous chapter (I.D.1) it has been explained how the first experiment with human embryos at this stage was done by Jerry Hall[66]. Because of the potentiality to divide in order to generate many human beings or to merge in order to form one

---

[65] Among her articles which sustained the term pre-embryo is Anne McLaren, "Prelude to Embryogenesis" in The Ciba Foundation, *Human Embryo Research, Yes or No?*, Tavistock, London, 1986. p. 12

[66] J. L. Hall, D. Engel, P. R. Gindoff, G. L. Mottla, R. J. Stilman, "Experimental cloning of human polyploid embryos using an artificial zona pellucida" in THE AMERICAN FERTILITY SOCIETY, *Abstracts: Scientific paper to be presented at the conjoint meeting of the American Fertility Society and the Canadian Fertility and Andrology Society, October 11 – 14, 1993, Montreal*, Supplement "Fertility and Sterility" (1993)S1 – S225; Jerry Hall and Robert Stillman, "Human embryo cloning reported", in *Science* 262(1993)652 – 653; Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", in Pontificia Academia Pro Vità, *Identity and Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Città del Vaticano, 1998, pp. 151 – 152

human being, the embryo in this stage lacks unity as an individual. Therefore, there is no individuality at this stage of development.

In responding to this problem, first of all it is important to underline that totipotency is a natural development of the human embryo. All of the developing entities must pass some stage without which the normal development will not proceed normally. This condition was rightly expressed by the Warnock Committee in their report, "*once the process has begun, there is no particular part of the developmental process that is more important than another; all are part of a continuous process, and unless each stage takes place normally, at the correct time, and in the correct sequence, further development will cease.*" (Warnock Report No. 11.19)[67].

The totipotency is part of the genomic preprogram without which embryonic development will not arrive at the ultimate goal because any further development will cease. Although there were some proofs that one embryo can be separated into many embryos, such as the work of Jerry Hall, H. Driesch and others, all of them were done in a laboratory with human intervention. In other words, the totipotent will remain a potentiality without any realization if there are no external interferences. The potentiality/possibility of something or someone can not be the reason why they are treated as if they had actualized their potentiality/ possibility. For example: those who have a history of heart attacks have the possibility/potentiality of dying at any time because of this problem. The fact that he has this potentiality, can not be the reason why he is treated as though he is a dead person

In the natural development of the embryo, the fact shows clearly that approximately only one out of 270 embryos has the possibility of becoming twins. It means that each of the embryos is per se determined to develop as a unique human individual and remain always one embryo[68]. Therefore the twinning case has to be considered as a special case of development. Twinning does not normally occur in human reproduction because twinning bears disadvantages both for the mother and the development of the children. T. W. Sadler, famous human embryologist explained, "*Twin pregnancies have a higher incidence of*

[67] Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, p. 65

[68] Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", in Pontificia Academia Pro Vita, *Identity and Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Città del Vaticano, 1998, p. 168

perinatal mortality and morbidity and a tendency toward preterm delivery. Approximately 12% of premature infants result from twin pregnancies, and twins are usually smaller at birth. Low birth weight and prematurity place infants of twin pregnancies at great risk, and approximately 10 -20% of them will die compared with only 2% of infants from single pregnancies."[69]

Some researches indicated strongly that this abnormality in embryonic development appeared to be a developmental accident. This accident results from an error in development such as an error in mitotic crossing over which occurs between the fourth and the seventh day after fertilization. Because of this error, a new and independent plan of development is determined so that a new individual being initiates its own life circle[70]. The error in mitotic crossing over brings many disadvantages as mentioned above.

In other words, the case of monozygotic twinning is not that of one embryo which becomes two embryos, but there is one human being (embryo) which continues its development according to its program and at a certain point a second embryo originates from the first as a separate entity and it continues its development according to its own program.[71] This indication was proven true in some discoveries of monozygotic twins with an abnormality in one of the twins[72]. In those articles, they described that they found monozygotic twins in which one of the twins had 47 chromosomes which is abnormal in human beings while the other twin had a normal number of chromosomes (46 chromosomes). From this data one can conclude that the first individual continued its own development and the second individual started its own life cycle as the new program became independent from the first.

---

[69] T. W. Sadler, *Medical Embryology*, pp. 116 - 117

[70] G. B. Coté and J. Gybtodinou, "Twinning and mitotic crossing-over: Some possibilities and their implications", in *American Journal of Human Genetics* 49(1991)120 – 130; Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", p. 168.

[71] Renée Mirkes, "NBAC and Embryo Ethics", in *The National Catholic Bioethics Quarterly* 1(2001)163 – 187

[72] J. G. Roggers, S. M. Voullaire, H. Gold, « Monozygotic twins discordant for trisomy 21", in *American Journal of Human Genetics* 11(1982) 143 – 146; C. E. Schwartz, S. M. Sauer, "Detection of DNA fingerprint differences in monozygotic twins discordant fro the proteus syndrome" in *Cytogenetics and Cell Genetics* 51(1989) 1075; Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", p. 169

This discovery demonstrated clearly that totipotency is not an indication that before the 14th day of gestation, the embryo is not an individual. In the case of twinning, before splitting there is one individual that continues its own development according to the internal genomic program while the second appears at a certain time and develops its own genomic program.

+ ***Individuality and anencephaly (cerebral absence)***

There are some theologians and philosophers who hold the position that the embryo only becomes a human being after the embryo has a brain (ratio) as the throne of his humanity. Before the presence of the brain, the embryo is not a human being although it may have a certain forms of human life.

A prominent Protestant theologian Joseph Fletcher said, "*We ought to regard the* ratio *and not the* vita *as the key to the homo.*"[73] Fletcher argues that what determines an individual as a human being is the brain, the human's mental power that resides in the *ratio* and not his life per se. If the brain ceases to function irreversibly, the human being is no longer a human being although he may still be breathing. He affirmed, "*The cerebral cortex is what distinguishes men from subhuman animals ... The distinctive or peculiar trait of human beings is their mental power, the ratio that only they posses.*"[74]

J. M. Goldening held a similar opinion regarding human beings. He said, "*human life can be viewed as a continuum spectrum, between the initiation of cerebral life (eighth week of gestation) and cerebral death. At any point tissues or organ systems may be present, but without the presence of a functional human brain they cannot constitute a human being, at least in a medical sense.*"[75]

Joseph F. Donceel – following St. Thomas Aquinas' way of thinking – affirmed that the soul is the substantial form of man that can be received by the human body only if the human body is capable of receiving it. This means that "*the human soul can exist only in a highly organized body.*"[76] He explained what he meant by the term highly

[73] Joseph Fletcher, *Humanhood: Essays in Biomedical Ethics*, Prometheus Books, Buffalo, 1979, p. 159

[74] Joseph Fletcher, *Humanhood: Essays in Biomedical Ethics*, pp. 163 - 164

[75] J. M. Goldening, "The brain-life theory: towards a consistent biological definition of humanness", in *Journal of Medical Ethics* 11(1985) 200

[76] Joseph F. Donceel, "Immediate Animation and Delayed Hominization", in *Theological Studies* 31 (1970) 76 - 100

organized body, "*there might not be human soul, and therefore no human person, in first weeks of gestation*" because "*the minimum that is requested before admitting the presence of a human soul is the nervous system, the brain and, mainly the cortex.*"[77]

The supporters of this view argued that the brain is the most important and distinctive characteristic of the human being. It is the brain that makes human beings different from the rest of creation. So if the brain ceases to function irreversibly, there is no longer a human being although it may still have a form of human life such as breathing, swallowing, and movement. In the medical definition, now it is accepted that if the brain ceases to function irreversibly, the person is considered dead although she/he may still be breathing and moving with the help of medical technologies[78].

If we accept that the end of life of a human being is marked by the cessation (the absence) of the brain, so we have to apply the same criteria to the beginning of the life of human being: the presence of the brain marks the beginning of life of a human being. Therefore, in the stage of embryonic development when there is not yet a brain, there is no human being either.[79]

In responding to this problem, let us return to the biological data. It is true that it is the brain that keeps people alive. It is true also that the cessation of function of the brain marks the end of life of a human being because it is the brain that organizes all of the functions of a human being in such a way that the unity of a person is maintained. When there is no more the organizer (brain), all of the functions in the

---

[77] Joseph F. Donceel, "Immediate Animation and Delayed Hominization", 76 – 100

[78] Up to now, there is still a big debate about what is the exact brain that can be used to determine the death. Some people support of the 'whole brain death' to determine the death of a person (Harvard Definition of Death) but other people support that it is enough that the 'higher brain death' to determine the death of a person. David Lamb, *Il Confine della Vita: Morte Cerebrale ed etica dei Trapianti*, Il Mulino, Bologna, 1987, pp. 42 – 46

[79] One of the famous supporters of this way of rationing is Joseph Fletcher. He stated, "*In the light of medical proposals to redefine death in terms of irreversible coma or loss of the higher brain function ... if such a non-cerebral or decorticate patient is no longer alive in any human sense or personal sense, would it not follow that a pre-cerebral embryo or fetus is not yet alive in any human and personal sense? This would, of course, obviate any further use of such question-begging rhetoric as 'killing unborn babies'* " Joseph Fletcher, "Ethical Aspects of Genetic Controls" in *New England Journal of Medicine* 285(1971)776 – 783

human being are degraded and there is no more unity in it. It means that the person ceases to exist. It is no longer a human being.

But this situation is very different if we compare the human zygote. In the previous chapter (I.C.3 and II.A.1.b) it has been explained that at the end of the fertilization process, the zygote has everything necessary to develop into a full human being. Even the most recent research confirmed that everything is formed within the first 24 hours after fertilization. "*Your world was shaped in the first 24 hours after conception. Where your head and feet would sprout, and which side would form your back and which your belly, were being defined in the minutes and hours after sperm and egg united. Just five years ago, this statement would have been heresy.*"[80]

If we compare the nature of the zygote and the formed person who is dying, we can see the difference. The nature of the formed people is that the organization of his body and his being is done by the brain while in the embryonic stage, the organization of his body and his being is done by the newly formed genome. So if the genome ceases to function to carry out its development program, the zygote is no longer a human being. So in this case, it is not important what makes the unity or organization of the body or the unity of the being, but the most important factor is the presence of the unity and organization itself. The unity in this stage is clearly seen in the embryonic development itself which is continuous and well organized to the determined goal.

Furthermore, the embryonic stage is a highly dynamic process in which the process of ontogenetic law requires a gradual organization of the whole body so that the formation of mature human organs takes time according to the internal genomic program. Although the development is gradual in time but there is no discontinuity of the developing subject. The subject is still the same before and after a certain stage. So the embryo with a formed brain is not different from the same embryo before its brain is formed. Angelo Serra and Roberto Colombo termed this important property of embryonic development as "morpho-functional unity". They said "*In fact, during the embryonal stage, there is an intense relationship between cell, tissues, and organs – upheld also by continuous, ordinate, and co-ordinate increase of nervous cells – testifying to a morpho-functional unity.*"[81]

---

[80] Helen Pearson, "Your destiny, from one day", in *Nature* 418(2002)14 – 15

[81] Angelo Serra and Roberto Colombo, "Identity and status of the Human Embryo: The Contribution of Biology", in Pontificia Academia Pro Vita, *Identity and*

From all of the above explanations, it is clear that there is no embryological basis for the use of the term pre-embryo regardless of their presumptive arguments and the implications about the lack of individual unity of the embryo. Since the conclusion of the fertilization process, embryo has been a human being who has started his life cycle. An embryo is not a mass of cell or a group of cell without coordination and unity. That is the reason why Coalition of Americans for Research Ethics said, "*An international scientific consensus now recognizes that human embryos are biologically human beings beginning at fertilization and acknowledges the physical continuity of human growth and development from the one-cell stage forward.*"[82]

Unfortunately, there are some people who still use the term pre-embryo. If we observe closely those who use it, we will arrive at a conclusion that it is a more political and moral terminology than an embryological terminology. They use the term pre-embryo to reduce the moral significance of the early embryo[83]. Lee Silver, a professor at Princeton University in the Department of Molecular Biology – although he agreed with human cloning – explained this situation nicely.

> *I'll let you in on a secret. The term pre-embryo has been embraced wholeheartedly by IVF practitioners for reasons that are political, not scientific... The term pre-embryo is useful in the political arena – where decisions are made about whether to allow early embryo (now called pre-embryo) experimentation – as well as in the confines of a doctor's office, where it can be used to allay moral concerns that might be expressed by IVF patients. 'Don't worry,' a doctor might say, 'it's only pre-embryos that we're manipulating or freezing. They won't turn into real human embryos until after we've put them back into your body*[84].

Statute of Human Embryo: Proceedings of the Third Asembly of the Pontifical Academy for Life, Libreria Editrice Vaticana; Città del Vaticano, 1998, p. 175

82 Coalition of Americans for Research Ethics, "On Human Embryos and Stem Cell Research: An Appeal for Legally and Ethically Responsible Science and Public Policy", in Richard Sherlock and John D. Morrey (eds.), *Ethical Issues in Biotechnology*, Rowman & Littlefield, Lamham, 2002, p. 596

83 C. Ward Kischer, "The Big Lie in Human Embryology: The Case of the Pre-embryo", in *Linacre Quarterly*, vol. 64. No. 4 (1997) 59

84 Lee M. Silver, *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998, p. 39

2. Personhood of Human Embryo

In examining the personhood of the embryo, we cannot remain on the biological level but we have to employ philosophical reflection, based on the data that are provided by biology. Biology itself does not have the competency to determine the personhood of the embryo since biology deals with the phenomenon of the physical life of human beings. So, the formal object of biological inquiry is not the person. The personhood is the object of philosophy. Nevertheless, biology can make valuable contribution to the discussion of how and when an individual human organism is formed. After having explained how and when an individual human organism is formed in the previous chapter, we will proceed to use the biological data in a philosophical reflection on personhood of the embryo.

There are a variety of opinions about the etymology of the term "person"[85]. Some people[86] contend that the term "person" is the English translation of the Latin word "persona" which means mask in a theatrical performance that later it also got the meaning of character. Other people claim that the term "person" came from the Latin word "personare" which indicated the acoustic resonance of the actor's voice behind the mask. Still other people[87] proposed that the term "person" came from Greek word "*prósopon*" which means the things that we see that is the face, the visage[88]. This is the idea that Aristotle used in his

[85] Laura Palazzani, *Il Concetto di Persona tra Bioetica e Diritto*, G. Giappichelle Editore, Torino, 1996, p. 17

[86] V. Menchiorre, "Persona ed essere" in AA. ZZ, *Essere e Parola: Idee per una antropologia Metafisica*, Vita e Pensiero, Milano, 1982; Laura Palazzani, "I Significati del concetto filosofico di persona e implicazioni nel dibattito bioetica e biogiuridico attuale sullo statuto dell'embrione umano" in Pontificia Academia Pro Vità, *Identità e Statuto dell'Embrione Umano*, Libreria Editrice Vaticana, Vatican, 1998, p. 55; Ludger Honnefelder, "The Concept of a Person in Moral Philosophy", in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, p. 140

[87] Andrea Milano, *Persona in Teologia: Alle origini del Significativo di Persona nel Cristianesimo Antico*, Edizioni Dehoniane Roma, Roma, 1996, p. 54

[88] Jean Delumeau, "The Development of the Concept of Personhood: A Brief Sketch", in, David C. Thomasma, David N. Weisstub and Christian Hervé (eds.), *Personhood and Health Care*, Kluwer Academic Publishers, Dordrecht, 2001, p. 13

writings[89]. This is the same meaning that is found already in Homer's epic poems dating from the ninth century B. C. He used the term *prósopon* to indicate the face, the appearance, and the figure of human beings. In a further development, the word *prósopon* took on the meaning of a theatrical mask and eventually was used to refer to the role of an actor or the person who was interpreted. It was only in the Hellenistic era that the word *prósopon* was used to refer to an individual, a man in his position in a society[90]. In Roman society, the term person was used to indicate the mask, referring both to the theatrical role of an actor and also the role of an individual in the society and in the family[91]. Until now, there is no unanimous conclusion regarding the etymology of the word person[92].

The greatest deepening of the words "person" came from the time of Tertulian (died in 222AD). He used the word "person" to express the doctrine of the Holy Trinity and to resolve the question of the two natures of Christ: divine and human. Tertulian spoke of a substance in three persons (The Father, The Son, and the Holy Spirit) to name the distinction within a single God. In fact, Tertulian was the first recorded individual who used the term Trinity[93]. Tertulian also spoke about the union of the nature of Christ (divine and human) as one person both God and Man at the same time. The Council of Nicea (325 AD) proclaimed the equality of the three persons (Te Father, The Son, and The Holy Spirit) in the unity of the divine substance. This proclamation was due to the dispute with Arianism which said that The Son is not equal to The Father. In its further development, the word

---

[89] Aristotle used the term prósopon in his book *History of Animals* I,8.491b.9, "*The part that lies below the skull is called the Face: but in the case of man only, for the term is not applied to a fish or to an ox*", Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, (vol. I), Princeton Univertity Press, Princeton, 1998, p. 782

[90] Andrea Milano, *Persona in Teologia: Alle origini del Significativo di persona nel Cristianesimo Antico*, p. 54

[91] Laura Palazzani, "I Significati del concetto filosofico di persona e implicazioni nel dibattito bioetica e biogiuridico attuale sullo statuto dell'embrione umano" in Pontificia Academia Pro Vità, *Identità e Statuto dell'Embrione Umano*, Libreria Editrice Vaticana, Vatican, 1998, p. 55

[92] Andrea Milano, *Persona in Teologia: Alle origini del Significativo di Persona nel Cristianesimo Antico*, p. 63

[93] Andrea Milano, *Persona in Teologia: Alle origini del Significativo di Persona nel Cristianesimo Antico*, p. 62

"person" came to express an individual capacity to be a legal subject in the 15th century [94].

Leaving aside the etymological controversy and the ancient meaning of the term person, we will examine the modern usage of the term person, especially in bioethics. Respect for the person is at the heart of bioethics[95]. Here, the person is usually seen as a rational, self conscious being who directs his own life, independently from other beings[96]. In bioethical debates, the term person enters into many sectors of bioethics, such as in the debate about the status of the embryo in its early development. The term person also enters in the discussion about the cure of the patients who have to be regarded as a person[97]. The term person also enters into the discussion about the end of life, especially regarding people in the PVS (persistent vegetative status) and other people who are incapable of making a decision about their life due to their difficult situation[98].

The problem of the status "person" enters in the discussion of bioethics because we have to respect patient (people) as person. Right to live and right to have one's life protected are linked to the status of person[99]. If so, the next logical question is "who is a person?". The debate entered into the early development of the embryo because some people contend that until a certain stage of embryonic development, the embryo is not a person; while other people hold that since the

[94] Jean Delumeau, "The Development of the Concept of Personhood: A Brief Sketch", in, David C. Thomasma, David N. Weisstub and Christian Hervé (eds.), *Personhood and Health Care*, Kluwer Academic Publishers, Dordrecht, 2001, p. 14. Andrea Milano, *Persona in Teologia: Alle origini del Significativo di Persona nel Cristianesimo Antico*, p. 103 – 172

[95] Hubert Doucet, "The concept of Person in Bioethics: Impasse and Beyond", in David C. Thomasma, David N. Weisstub and Christian Hervé (eds.), *Personhood and Health Care*, Kluwer Academic Publishers, Dordrecht, 2001, pp. 121 – 122; Gilbert C. Meilaender, *Body, Soul, and Bioethics*, University of Notre Dame, Notre Dame, 1995, p. 43

[96] Ruud H. J. ter Meulen, "Toward a Social Concept of the Person", in David C. Thomasma, David N. Weisstub and Christian Hervé (eds.), *Personhood and Health Care*, p. 129

[97] See for example: Paul Ramsey, *The Patient as Person*, Yale University Press, New Haven, 1970

[98] Gilbert C. Meilaender, *Body, Soul, and Bioethics*, University of Notre Dame, Notre Dame, 1995, pp. 44 – 47

[99] Ludger Honnefelder, "The Concept of a Person in Moral Philosophy", in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, p. 139

beginning of his biological life, the embryo is a person. Further difficulties also arise from the fact that there is no unanimous agreement about the exact time of the "certain stage" of the development[100] as well as the criteria of personhood itself[101]. Traditionally, the criteria of personhood have included ratio like Boetius' definition of person as 'an individual substance in a rational nature'. This view was develop by Thomas Aquinas, saying, "*It belongs to every man to be a person, inasmuch as everything subsisting in human nature is a person... The individual substance, which is included in the definition of a person, implies a complete substance subsisting of itself and separate from all else.*"[102]

In the recent bioethical discussions, people place some important indicators of personhood that are different from each other. For example, Joseph Fletcher said that the most important indicator was the presence of the "neo-cortical function" so that human body may remain

---

[100] Most of the people believe that the "certain stage" is the day 14th of gestation due to the reason of individuality (personhood) of the embryo. There are some others who believe that it should be connected to the viability (the ability to life outside the mother womb) of the offspring. The United States Supreme Court in the case of Roe v. Wade in 1973 declared that the protection of the embryo was granted after the first trimester of gestation. In other words, before the first trimester, abortion can be performed freely.

[101] For example: John T. Noonan hold that being of humans makes one human and a person (John T. Noonan, *The Morality of Abortion: Legal and historical Perspectives*, Harvard University Press, Cambridge, 1970); Paul Ramsey said that each specific genetic code is unique and identifies that human individual and that is the reason that it is a person (Paul Ramsey, "The Morality of Abortion" in D. H. Labby (ed.), *Life or Death: Ethics and Options*, University of Washington Press, Seatle, 1969, pp. 60 – 93); Michael Tooley hold that to be a person one must have a serious moral right to life as determined by the self consciousness requirements to experience and capable of desiring to exist as a subject of experiences and other mental states. In this case, the fetus and the new born are not a person so that the abortion and infanticide is justified (Michael Tooley, "Abortion and Infanticide" in *Philosophy and Public Affairs* 2(1971) 37 – 65). Clifford Grobstein hold that the human behavior which made a person (Clifford Grobstein, *Science and the unborn*, Basic Book, New York, 1988). Peter Singer holds that the criteria of personhood are the capacity to feel the paint and joy (Peter Singer, *The Expanding circle: Ethics and Sociobiology*, Clarendon Press, Oxford, 1981). Gregory E. Pence hold that the personhood is determined by the cognitive criterion of personhood (Gregory E. Pence, *Who's Affraid of Human Cloning?*, Rowman & Littlefield, Lanham, 1998, p. 88

[102] Summa Theologiae III, 16.12,1 – 2

'alive' but if his cortex does not function, he is no more a person[103]. Peter Singer held that the most important indicator was the self-consciousness. Since the right to live is connected to the status of person, for Peter Singer, a chimpanzee or a pig which has higher degree of self-consciousness has more right to live than the neonates with grave retardation[104]. Some other people indicate other indicators of personhood, such as consciousness, reasoning, self-motivated activity, capacity to communicate, and the presence of self-concepts[105]. Many people in the bioethical debate contended that any being which satisfies non of them is not a person.

There has been a shift in the criteria of the legal and moral protection of the embryo. In ancient times, the legal and moral protection of the embryo was related to the animation of the embryo which was indicated by the quickening of the embryo. It meant that the embryo before quickening could be aborted without fear of sanction. In more recent times, the legal and moral protection of the embryo is related to its status as a person.

Many people hold that it is the personhood status of the embryo which determines the legal and moral rights, obligations, protection, and respect of the embryo. This is the reason why the debate about the personhood of the embryo is important in bioethics because many people hold that the justification of many embryonic interventions, such as cloning, harvesting embryonic stem cells, abortion, genetic engineering, *in vitro fertilization* or some other future technologies depend on the personhood status of the embryo.

a. Person as Legal Subject

In the history of human civilization, we can easily find a time when not all human beings had the equal dignity before the law. The

---

[103] Joseph Fletcher, "Indicators of Humanhood: A tentative Profile of Man", in *The Hasting Center Report* 2(1972) 1 – 4

[104] Peter Singer, *Liberazione Animali: Il Manifesto di uni Movimento Diffuso in Tutto il Mondo*, Il Saggiatore, Milano, 2003, p. 35

[105] Stephen D. Schwarz, *The Moral Question of Abortion*, Loyola University Press, Chicago, 1990, p. 88; James J. McCartney, *Unborn Persons: Pope John Pauls II and the Abortion Debate*, Peter Lang, New York, 1987, pp. 103 – 121; H. Tristram Engelhardt, "Viability and the Use of the Fetus" in William B. Bondeson, H. Tristram Engelhardt, *Abortion and the Status of the Fetus*, Kluwer Academic Publisher, Dordrecht, 1983, p. 184

practice of slavery, which is long standing and widespread throughout the world, is the most obvious case of human inequality and degradation of human beings. Their rights as persons, as human beings, as a free people are negated and they are reduced to tools to achieve certain goals. On the eve of the Second World War, there were groups in the society, such as Jews, Gypsies, and homosexual persons whose right to life was negated and they ended up in concentration camp. In order not to repeat the same tragedy in the future, the newly created United Nations proclaimed the Universal Declaration of Human Rights on December 10, 1948[106].

In the article 6 of the declaration, it was proclaimed that "*Everyone has the right to recognition everywhere as a person before the law.*" In the next article no. 7 it was stated that, "*All are equal before the law and are entitled without any discrimination to equal protection of the law. All are entitled to equal protection against any discrimination in violation of this Declaration and against any incitement to such discrimination.*" It was a solemn recognition of a person before the law. With this proclamation, the status of the human being as a person was connected to the law. Rodolfo-Carlos Barra concluded that the juridical concept of person and its applications to all people was the creation of the juridical civilization[107].

The status of a person is regarded as important in the legal view because it relates closely to the capacity to act legally before the law especially regarding the rights and obligations of a human being. The laws both prescribe and proscribe the behaviour of individuals and institutions towards persons. If the fetus is a person within the meaning of some legal strictures, that stricture will apply to the treatment of a fetus. The violation of a law will be rewarded with a punishment.

b. Person as Moral Subject

Like the status of the person in the legal view, the status of the person is also regarded important in moral view although there are some differences. In a good legal system, laws would never conflict

---

[106] Adopted by United Nations General Assembly Resolution 217A (III), UN Doc A/810 at 71 of 10 December 1948.

[107] Rodolfo-Carlos Barra, "Status Giuridico dell'embrione Umano", in Pontificio Consiglio per la Famiglia, *Lexicon: Termini Ambigui e Discussi su Familgia, Vita, e Questioni Etiche*, Edizioni Dehoniane Bologna, Bologna, 2003, p. 821

with one another and there would be no conflict among the laws in the system so that citizens would not have to break a law in order to comply with another law. If there is a conflict, an adjudicatory process will be provided to resolve the conflict.

The moral function is somewhat different from the legal function. In spite of there being no physical punishment for violations of the moral principles, the strength of moral principles are different from one another. For example: even though killing a person is wrong morally, not all of killing of a person is wrong morally in the case of legitimate self-defense. On many occasions, there is a conflict of moral principles. The common principle of resolving moral conflicts is that the higher value of the moral principles has to be given precedence over the lower. The problem is that there are no unanimous criteria to determine the gradation of moral values. If there are no unanimous criteria of the principles, it can not be assumed that a clear gradation of value is possible.

The problem of the status of the embryo as a person is tightly connected to the role of the person as a moral agent who is self-conscious, rational, and self-determining in his action so that one may have responsibilities, rights, and obligations. In other words, a moral act is the act which flows from a free will that is illuminated by the intellect.

c. Human Embryo as Person

It is time to pose a question, "Is an embryo a person?" In the strict legal and moral sense, certainly an embryo is not a legal and moral subject. Most countries set the limit of the standard age of 18 years as the age when one can act legally. It means that the people under 18 years are not persons in the strict legal sense.

In the strict moral sense, an embryo also is not a person either because an embryo cannot act freely so that we can ask for responsibilities for his/her actions. In this strict moral sense, even a baby is not a person because babies cannot act freely with self-consciousness, rationality, and self-determination[108].

If a baby is not a person in a legal and moral sense, does it mean that the babies do not have legal and moral protection so that

[108] H. Tristram Engelhardt, *The Foundations of Bioethics*, Oxford University Press, Oxford, 1996, p. 139

infanticide is justified – like the proposal of Michael Tooley?[109] Many people do not agree with this proposal and they believe that there has to be a protection of the embryo both morally and legally. Many people interpret the personhood status of the embryo not in the sense mentioned above but in the way that means equivalent to being an individual[110]. In the previous chapter regarding the pre-embryo, we have discussed that the embryo has unity as an individual. In this sense, the embryo certainly is a person.

Furthermore, modern embryology illuminates the problem of traditional personhood regarding the human embryo because modern embryology shows that the embryo fulfills the traditional criteria of a person:

- Regarding the brain and the nerves. Recent research has confirmed that the human body – the brain included – is determined within 24 hours after fertilization is completed[111]. In the one-cell zygote, the future of a human being is formed and it will develop according to the inner genomic program of the embryo.

- Regarding relation and communication. Many people hold the position that only after implantation does the embryo have the first relation/communication with other subjects. This position is not true. Since its existence, the zygote sends chemical signal to the "information center" of the mother's body so that the zygote is protected by the immune system of the mother's body. The zygote has a different genome from the mother's genome. The zygote also has a different structure and life cycle. In short, the zygote is a stranger in the mother's body. Although the zygote is a stranger in the mother's body, it is not killed by the immune system of the mother. Normally, the immune system of the body will fight against strangers in the body and kill them to keep the body healthy.

In this case, it is important to note the difference between existence and function or being a person and functioning as a person[112].

---

[109] Michael Tooley, "In Defense of Abortion and Infanticide", in Louis P. Poijman, Francis J. Beckwith, *The Abortion Controversy: A Reader*, Jones and Barlett, Boston, 1994, pp. 186 - 211

[110] Eugenio Lecaldano, "Persona" in Eugenio Lecaldano (ed.), *Dizionario di Bioetica*, Editori Laterza, Roma, 2002, p. 220

[111] Helen Pearson, "Your destiny, from one day", in *Nature* 418(2002)14 – 15

[112] Stephen Schwarz, "Personhood Begins at Conception", in Louis P. Poijman, Francis J. Beckwith (eds.), *The Abortion Controversy: A Reader*, Jones and Barlett, Boston, 1994, p. 239 - 247

From the above explanation, we can see clearly that all the factors necessary to live have been determined at the time of fertilization and are written in the genome of the zygote. The embryo fulfills the criteria of the personhood of human beings. It is almost incredible but it is true that they exist. As yet they are not functioning as an adult's organs function. There are major differences between existing as a person and functioning as a person. In the case of an embryo, it exists but it does not function as an adult. But this is part of the nature of the embryo. Even in adult people, not all of their organs may not be functioning. Let us take the example of the unconscious person. All the criteria of personhood are not present. The unconscious person cannot think, sense, or have self motivated action. Although his capacities of personhood are not functioning, we cannot negate his personhood because his capacities of personhood present. When he returns to consciousness, his capacity as a person will function again.

The same thing occurs in the embryo. It is true that the brain of the embryo at the early stage of the development is not functioning but the time will arrive when it will function. It is only a question of time and it will function.

The case of a person being totally brain dead is different. People in the state of being totally brain dead have lost the function of their brains irreversibly and therefore their faculties to be persons have also finished. They are no longer persons.

So, a human embryo is a person with the same dignity as adult people. We need not reduce the embryo's dignity based on his "not function" faculty of personhood. Unfortunately, there are legal systems that do reduce the embryo's dignity to the lower level and even to the level of research tools to achieve a certain goal. The case of the Warnock Committee is one of the more famous examples. With a euphemism the Warnock Committee stated,

> *The human embryo per se has no legal status. It is not, under law in the United Kingdom accorded the same status as a child or an adult, and the law does not treat the human embryo as having a right to life... Although, therefore, the law provides a measure of protection for the human embryo in vivo it is clear that the human embryo under our definition of the term (1.4) is not, under the present law in the UK accorded the same status as a living child or an adult, nor do we necessarily wish it to be accorded that same status. Nevertheless we were agreed that the embryo of the*

human species ought to have special status. (Warnock Report no. 11.16 – 11.17)[113].

So in this statement the Committee wanted to say that: A human embryo did not have legal status and did not have a right to life. The committee wanted to give an embryo a legal or "special status" which was not the same as that of a living child or an adult. In the report no. 11.15, the Committee explained that the embryo enjoys a "special status" so that it can be used as a tool for research. "*though the human embryo is entitled to some added measure of respect... that respect can not be absolute, and may be weighted against the benefits arising from research.*"[114]

3. Biological Identity, Uniqueness, and Unrepeatability of Human Life

Some people have said that the embryo in its first days of development until 14 days is only a mass of cells or a collection of cells[115] or a tiny bunch of molecules[116] which has no significant difference from other billions of human cells and has no right for respect as a human being.

As we have shown in the discussion in the previous chapters, this statement is not true. Angelo Serra, a famous geneticist from the Sacred Heart University in Rome, stated that there are approximately 4 – 8 million cells when an embryo arrives at the age of 15 days[117]. Those cells are not a mass of cells without any identity; on the contrary, those cells have their exact genomic identity which was formed in the time of fertilization and this genomic identity becomes his identity for all of his

---

[113] Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, pp. 62 – 63

[114] Warnock Report No. 11.15. Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, pp. 62

[115] Warnock Report no. 11.15. Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, p. 62

[116] Jeffrey Reiman, *Abortion and the Ways We Value Human Life*, Rowman & Littlefield Publishers, Inc., Lanham, 1999, p. 66

[117] Angelo Serra, *L'Uomo-embrione: Il Grande Misconosciuto*, Cantagalli, Siena, 2003, p. 38

life; those cells form a unity as an individual where each of the cells has its own place and proper job in the overall precise and determined development; its development is autonomous because it is guided and directed by an internal genomic program.

Certainly this identity is not exactly the same as that of adult people where their identities are manifested – first of all – in their biological appearances. But the biological appearances are determined by the genome of the people. So the biological appearances are manifestation of the genomic identity of the people. Physical appearances can be changed but not the genomic identity. The genomic identity exists once and forever.

This genomic identity of the embryo is unique because it is different from the genomic identity of those who have generated the embryo (father and mother) and it is different from that of the other children of the same parents and certainly it is different from that of any people in the world.

For all human beings, the genomic identity is very precious and it is protected by UNESCO and UNO in the Universal Declaration on the Human Genome and Human Rights[118]. So the genomic identity is declared as the human rights. The origin of the declaration was prepared by UNESCO. In November 1993, UNESCO created the International Bioethics Committee (IBC) as an international instrument on the protection of the human genome[119]. Since its creation, the IBC has worked for the elaboration of an international instrument for the protection of the human genome. At the twenty-ninth session of UNESCO's General Conference on 11 November 1997, UNESCO adopted unanimously the Universal Declaration on the Human Genome and Human Rights by acclamation. The following year, the United Nations General Assembly endorsed the Declaration.

In the article 2 of the declaration, it is said, "*a) Everyone has a right to respect for their dignity and for their rights regardless of their genetic characteristics. b) That dignity makes it imperative not to reduce individuals to their genetic characteristics and to respect their uniqueness and diversity.*"

[118] The text of the declaration can be accessed in http://www.unesco.org/ibc/en/genome/projet/index.htm

[119] For the creation of the IBC, see the 27 C/Resolution 5.15 of the UNESCO, "Preparation of an International instrument for the Protection of the Human Genome" which was adopted by the General Conference of UNESCO on 15 November 1993. http://www.unesco.org/ibc/en/presentation/resol27.html

In the article 11 of the same declaration, it is stated, *"Practices which are contrary to human dignity, such as reproductive cloning of human beings, shall not be permitted. States and competent international organizations are invited to co-operate in identifying such practices and in taking, at national or international level, the measures necessary to ensure that the principles set out in this Declaration are respected."*

There are some interesting and noteworthy elements in this declaration. First of all regarding the human dignity and human rights: the right for respect and dignity has to be applied to everyone. This respect and dignity is connected to the genetic characteristics and not to the personhood status of human beings. Whatever the genetic characteristics of the subject are, as long as it is a human genetic characteristic, its dignity and rights must be respected.

Secondly, the declaration emphasized the uniqueness and diversity of the genetic characteristics. The text stated strongly that the uniqueness and diversity of the genetic characteristics have to be respected. That is the reason why the declaration explained eloquently that the practices which are contrary to human dignity – such as reproductive cloning – shall not be permitted.

As we have discussed in the previous chapter (I.D.4), it is true that the genome of the cloned person is not always exactly the same to the one being cloned, but the similarity between them is very large. The dissimilarity comes from the mitochondrial DNA (contained in the outer layer of the egg) from the (enucleated) egg used in the nuclear replacement process[120]. But the number of these genes is very small so that the dissimilarities of the genome between the person being cloned and the cloned person is very small. But if a woman is cloned using her own ovum, the genome is exactly the same. The United Nations regarded this similarity of the human genome between two persons as a violation against privacy and an act against the common heritage of humanity[121] so that cloning shall not be permitted.

With the Universal Declaration on the Human Genome and Human Rights, Unesco and the UN declared that the human genome is

---

[120] George E. Seidel, "Genetic and Phenotypic Similarity among Members of Mammalian Clonal Sets", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 215

[121] Bartha Maria Knoppers, "Il Genoma Umano: Proprietà dell'individuo o patrimonio Comune" in Anne McLaren, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002, p. 132 – 139

the common heritage of humanity so that everybody's rights to their proper genetic patrimony were reaffirmed as things that cannot be transferred or repudiated because they belong to a particular individual. All the legal entities – whether international or national communities – have to protect and guarantee this patrimony, according to article 18 of the Declaration:

> *States should make every effort, with due and appropriate regard for the principles set out in this Declaration, to continue fostering the international dissemination of scientific knowledge concerning the human genome, human diversity and genetic research and, in that regard, to foster scientific and cultural co-operation, particularly between industrialized and developing countries.*

There is a debate on whether genetic materials and genetic information are private property or the common heritage of humanity. Some countries – such as the European Community – states that they are not private property but in other countries – such as the USA – they are considered private property. This debate is important because it is closely related to the right of patent regarding inventions in the human genome. If it is a common heritage of humanity, it shall be available for all and it cannot be patented, otherwise, if it is a private property, it can be patented.

B. The Value of Human Life

In this chapter, we will deal with two interrelated issues: human life and its value. First of all we will discuss "life" in its relation with "human life" and then we will discuss the meaning of the "value" in its relation with "the value of human life". This discussion is important to clarify the exact meaning of the terminology in this discussion so that it can minimize the misinterpretation of these terms in relation to the complicated debates regarding human cloning.

Life is always characterized by certain qualities, such as movement, the ability to reproduce and to evolve, and the capacity for growth and development. Other criteria for defining life as opposed to non-life include the capacity to metabolize, in particular through the possession of cells. According to Sarah Franklin[122] - a professor from the University of California, Santa Cruz – today molecular biology provides the primary analytic perspective on the essence of life, which is seen to be DNA, or the genetic code. It is DNA that all living beings are said to have in common. Thus DNA is the substance and mechanism of heredity intrinsic to the notion of life itself. Today the most definitive accounts of life rely on evolutionary and genetic models. Franklin cited one of the great twentieth-century biologists, Ernst Mayr, who said, "*The possession of a genetic program provides for an absolute difference between organisms and inorganic matter*"[123].

In the case of human life, the life of a human being has to be defined with the possession of genetic programs which were formed and determined at the time of fertilization. These genetic programs are human genes which have a unique identity, oriented to the precise and determined final goal, and they develop gradually. As we have discussed in the previous chapters, the beginning of human life starts when the process of fertilization is finished.

John Kleinig, Edmund Pellegrino and David C. Thomasma agreed that the term "value" comes from the economic world to indicate the relative cost of an item[124]. The oldest uses of this term seem to come

---

[122] Sarah Franklin, "Life" in Warren Thomas Reich (ed.), *Encyclopedia of Bioethics* (Revised Edition), Simon and Schuster Macmillan, New York, 1995 (CD ROM edition).

[123] Ernst Mayr, *The Growth of Biological Thought: Diversity, Evolution, and Inheritance*, Harvard University Press, Cambridge, 1982, p. 55

[124] David C. Thomasma, *Human Life in the Balance*, Westminster, Louisville, 1990, p. 38; Edmund D. Pellegrino and David C. Thomasma, *A Philosophical Basis of*

from a commercial context, in the pricing of objects or the determination of their monetary equivalents[125]. In further development, this term is also used for other things such as the quality of a product, a commitment to a thing, action or a person[126].

In the realm of moral reflection, values are concepts or ideas or notions that we use to explain how and why various realities are important and attractive. Those values attract us and draw us to pursue them and they aspire after the good that they articulate. We expect to find our own good in relation to what they offer.

In simple societies, values generally operate as components of the common culture that are taken for granted without need for further complicated reflections. The value enters into the realm of moral reflection when many options are presented as possibilities to live human life. All these possibilities are interesting, sound good, and desirable, but sometimes they contradict each other so that we cannot have them all. That is why reflection is needed before choosing the right things or the right actions. Ethics provides this reflection and pushes for preference.

In other words, choosing the right things is preceded by an act of valuing the things. In order to choose rightly, one has to reflect first on the value of the things, and only then can one choose. Values are found at the root of the judgment. So, valuing does imply an ethical dimension because after reflecting ethically on the multi dimension of the objects, people are capable of judging the objects according to the norms or principles proposed by ethics.

The capability of valuing increases along with the human's experience in orienting life toward the future. Therefore a value can be said to be a personal future orientation. It is a person's personal values which drive him to pursue his future. If his personal values are changed, the orientation of his life also changes.

In the context of human life, the main question is simple: What makes human life valuable? Why is it more valuable than other forms of life? So in this case it does not deal with the question of why a

---

Medical Practice: Toward a Philosophy and Ethics of the Healing Professions, p. 180; John Kleinig, *Valuing Life*, Princeton University Press, Princeton 1991, p. 5

[125] John Kleinig, *Valuing Life*, Princeton University Press, Princeton, 1991, p. 5

[126] David C. Thomasma, *Human Life in the Balance*, Westminster, Louisville, 1990, p. 38; Edmund D. Pellegrino and David C. Thomasma, *A Philosophical Basis of Medical Practice: Toward a Philosophy and Ethics of the Healing Professions*, p. 180.

person (for example an adult) is more valuable than the other (for example a baby). Rather it is interested in why and whether people have a particular significance and value because they are human beings. The answers to these questions will be discussed in further chapters in which we will examine the properties of human life.

Since valuing is a moral act, the attention of some people regarding human life is not posed primarily at the beginning and at the end of life but rather when does life begin to matter morally and when does life cease to matter morally[127]. Although many people agree that the life of human beings begins biologically at the time of fertilization, it does not mean that they also agree that the life of human beings begins to matter morally at the time of fertilization. But some people do agree that life begins to matter morally at the same time that life begins biologically.

The value of human life is the weight assigned to human beings and to their attitudes[128]. Human life is attractive and all people (except those who want to commit suicide) are seeking to preserve their life (human survival). People will struggle hard to preserve their life in the case of dangers. In the Thomistic term, each man has a natural inclination to keep himself in being and resist corruption[129]. Pursuing human survival certainly assumes that human life has value. Otherwise, it would be worthless to pursue something which is valueless. That is why, in the midst of many things which are of value, human life must be considered to be important and to be respected.

Human life cannot be valued merely externally because each life has a unique and inestimable value that cannot be substituted or eliminated. Intrinsically speaking, the value of human life means that each life bears immeasurable value regardless of its external appearance.

The way and the weight of how the people value the human life depend on the many notions which constitute the human life itself. In

---

[127] See for example John Harris, *The Value of Life*, Routledge & Keegan Paul, London, 1985, p. 8

[128] David C. Thomasma, *An Apology for the Value of Human Life*, The Catholic Health Ass., St. Louis, 1983, p. 15; see also D. C. Thomasma, *Human Life in the Balance*, p. 38.

[129] "*Everything naturally loves itself, the result being that everything naturally keeps itself in being, and resists corruptions so far as it can. Wherefore suicide is contrary to the inclination of nature, and to charity whereby every man should love himself.*" Summa Theologica II.II.64.5.5

spite of those notions, we will see that in the Judeo – Christian tradition, the life of human beings is valuable and more important than the other forms of life because the life of a human being has the following properties:

1. Life as a Basic Human Right

In this chapter we will discuss life as a basic human right because life is the basis for a human being's existence and aspirations. First, we will review briefly the meaning of a right. Then we will review human rights and finally we will discuss life as a basic human right.

In the ethical and judicial discussions, a right is closely connected to a duty because whenever there is a right there is also a duty or vice versa. Because of this close relationship between the two, people have called this relation "the logical correlative of rights and duties"[130]. This correlativeness comes from the origin word of duty. The word duty is associated with actions that are due to someone else, for example, the payments of debts to creditors, the payment of tuition fees, the payment for the membership in a club and so forth. Therefore, in this original meaning, the duty is correlated with the right of those to whom the duty is owed. In further development, the duty is not always related to the right of a person, for example, the duty to stop when the traffic light is red. This duty does not come from the fact that I have a debt to some one, but this duty comes from the law. So in the further development, the duty is also used to express any action that we must do for whatever reason[131].

Like the development of the meaning of duty, the word right also has undergone development. In the first place, the understanding of a right is closely related to the understanding of a duty. Whenever there is a duty, there is a right or vice versa. Now the word right has also been applied to what was merely an act of gratitude, or reward, or bonus in the past. The practice of tipping is such an example. Originally, one gave a tip as a gesture of gratitude because of good service received. Now this is changing. In many cases, the taxi drivers, or waitresses in a restaurant, or porters in a hotel feel that they have a

---

[130] Joel Feinberg, "The Nature and Value of Rights", in Elsie L. Bandman and Bertram Bandman (eds.), *Bioethics and Human Rights*, Little Brown and Company, Boston, 1978, p. 19

[131] Joel Feinberg, "The Nature and Value of Righ.s", *p. 20*

right to a tip regardless of the quality of service given. In short, a right is a kind of claim that other people have to provide or respect because of the possession of the object. The roots of this possession may come from different sources such as purchase, law, inheritance, or nature. The validity of the claim of possession may be governed by rules or moral principles. The differences between right and duty (obligation) is that the owner of the right may exercise it or renounce it without any legal consequences while those who have the duty or obligation do not have a choice other than to perform it. One may renounce his right for the sake of higher values. But this renouncement is a free act of the owner and cannot be forced[132].

So, when one speaks about human rights, one is referring to the rights that are attributed or connected with a human being as human being. In other words, all human beings have these rights because they are human beings. The ownership of this right is caused by being human. So human rights come from the nature (natural law) of being human (man's natural essence) and are inherent to human dignity and are the expression of human dignity[133].

These rights are previous to all positive laws because positive laws are crystallizations of those rights in specific norms and assimilate them as a foundation for juridical ordinances[134]. Because they precede positive laws, human rights become the foundation and the criteria for judging the validity of all juridical orders (laws). In other words, positive laws cannot contradict human rights[135].

More and more people in modern times are coming to realize their human rights and to demand that they are respected. The violation of these human rights has become a hot issue in the diplomatic relations among the countries and societies. Unfortunately, sometimes human rights are used to legitimize the violation of other human rights.

---

[132] Joel Feinberg, "The Nature and Value of Rights", *pp. 25 – 33*

[133] Giuseppe Gervasio, "La Cultura dei Diritti Umani e il Cammino per il Loro Progressivo Sviluppo", in Santi Corsi (ed.), *Individui Senza Volto: Diritti Universali e Ricerca dell'Identità in una Società Multiculturale*, Canta Galli, Siena, 2003, p. 21

[134] M. D. Vila Coro, "The Rights of Man and the Right to Life", in Pontificia Academia Pro Vita, *The Nature and Dignity of the Human Person as the Foundation of the Right to Life: The Challenges of the Contemporary Cultural Context*, Libreria Editrice Vaticana, Città del Vaticano, 2003, pp. 216 – 217

[135] Giuseppe Gervasio, "La Cultura dei Diritti Umani e il Cammino per il Loro Progressivo Sviluppo", p. 21

The newly erected United Nations (UN) proclaimed the Universal Declaration of Human Rights on December 10, 1948[136]. This was a brilliant effort to safeguard the human rights which had been violated in the previous decades. In Article No. 3 of this Declaration, it was stated that, "*Everyone has the right to life, liberty and security of person.*"[137]

From this declaration, it is rightly stated that everyone has the right to life. What is not appropriate in the declaration is that it is placed in the same sequence with the right of liberty and security. It gives the impression that those rights are all on the same level and equal in value. In fact, that is not the case. Among all human rights, the right to life is the most basic of human rights. The right to life must be placed as the basis or the foundation of all other rights. All human rights have a basic and constitutive assumption based on the life of human beings because all human rights are for those who are living and because there is life. People who have died no longer have human rights. All of the human rights and their applications are for those who are living. Even the right to die[138] – if somebody believes to have it – is for those who are living. Without life, there are no human rights

---

[136] Eugene B. Brody, *Biomedical Technology and Human Right*, Unesco Publishing, Paris, 1993, pp. 261 - 267

[137] Eugene B. Brody, *Biomedical Technology and Human Right*, p. 262

[138] Historically, the right to die emerged whenever the process of dying became more complicated because of excessive medical efforts to forestall the death. As the reaction of this medical effort, people asserted and won a right to refuse life-prolonging treatment which was burdensome. The right to refuse the burdensome life-prolonging treatment *per sé* is not the same with the right to die but soon it turned into the right to die because in the further development, people not only refuse treatment but also refuse life itself.

The Catholic Church also gave reaction to this excessive treatment. In the discourse to the healthcare workers about the religious and moral problem of the reanimation in 1957, Pope Pius XII endorsed the doctrine of ordinary and extraordinary means in which people do not have obligation to procure extraordinary treatment but it is an obligation to procure ordinary treatment. There are big debates about the criteria of ordinary and extraordinary because they were not always clear.

To day, there are changes in the bases to demand the right to die. To day, the demands to the right to die are more and more based in the supremacy of choice, autonomy, and self-determination. Leon R. Kass, "Death with Dignity and the Sanctity of Life", in Michael M. (ed.) Uhlmann, *Last Rights?: Assisted Suicide and Euthanasia*, William B. Eerdmans Publishing Company, Grand Rapids, 1998, p. 201

whatsoever. Everything which is related to human experiences, human achievements, human responses even self realizations, needs human life as a basis. Richard A. McCormick summarized this condition as "*Life as a condition for other values and achievement.*"[139]

People plan on having many achievements during their lifetime. They have many dreams which they want to come true. The realization of all of these achievements and dreams needs life as a basis, because without life they will never come true. This condition is valid not only for superficial actions such as eating and drinking but also for the deepest moral actions such as freedom and self-realization.

Vila Coro summarized that the right to life "*is an anthropological prius. It is more than a fundamental right; it is the condition which makes any subsequent right possible: life is empirical not theoretical. The fact of life is an entitlement to the right to life.*"[140]

Since the right to life is the basic right of humanity, respect for this human life needs to be placed as the basis for all things and it has to be respected firmly. Human life is to be preserved precisely as a condition for other values and therefore insofar as these other values remain attainable. In the future, if it ever happens that human beings succeed in making new human beings through the technique of cloning, there is no reason to lack respect for life as a basic human right.

We will see further that human life as the basic human right does not means that human life is always the ultimate value which cannot be sacrificed for the sake of other things. In further discussion about the inviolable value of a human being, we will discuss the conditions in which a human person can sacrifice his life for others.

2. Intrinsic and Extrinsic Value of Human Life

When people value a thing, they can value it according to the criteria which come from outside the thing itself (extrinsic) or according to the criteria from within the thing itself (intrinsic)[141]. Extrinsic value is a value which is imposed on something or someone by somebody else according to external criteria. Usually extrinsic value

---

[139] Richard A. McCormick, *How Brave A New World: Dilemas in Bioethics*, Georgetown University Press, Washington D.C, 1981, p. 405

[140] M. D. Vila Coro, "The Rights of Man and the Right to Life", p. 222

[141] John Kleinig, *Valuing Life*, Princeton University Press, Princeton, 199', pp. 4 - 10

closely relates to *bonum utile* in which the thing is valued according to the utility of the thing[142] or the socio-economic values in which the thing is valued according to the risk and benefit of the thing[143]. For example, human life does have socio-economic values as, for instance, in the life insurance. People who have a high risk of mortality or sickness have to pay a higher premium than the people who do not have these high risks. In this case, the life of a human being is valued according to the risk of the people and benefit of the insurance company.

The extrinsic value of a thing can be changed easily according to the external criteria which sometimes can not be controlled by the one being valued. For example, the insurance premium can change because of epidemic diseases that cannot be controlled.

From the point of view of the ethical reflection on life, the intrinsic value of human life is more important than its extrinsic value. Intrinsic value means that things are desirable for their own sake. It is, therefore, affirmatively valued for its own sake, and it exists from the beginning of its existence[144]. It is not a value that is added by someone else in the course of time but it is a value that exists since the existence of the thing and it will only cease to exist at the same time that the thing ceases to exist. So, if someone believes that the life of a human being begins to matter morally only after the 14 days of gestation, it means that he does not believe in the intrinsic value of human beings because the beginning of life is not at the same time as when life begins to matter morally. There is a span of time when the life of a human being does not have intrinsic value. As we have seen in the previous chapter, that this is a disputable affirmation which does not have any biological basis.

The intrinsic and extrinsic values of human life cannot be interchanged. What is true on one side cannot always be true on the other side. If someone places a monetary value on human life, this monetary value may have no validity with respect to moral claims that people may make on others' resources. One cannot "back into" the moral and metaphysical realm from the economic perspective. In doing

---

[142] William May, "Ethics and Human Identity: The Challenge of the New Biology", in *Horizon* 3(1976) 35

[143] John Kleinig, *Valuing Life*, pp. 145 – 148

[144] John Kleinig, *Valuing Life*, p. 9; Peter Singer, *Practical Ethics*, Cambridge University Press, Cambridge, 1999, p. 271

so, one will fall into the naturalistic fallacy: moving from a description of the way we act to the normative dimension of how we ought to act[145].

So, human life is valuable not because somebody or a state or an institution gives value to it, but because human beings are human beings. Economical value places the value extrinsically and that is not a proper value regarding human beings. On the other hand, moral value places value intrinsically. Measuring human value only extrinsically degrades the value of a human being. Extrinsically, human life may have a low value (e.g. the poor man, the unimportant man, the powerless man, etc.) but intrinsically the human being has an intrinsic equal value. Regardless of its extrinsic value, human life bears an inestimable worth intrinsically that has to be respected by all people. In the case when someone must choose one human life among other human lives (in a war, in an emergency, or in the case of an abortion), one can not say that one life has less intrinsic merit than another, but he has to say that all lives are of equal value. Unfortunately, in the case of war, or abortion, or an emergency, there is no choice but to sacrifice someone of inestimable worth.[146]

So the intrinsic value of human life means that each life bears inestimable worth regardless of externally applied criteria and it also means that among many valuable things, human life must be considered to be the most important. In other words, in comparison with other things and creatures in our known universe, human life is to be respected. If required by circumstances, human life needs to be chosen over all other things and other creatures.[147]

Some people – for example Jonathan Glover and Peter Singer – criticized this statement by saying that this statement is analogous to racism in its purest form[148]. Glover criticized the intrinsic value of human life as 'speciesism' because "*human life [is] being treated as having a special priority over animal life simply because it is human.*"[149] The same way of thinking can be seen in the statement,

---

[145] David C. Thomasma, *Human Life in the Balance*, Westminster, Louisville, 1990, p. 38.
[146] David C. Thomasma, *Human Life in the Balance*, p. 39
[147] David C. Thomasma, *Human Life in the Balance*, p. 39
[148] Jonathan Glover, "The Sanctity of Life" in Helga Kushe, Peter Singer (eds), *Bioethics: An Anthology*, Blackwell, Oxford, 1999, p. 198; Peter Singer, *Practical Ethics*, Cambridge University Press, Cambridge, 1999, pp. 55 - 62
[149] Jonathan Glover, "The Sanctity of Life", p. 198

"*people of a certain race ought to be treated differently simply because of their membership of that race.*"[150]

In responding to this objection, a distinction must be clearly made between what makes a human being is different from an animal is different from what makes human beings different from one another. The difference lies in the different level. In the biological terminology, this difference is expressed by the term "species" and "race". A species is a sequence of ancestral and descendant populations closely related to each other and, therefore, more or less similar in essential characteristics. Among the same species, they can actually or potentially interbreed natural populations that are genetically similar and reproductively isolated from other such groups[151]. Race is a group of persons related by common descent or heredity[152]. The difference between animals and human beings is the difference in species while the difference among human being is the difference in race.

The difference between human species and animal species is the difference of biological structures which make a human a human and an animal an animal. It is this difference which makes the nature of a human different from the nature of an animal. Whereas the difference between one human being and another human being (racialism) is the difference between person (personality) which does not make any difference in his humanness (the nature of the human).

So the affirmation of the intrinsic value of a human being is not the same thing as racialism because the difference between species cannot be applied to the difference between (human) races. The nature of the difference lies in the different levels which can not be parallel with each other.

Human life itself has an intrinsic value because human life itself has the value within life itself and has finality in itself so that it cannot be used merely as a means to achieve something else.

This affirmation is challenged in the modern world. The threat of modern technologies regarding human life is imminent and immense. It sounds like a contradiction to say that human life is threatened by the modern technologies since the purpose of technologies is to help

---

[150] Jonathan Glover, "The Sanctity of Life", p. 198

[151] Angelo Serra and Roberto Colombo, "Identity and Status of the Human Embryo: the Contribution of Biology", p. 133

[152] Random House Webster's Electronic Dictionary and Thesaurus, College Edition, 1992

human beings and to make the life of human beings is easier and more comfortable.

The tragedy of Frankenstein is the famous example of this. The robot which was created by Dr. Frankenstein turned against its creator. This tragedy was caused by the failure of Frankenstein to care for what he had created so that the robot (modern technology) which was supposed to help the creator (human being), then turned against the creator and became a threat to human beings. Human beings have lost their control over technology so that the good ideas of technology as the servant of human life is now turned against human life. David Thomasma explained this situation by saying, "*the promising child of science has grown into a terrible teenager.*"[153]

The Warnock Commission's decision regarding the embryo is a clear example of a legal threat on human life. Human life is regarded merely as a tool for research without considering the intrinsic value of this human life. Human life has finality in itself and is not meant for any other finality. The decision of the Warnock Committee means that the embryo before it is 14 days-old can be destroyed, modified, frozen and so on according to the necessity of the researchers. In their recommendation No. 11.15, the commission gave as the reason why research using human embryos is permitted is because the benefit which arises from this research is greater than the value of the embryo[154].

One of the last controversial threats of technologies over human life is cloning human beings. In what some scientists call euphemistically therapeutic cloning, human life is regarded merely as a tool for research and a tool for obtaining some medicines for incurable diseases or as a better understanding about the structures of the human embryo. As we have seen in the previous chapter (I.D.6 and 7) in cloning to create therapeutic means, the life of the embryo is destroyed in order to harvest its stem cells.

Briefly, because of the intrinsic value of human life, individual persons have to be protected because they enjoy uniqueness and specialness that is in itself deserving of protection[155].

---

[153] David C. Thomasma, *Human Life in the Balance*, p. 57

[154] Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, p. 62

[155] Steven Malby, "Human Dignity and Human Reproductive Cloning", in *Health and Human Rights*, 6(2002) 109

3. Dignity of Human Life

The dignity of human life is a very important theme in many discussions of humanities especially in relation to the protection of human life. In the bioethical discussions, the theme of the dignity of human life is even more important because it is related to the core of bioethics it self as the ethic (*ethos*) of life (*bios*)[156] in which is discussed the life and death of human beings. The reason why some important international communities such as the United Nations and the Council of Europe have banned human cloning is because it is contrary to human dignity[157].

Unfortunately, although the dignity of human life is used frequently in many important issues such as in banning slavery, sex exploitation, cloning, and so on, there is lack of adequate philosophical reflection so that the use of this important notion is irritating and inflationary[158]. This fact is not without its reasons. It is difficult to make definitions about human dignity; the reality is much more easily grasped when there is a lack or violation of human dignity[159]. In other

---

[156] When the word bioethics was coined by Van Rensselaer Potter in 1971, he wanted to promote a new discipline whose bases were biological knowledge and human values. He insisted that the two parts – which usually has no relation – should be built a bridge so that they could communicate each other in order to achieve wisdom. This wisdom is very important for the survival of the universe because in the age of specialization, there is dangerous tendency to lost contact of each other so that one thinks and acts for his/herself. This bridge can unite human values (ethical values) and biological knowledge (biological fact) because the wisdom demands that the ethical values can not be separated from biological fact. Van Rensselaer Potter, *Bioethics: Bridge to the Future*, Prentice-Hall, Inc, Englewood Cliffs, 1971, pp. 1- 3

[157] See for examples: The Universal Declaration on the Human Genome and Human Rights (1997) by the UN; The Council of Europe Additional Protocol to the Convention for the Protection of Human Rights and Dignity of the Human Being with Regard to the Application of Biology and Medicine (1998) by the Council of Europe. Steven Malby, "Human Dignity and Human Reproductive Cloning", in *Health and Human Rights*, 6(2002) 103

[158] Dieter Birnbacher, "Ambiguities in the concept of Menschenwürde", in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, pp. 107 – 108; Thomas Petermann, "Human dignity and Genetic Tests", in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, p. 124

[159] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. 15; Eberhard

words, the violation of human dignity is much more readily understood than the attempt to define the dignity of the human being itself[160].

Here we will see how the dignity of human life plays an important role in bioethical decisions and especially why cloning of human being is contrary to the dignity of human life.

a. Terminology and Meaning of the Dignity of Human Life

The word dignity comes from the Latin word *dignitas* which means worth, worthiness, merit[161]. The original usages of the word *dignitas* referred especially to that aspect of virtue or excellence that made one worthy of honor. Dignity, then, referred both to a kind of deserving and to something deserved. In the Middle Ages, the word dignity was closely related to an undemocratic idea because it was closely related to noble or aristocratic persons in a society. So it was not applied to all people because only a number of persons - nobles and aristocrat – had this dignity[162].

Among the many meanings of the word 'dignity', the American Heritage Dictionary[163] gives the definition as follows: 1. *the quality or state of being worthy of esteem or respect.* 2. *inherent nobility and worth.* The Random House Webster's Electronic Dictionary and Thesaurus[164] gives the definition as follows: 1. *bearing, conduct, or*

Schockenhoff, *Etica della Vita: Un Compendio Teologico*, Queriniana, Brescia, 1997,p. 182

160 Linda Hogan and John D'Arcy May, "Costruire l'Umano: La Dignità nel Dialogo Interreligioso" in *Concilium, Rivista Internazionale di Teologia*, XXXIX, 2 (2003) 299 – 300; Enrique Dussel, "Dignità: Negazione e Riconoscimento in un Contesto Concreto di Liberazione", in *Concilium, Rivista Internazionale di Teologia*, XXXIX, 2 (2003) 257 – 258; Kurt Bayerts, "Introduction", in in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, p. xix

161 D. P. Simpson, *Cassell's New Latin – English, English – Latin Dictionary*, Cassell, London, 1959

162 Susan M. Shell, "Kant on Human Dignity", in Robert P. Kraynak and Glenn Tinder (eds.), *In Defense of Human Dignity: Essays for Our Times*, University of Notre Dame Press, Notre Dame, 2003, p. 53; Leon R. Kass, *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics*, Encounter Book, San Francisco, 2002, p. 246

163 The American Heritage Dictionary (3rd Edition), Infosoft International Inc., 1994 (CD ROM edition)

164 The Random House Webster's Electronic Dictionary and Thesaurus, College Edition, Reference Software International, 1992 (CD ROM Edition)

manner indicative of self-respect, formality, or gravity. 2. *nobility or elevation of character; worthiness.* The second definition of the American Heritage Dictionary gives the suitable meaning in relation to the dignity of human life. So the dignity of human life means the inherent nobility and worth of the life or inherent value-property of the life of human beings[165]. It is the sublime value of human life that does not depend on like or dislike or subjectivity, but it exists universally in all human beings as long as a human being is a human being.

To arrive at the modern meaning, the concept of the word dignity underwent an evolution of meaning. Cicero, (106 - 43 B.C.) a Roman statesman, orator, and writer, coined the term dignity of human beings and gave a special meaning that was different from the common Greek virtues[166]. According to Cicero, the dignity of a human being lies in the act that conforms to the duty (obligation)[167].

In ancient Rome, the word *dignitas* meant the things that were obligations for a dignitary in relation with others in propriety of conduct, manners, or appearance. A dignitary had to respect his rank and maintain his appearances. As the recompense for his deeds, he had the right to a particular respect[168].

Giovanni Pico della Mirandolla[169] (1463 – 1494) was one of the most brilliant thinkers of the great Renaissance families. In his famous

---

[165] J. Seifert, "The right to Life and the Fourfold root of human dignity", in Pontificia Academia Pro Vita, *The Nature and the Dignity of the Human Person as the Foundation of the Right to Life: The Challenger of the Contemporary Cultural Context*, Libreria Editrice Vaticana, Vatican, 2003, p. 194. 197

[166] Oskar Negt, "L'irripetibile: trasformazioni nel concetto culturale di dignità", in *Concilium, Rivista Internazionale di Teologia*, XXXIX, 2 (2003) 230

[167] Oskar Negt, "L'irripetibile: trasformazioni nel concetto culturale di dignità", p. 233

[168] Patrick Verspieren, "La Dignità nei Dibattiti Politici e Bioetica" in *Concilium Rivista Internazionale di Teologia*, 2(2003) 224

[169] Pico was a son of the princely house of Mirandola. He studied at Bologna and wondered through the Italian and French universities. He was immensely erudite and proficient in Greek, Latin, Hebrew, Chaldee, and Arabic. He synthesized and reconciled Hebrew, classical, and Christian tradition. When he was only 24 years old (in 1486) he challenged the doctors of the schools in Rome to dispute with him on nine hundred grave questions. The disputation did not take place because it was suspended by Pope Innocent VIII and the pope appointed a commission to examine the theses and some of the theses were condemned. Among his nine hundred theses which was widely read nowadays is the brief discourse. "The Dignity of Man" which was regarded as the manifesto of humanism. Actually, Pico discussed the human dignity only in the first part of his discourse. Russell Kirk, "Introduction"

book "Oration on the Dignity of man"[170], Pico said that a human being was the most fortunate of living things and deserving of all admiration which surpasses even all the astral and very intelligent beings which dwell beyond the confines of the world[171]. This highest dignity was shown in the creation of human beings. When the Creator created the universe, he created all wonderful things in the world and gave some of the creatures an intelligent and immortal soul but he did not find the creature which might be moved with love at its beauty and smitten with awe at its grandeur. The Creator wanted to create such a being and He bethought himself to bring forth man and gave the man everything He had created[172]. Unlike the other creatures which were defined and restricted within laws, the Creator gave the human being free will to shape his own being and fashion his own life in the form that he would prefer. This freedom was ultimately guided by theoretical knowledge without which that freedom would be worthless. The important point of freedom according to Mirandola was that man himself could choose what he willed to be[173].

Thomas Hobbes (1588 – 1679) gave a different meaning to the word dignity. The dignity of human beings was related to power and dominion. According to Hobbes, dignity is the public value that the state gives to a person. So, according to Hobbes' opinion, those who did not have the power lacked appreciation and dignity. This opinion has to be understood in the Hobbes' framework of his famous philosophy of the natural state of people which is a *bellum omnium contra omnes*. In this chaotic situation, one person will become the wolf for the others (*homo homini lupus*) so that the survival of the person lies in the power and dominion of that person over the others. In such a natural state of people, those powers of the person have to be taken away and given to the state to guarantee the peace. In turn, the

---

in Giovanni Pico della Mirandola, *Oration on the Dignity of Man*, Regnery Publishing, Inc., Washington, D.C., 1999, p. vii – xiii

[170] The book was published for the first time in 1496. I use the English translation of this book, Giovanni Pico della Mirandola, *Oration on the Dignity of Man*, Regnery Publishing, Inc., Washington, D.C., 1999

[171] Giovanni Pico della Mirandola, *Oration on the Dignity of Man*, p. 4

[172] Giovanni Pico della Mirandola, *Oration on the Dignity of Man*, pp. 5 – 7

[173] Giovanni Pico della Mirandola, *Oration on the Dignity of Man*, pp. 7 – 8

state gives it back to some people to govern the people. In Hobbes point of view, this is the dignity of the people[174].

Many modern thinkers formulated the dignity of human life in the following elements: reason, freedom, and autonomy[175]. Unlike in ancient times when the dignity was applied to a limited number of persons or a particular people (dignitary people), the modern understanding of the dignity of human beings is applied to all human beings. This formulation is based on the thoughts of the following philosophers:

Some philosophers such as Francis Bacon (1561 – 1626), René Descartes (1596 – 1650), Blaise Pascal (1623 – 1662), and John Stuart Mill (1806 – 1873) stressed the ability to think and consciousness as the basis for human dignity. They affirmed that the reason (mind) is the most characteristic feature of human race which separates human beings from others creatures. In this case, the reason was no longer connected closely to the possession of knowledge of the goal and purpose of human existence but it was connected to the capacity to understand, decode, and dominate the nature.

Jean Jacques Rousseau (1712 – 1778) put a different accent on human dignity. His famous words are that a human being has "the faculty of improvement"[176]. With these words, he wanted to explain that this is the faculty which distinguished human beings from animal. Unlike other living creatures which have a fixed (certain) way of life, nature (and God) does not provide a human being a fixed way of life that has to be followed. In front of human beings, there are many choices that can be chosen freely. The free choices that a human being makes have the capacity to change, to improve, and to search for a new way of life. In this way, human beings experience an unending progress toward perfection.

In the western philosophical tradition, the most high-minded attempt to explore the universality of human dignity was made by

---

[174] Oskar Negt, "L'irripetibile: trasformazioni nel concetto culturale di dignità", pp. 234 – 235

[175] Kurt Bayertz, "Human Dignity: Philosophical Origin and Scientific Erosion of an Idea" in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, pp. 74 – 77

[176] Jean Jacques Rousseau, *Discourse of Equality*, as cited by Kurtz Bayertz, "Human Dignity: Philosophical Origin and Scientific Erosion of an Idea", p. 74

Immanuel Kant (1724 – 1804)[177]. This approach was new because before Kant, dignity was not applied to all human beings[178]. Kant made extensive discourses about human dignity whose central doctrine is the respect of a human being as a person who is the subject of morally practical reason[179]. The human being is exalted neither by nature nor by God but by autonomy, or subjection to self-made law, as announced and certified by conscience. So all persons are deserving of respect not because of their achievements that they had made (like in the Middle ages), but because of a universally shared participation in morality and the ability to live under the moral law[180]. Kant insisted that the dignity of a human person is not an external or additional element in human life but it is the absolute inner worth of a human being because a human being is regarded as a person and is exalted above any price[181]. Kant made a distinction between external value and intrinsic value. The external value is the worth of something in relation to something else. It is roughly the same as price or value in exchange. All things have value only in the relation to the other. A human being, on the contrary, has value in himself (intrinsic value) and an end in himself. All living beings have price but only human beings have dignity[182]. That is the reason why the one who possesses dignity (human being) "*is not to be*

---

[177] Leon R. Kass (Chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. 16; Martin Haeler and Dietrich Ritschl, "The General Notion of Human Dignity and the Specific Arguments in Medical Ethics", in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, p. 98

[178] Susan M. Shell, "Kant on Human Dignity", in Robert P. Kraynak and Glenn Tinder (eds.), *In Defense of Human Dignity: Essays for Our Times*, University of Notre Dame Press, Notre Dame, 2003, p. 54

[179] Immanuel Kant, *The Metaphysics of Morals*, Cambridge University Press, Cambridge, 2003, p.186

[180] Immanuel Kant, *Fondazione della Metafisica dei Costumi*, Edizione Bompiani, Milano, 2003, pp. 173, p. 161

[181] Immanuel Kant, *The Metaphysics of Morals*, Cambridge University Press, Cambridge, 2003, p. 186; Immanuel Kant, *Groundwork for the Metaphysics of Morals*, Yale University Press, New Haven, 2002, p. 52; Immanuel Kant, *Fondazione della Metafisica dei Costumi*, Edizione Bompiani, Milano, 2003, pp. 173, p. 159

[182] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, p. 52; Immanuel Kant, *Fondazione della Metafisica dei Costumi*, Edizione Bompiani, Milano, 2003, pp. 173, pp. 157 – 159; Immanuel Kant, *The Metaphysics of Morals*, p. 186

valued merely as a means to the ends of others or even to his own ends, but as an end in himself."[183]

Like other philosophers, Kant agreed that a human being is a rational being who exists as an end in himself[184]. As a rational being, a human being has the ability to examine the various beliefs, goals, intentions, acts, etc. that a human being holds and to see whether it is worth holding or to change them. In order to exercise this ability, a human being has to have standards by which to evaluate them. What Kant meant about rationality, went beyond mere intelligence. Intelligence is the ability to produce beliefs and actions that are appropriate with circumstances. In this case, animals have these capacities because if animals are hungry, they have the capacity to produce the acts that move them to look for something to eat. But a human being as a rational being, goes further than this. A human being has the ability to evaluate, to compare, to re-examine his beliefs and acts so that he can be accepted or rejected in order to be suitable to the new considerations. This capacity even goes further than that because a human being as a rational being has the capacity to evaluate and re-examine the basis itself so that it can be changed or re-accepted according to the new considerations[185]. For Kant, rationality is a fundamental element of human dignity because without rationality, a being is unable to be an end in itself, cannot be conscious of its existence, and can not self-reflect.

Regarding freedom, Kant held that freedom is the independence from being constrained by another's choice and it is the only original right belonging to every man by virtue of his humanity[186]. For Kant, freedom is the ground or reason without which there would not be a moral law, while the awareness of moral law (conscience) is the ground or reason to recognize that a human being is free[187]. So "by default" a human being is a free being who can use his rationality to refuse or to accept the incoming impulses. Only the acts which are done with free will can be classified as the moral acts. Precisely this is one element of the dignity of human beings because only human beings are moral agents. It is human freedom which indicates and guarantees the

---

[183] Immanuel Kant, *The Metaphysics of Morals*, p. 186
[184] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, p. 46
[185] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, pp. 44 – 45
[186] Immanuel Kant, *The Metaphysics of Morals*, p. 30
[187] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, p. 64

prominent and elevated status of human beings. This freedom ought to be used in the best way possible by following the moral law.

Kant discussed extensively human autonomy in relation to the autonomy of the will. The autonomy of the will is the property of the will which is not solely subject to the law, but subject in such a way that it must be regarded as legislating to itself[188]. According to Kant, autonomy of the will is the property of the will itself so that it becomes the law for itself[189] and the unique (sole) and supreme principle of morality[190]. Only by virtue of autonomy can the practical necessity – that characterizes the moral law's categorical command – be reconciled with freedom to obey to which the moral law also immediately testifies. The principle of autonomy is to make the choice whose maxims conform to the universal law[191]. Certainly, in order to choose correctly, one needs rationality and freedom without which one can not act autonomously. Kant said that autonomy is the ground of the dignity of human nature and of every rational nature[192].

Briefly, Kant asserted that the elements of rationality, freedom and autonomy of human beings are closely interrelated to each other and that together they all together form the dignity of human beings. All of them are regarded as element of the basic human dignity that cannot be taken away from human beings because they exist intrinsically in human beings as long as human beings are human beings.

b. Dignity of Human Life According to the Catholic Church

Although the bioethical discussion on human dignity is relatively new, the Church's teaching on human dignity is not a new one. It is rooted deeply in biblical passages, both in the Old Testament and the New Testament. Among the many teachings on human dignity available in the world, the Christian teaching is the loftiest. We will see

---

[188] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, p. 49; Immanuel Kant, *Fondazione della Metafisica dei Costumi*, p. 171

[189] Immanuel Kant, *Fondazione della Metafisica dei Costumi*, p. 171; Immanuel Kant, *Groundwork for the Metaphysics of Morals*, p. 49

[190] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, p. 58; Immanuel Kant, *Fondazione della Metafisica dei Costumi*, pp. 173

[191] Immanuel Kant, *Fondazione della Metafisica dei Costumi*, p. 171

[192] Immanuel Kant, *Fondazione della Metafisica dei Costumi*, p. 161; Immanuel Kant, *Groundwork of the Metaphysic of Morals*, p. 103

that the Christian teaching is revolutionary because there is no such teaching in the time of Jesus and even after Jesus.

The environment where Jesus grew up was Hellenistic and Judaic. Aristotle said, "*man is not the best thing in the world*"[193] because the heavenly body is more perfect. Judaism – as the predecessor of Christianity – has the same roots with Christian teaching on human dignity. For Judaism, the human being is exalted above any other creatures because the human being is the peak of creation of the universe and, above all, he was created in the image and likeness of God. There are three passages of the Hebrew Bible that explain this status: "*Then God said, Let us make humankind in our image, according to our likeness... So God created humankind in his image, in the image of God he created them.*"[194] The second passage draws a parallel between God's creation and Adam's procreation, "*When Adam had lived one hundred thirty years, he became the father of a son in his likeness, according to his image, and named him Seth.*"[195] The third passage is the covenant between God and Noah after the flood. "*Whoever sheds the blood of a human, by a human shall that person's blood be shed; for in his own image God made humankind.*"[196]

Without negating the Jewish teaching on human dignity, the Christian teaching on human dignity goes further. The human being is not only the peak of creation and the image and likeness of God but also is exalted with the incarnation and redemption of Christ. Christ who is the Son of God and the perfect image of God[197] lowered his divine nature and took the form of a human body[198] but in so doing raised human nature by offering the hope of salvation to human beings. By the merit of Christ's redemption the human being becomes the God's adopted son[199]. This high level of teaching on human dignity was a revolutionary because such a doctrine had never been taught

---

[193] Aristotle, *Nicomachean Ethics*, VI. 1141.a.21. Jonathan Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation*, vol. II, Princeton University Press, Princeton, 1998, p. 1801

[194] Genesis 1: 26 – 27. All of the biblical citations are taken from *Holy Bible New Revised Standard Version*, Catholic Edition, Geoffrey Chapman, London, 1993 (with imprimatur).

[195] Genesis 5: 3

[196] Genesis 7: 6

[197] Colossians 1.15

[198] Philippians 2: 6 – 8

[199] Galatians 3: 26

before[200]. Christ reveals that the dignity of human being is connected not only to the origin of human life which is from God and is created in the image and likeness of God but also its destiny of fellowship with God in knowledge and love of him (redemption).

One of the prominent modern teachings of the Church regarding human dignity is the Encyclical *Evangelium Vitae* (The Gospel of Life) which is also called the Gospel of the dignity of the person. "*The Gospel of God's love for man, the Gospel of the dignity of the person and the Gospel of life are a single and indivisible Gospel.*"[201]. The core of the Gospel itself is eternal life[202] which was expressed right in the first sentence of this encyclical, "*The Gospel of life is at the heart of Jesus' message.*"[203] In other words, since the gospel of life and the Gospel of the dignity of the person are an indivisible Gospel, and the core of Jesus' message is the Gospel of life, so the core of Jesus' message is also the Gospel of the dignity of the human person.

The Encyclical *Evangelium Vitae* summarized the Catholic teaching on the dignity of the human being by saying: "*Man has been given a sublime dignity, based on the intimate bond which unites him to his Creator: in man there shines forth a reflection of God himself.*"[204]

The encyclical goes further and says, "*The dignity of this life is linked not only to its beginning, to the fact that it comes from God, but also to its final end, to its destiny of fellowship with God in knowledge and love of him.*"[205]

The above statements are the summary of the Catholic teaching on the dignity of the human person. Its roots are found right in the creation of the world in the book of Genesis. According to the book of Genesis, the whole universe was created step by step and arrived at its culmination in the creation of human beings. The culmination of the

---

[200] Robert P. Kraynak, "Made in the Image of God: The Christian View of Human Dignity and Political Order", in Robert P. Kraynak and Glenn Tinder (eds.), *In Defense of Human Dignity: Essays for Our Times*, University of Notre Dame Press, Notre Dame, 2003, p. 81

[201] *Evangelium Vitae* (E.V.) no. 2. All of citations of *Evangelium Vitae* are taken from a Vatican translation *Encyclical Letter The Gospel of Life Evangelium Vitae*, St. Paul Books & Media, Boston, 1999

[202] Jean Laffitte, "Evangelium Vitae: Aspects Théologiques et Doctrinaux", in *Nouvelle Revue Théologique* 117(1995) 822

[203] *Evangelium Vitae* no. 1

[204] *Evangelium Vitae* no. 34

[205] *Evangelium Vitae* no. 38

creation of human beings is demonstrated by a special phrase in the words of God '*let us make*' which do not exist in the other acts of God in creation. According to Claus Westermann – one of the leading exegetes from Heidelberg – the phrase '*let us make*' indicate a solemn act and a deliberate decision of God[206]. God said, "*Let us make human kind in our image, according to our likeness*[207]*; ... So God created humankind in his image, in the image of God he created them; male and female he created them.*"[208]. After the creation of human beings "*God blessed them, and God said to them, 'Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth.*"[209]

Evangelium Vitae emphasized that the deliberate decision of God to create human beings is a clear sign that human beings are different from the rest of the creatures[210]. These differences are in some intrinsic qualities (dignity) of human beings. First of all, the life of human beings comes from God and is created by God in the image and likeness of God and surpasses above all other creatures. The life of a human being "*is the manifestation of God in the world, a sign of his presence, a trace of his Glory.*"[211] *Evangelium Vitae* summarized these facts by saying, "*Life is always a good.*"[212]

It is important to note that the human status as being made in the image and likeness of God was not only when the human being was created but also for the rest of his life. The whole of the life of a human being bears permanently the internal imprint of this image and likeness. This image and likeness arrives at its fullness in Jesus because only

---

[206] Claus Westermann, *Genesi: Commentario*, Piemme, Casale Monferrato, 1989, p. 25

[207] The Hebrew word of image is *selem* and likeness is *demût*. *Selem* means statue or something that extremely similar to the reality that is represented. *Demût* is an abstract concept that indicates a more fluid likeness, less precise and less direct. So in this case, human being is a creature that is very similar to God but at the same time also is not fully identical to God. Gian Franco Ravasi, *Il Libro della Genesi/1*, EDB, Bologna, 1988, p. 114

[208] Genesis 1, 26 – 27.

[209] Genesis 1, 28

[210] *Evangelium Vitae* no. 34

[211] *Evangelium Vitae* no. 34

[212] *Evangelium Vitae* no. 34

Jesus is the true image of the invisible God[213]. "*He is the image of the invisible God, the firstborn of all creation.*"[214] The incarnation of Jesus – who is the Word become flesh (John 1, 14) – is the reaffirmation of the dignity of human life. Life in the world received a new perspective and meaning because God manifested himself in the form of flesh. He experienced the life of a human being with all of its joys and its hopes, grief and anxiety so that the glory of God would be manifested in the life of a human being[215].

With the phrase the image and likeness of God, the book of Genesis wants to underline that a human being has an intimate bond which unites him to his Creator so that in a human being there shines forth a reflection of God himself[216]. The human being also has the intrinsic quality to make relationship with God and God can dialog (to speak to and listen to) with him. Since his creation, human being entered immediately to the relation with God. God gives him the dignity of dialogue partner with God and makes him a human person[217]. It means that the particularity of human being as the image of God has to be found in this special relationship to God.

The faculties for making relationship with God are "*those spiritual faculties which are distinctively human such as reason, discernment between good and evil, and free will.*"[218] A human being has reason to understand good and evil in order to do good actions and take personal responsibility for his actions. The Second Vatican Council's declaration *Dignitatis Humanae*, underlined this element of human dignity "*It is in accordance with their dignity as persons—that is, beings endowed with reason and free will and therefore privileged to bear personal responsibility.*"[219]

The faculty that a person has to make relationship with God is an indispensable aspect of human life which enable him to arrive at its the

---

[213] Dionigi Tettamanzi, *Nuova Bioetica Cristiana,* Piemme, Casale Monferato, 2000, p. 39

[214] Colossians 1.15

[215] Regis Duffy and Angelus Gambatese, *Made in God's Immage: The Catholic Vision of Human Dignity*, Paulist Press, Mahwah, 1999, pp. 13 - 14

[216] cf. *Evangelium Vitae* no. 34

[217] Eberhard Schockenhoff, *Natural Law & Human Dignity: Universal Ethics in an Historical World*, The Catholic University of America Press, Washington D. C., 2003, p. 229

[218] *Evangelium Vitae* no. 34

[219] *Dignitatis Humanae* no. 2

final destiny of his life because human life is destined for the loving union with God and not the destruction or the evil[220]. Christ's redemption of the world carried out this loving union with God and made it possible that a human person could have a true union with God. With Christ's redemption, the human being is elevated even higher to the status of a redeemed person which underlines the incomparable value of the human being. "*This saving event reveals to humanity not only the boundless love of God who 'so loved the world that he gave his only Son' (Jn 3:16), but also the incomparable value of every human person.*"[221]

The common final destination of human beings is the basis for the equal dignity of human beings[222]. The equal dignity of human life leaves no room for any kind of human exploitation in any of the stages of life whether a human being is at the beginning of his life or at the end of his life[223]. Human life must be absolutely respected and protected from the moment of conception until its natural end because the life which parents transmit to their children has its origins in God and is part of God's plan. Therefore, there is no single moment of this marvelous process of the unfolding of life which can be separated from the wise and loving work of the Creator, and left prey to human caprice[224].

The dignity of human being is inherent (intrinsic) to the nature of human beings. It is not added by any institution or people. It has nothing to do with the person's achievements or works. It is united inseparably with human existence. So as long as a human being is a human being, he has this incomparable dignity. In his previous encyclicals *Centesimus Annus*, in which Pope John Paul II discussed human being as workers, he said, "*God has imprinted his own image and likeness on man (cf. Gen 1:26), conferring upon him an incomparable dignity, as the encyclical frequently insists. In effect, beyond the rights which man acquires by his own work, there exist rights which do not correspond to any work he performs, but which flow from his essential dignity as a person.*"[225]

---

[220] *Evangelium Vitae* no. *7 – 8*
[221] *Evangelium Vitae* no. *2*
[222] *Evangelium Vitae* no. *8*
[223] *Evangelium Vitae* no. *3; Gaudium et Spes*, no. *27; Donum Vitae* no. *5*
[224] *Evangelium Vitae* no. *44*
[225] *Centesimus Annus* no. *11*

Since the dignity of a human being is an intrinsic dignity which last as long as the life of the human being, therefore respect for the dignity of the human being applies during the life time of the human being. It means that the exploitation of human being such as slavery and manipulation of life is against human dignity. "*Freedom from slavery meant the gift of an identity, the recognition of an indestructible dignity and the beginning of a new history in which the discovery of God and discovery of self go hand in hand.*"[226]

Advanced age with the diminishment of human abilities does not diminish human dignity. Old age is characterized by dignity and is meant to be surrounded with reverence[227] so that there is no reason for an elderly person to give up his life until the day of God's call to his loving eternity. "*Man is not the master of life, nor is he the master of death. In life and in death, he has to entrust himself completely to the 'good pleasure of the Most High,' to his loving plan.*"[228]

Unfortunately, the crimes against human dignity such as killing and suicide occur often and everywhere. These crimes are against human dignity which unites all people in one great family because of the equality of dignity among people. "*Like the first fratricide, every murder is a violation of the 'spiritual' kinship uniting mankind in one great family, in which all share the same fundamental good: equal personal dignity.*"[229] But it is interesting to note that those criminals (the murderers) do not lose their dignity. "*Not even a murderer loses his personal dignity, and God himself pledges to guarantee this.*"[230] Although God punishes them, He is always merciful to them by offering them pardon and reconciliation so that there is no reason to take the life of the criminals (death penality).

Regarding freedom, *Evangelium Vitae* underlined that this freedom of human beings is a human prerogative because only human beings have the freedom which enable them to know and to love God, the Creator whose image is imprinted in him[231]. This freedom is implanted right in the core of human life so that the two of them are connected inseparably.

---

[226] *Evangelium Vitae* no. *31*
[227] *Evangelium Vitae* no. *46*
[228] *Evangelium Vitae* no. 46
[229] *Evangelium Vitae* no. 8
[230] *Evangelium Vitae* no. 9
[231] *Evangelium Vitae* no. 34

> *These [life and freedom] are inseparable goods: where one is violated, the other also ends up being violated. There is no true freedom where life is not welcomed and loved; and there is no fullness of life except in freedom. Both realities have something inherent and specific which links them inextricably: the vocation to love. Love, as a sincere gift of self, is what gives the life and freedom of the person their truest meaning*[232].

The freedom that a human being has in the core of his existence is a great gift of God which also has an inherent relational dimension. A person has to exercise his freedom in relation to other people in such a way that it does not destroy the life of other human beings. There will never be a legitimate violation against life in the name of freedom. If there is this kind of violation, it is not a true freedom but it is a completely individualistic freedom which contradicts the dignity of human life and leads to the freedom of the strong against the weak[233].

The other essential element of freedom is its close connection to the truth. Freedom must serve the end of truth and conscience must submit to the objective order of the natural moral law, where natural law commands the love of God and respect for the dignity of the human person[234]. If freedom does not respect the truth, it becomes a factor leading to the destruction of others. It will even destroy the freedom itself[235] because the truth enlightens man's intelligence and shapes his freedom, leading him to know and to love the Lord[236]. In public life, the relation between freedom and truth is even more important. "*when freedom is detached from objective truth it becomes impossible to establish personal rights on a firm rational basis; and the ground is laid for society to be at the mercy of the unrestrained will of individuals or the oppressive totalitarianism of public authority.*"[237]

Another important element of human dignity is the duty toward the universe. God gives human beings the task of dominating the universe. According to Claus Westermann, the word "dominion" in Genesis 1, 28 has no meaning of exploitation at all but – according to

---

[232] *Evangelium Vitae* no. 96
[233] *Evangelium Vitae* no. 19
[234] cf. *Veritatis Splendor* no. 60. All of citations of *Veritatis Splendor* are taken from a Vatican translation *Encyclical Letter of John Paul II The Splendor of the Truth Veritatis Splendor*, St. Paul Books & Media, Boston, 1996
[235] *Evangelium Vitae* no. 19
[236] *Veritatis Splendor* no. 1.
[237] *Evangelium Vitae* no. 126

the ancient understanding - it was used to indicate the dominion of the king in which the king took responsibility personally for the prosperity and welfare of his people. So the king's dominion has to serve for the common good and the well being of those over whom the king has dominion. So in this case, when human beings exercise dominion over the universe – which is represented by fish, birds, and the living things that move upon the earth – it means that they take responsibility personally for the well-being of the universe[238].

c. Dignity of Human Life in the Secular Context

In the secular context, the concept of human dignity is one of the fundamental philosophical innovations of the Renaissance although it was not a completely new idea. It had roots in ancient philosophy and Christian theology and it was reformulated with the new vision of human self-understanding which was to become fundamental to the modern age[239].

The ancient philosophy which contributed significantly to the understanding of human dignity was Stoic philosophy[240]. According to this philosophy, the whole cosmos is penetrated by the *logos* which is the reason and the rationality of God. Everything is interconnected with all the rest and it is guided and interpreted by the *logos*. Because of this interconnectivity, wise men have to live in accordance with nature (*physis)*[241]. According to Stoic philosophy, human dignity and the laws

---

[238] Claus Westermann, *Genesi: Commentario,* Piemme, Casale Monferrato, 1989, p. 25

[239] Kurt Bayertz, "Human Dignity: Philosophical Origin and Scientific Erosion of an Idea" in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity,* Kluwer Academic Publisher, Dordrecht, 1996, p. 73; James S. Dalton, "Human Dignity, Human Rights, and Ecology: Christian, Buddhist, and Native American Perspectives", in Regis Duffy, Angelus Gambatese, *Made in God's Immage: The Catholic Vision of Human Dignity*, Paulist Press, Mahwah, 1999, pp. 32 – 33

[240] Stoic philosophy was founded by Zeno. He was born in Cizio in the island of Cyprus ca. 336 B.C. and died in 264 B.C. He moved to Athena in 314 B.C. He was the disciple of Cratete. When he was 42 years old, he started to teach and his thoughts was named Zenonians but latter on it was name Stoic because it was the traditional custom to name a school of thought according to the place where it was founded. Jean Brun, *Lo Stoicismo,* Xenia Edizioni, Milano, 1998, pp. 7 – 10

[241] Martin Hailer and Dietrich Ritschl, "The General Notion of Human Dignity and The Specific Arguments in Medical Ethics", in Kurt Bayertz (ed.), *Sanctity of Life*

of nature have the same source and must be respected in the same way. We must respect human dignity because each one of us is penetrated by the same *logos* and is interconnected with the same logos. So this Stoic philosophy was the first philosophical school in antiquity which favored a general notion of humanity and humanism. Even Seneca (circa 4 B.C. - A.D. 65), a roman Stoic philosopher and dramatist, affirmed that *homo est sacra res homini*, which led to demand the abolition of slavery[242].

The Renaissance changes were logical developments of the new idea about human self-understanding which is fundamental for the modern age. The new idea about human self-understanding sprang up because of a new understanding of earthly life. For centuries – especially in the mediaeval ideology – the earth and earthly life were only a trial run for eternal life. Earth was seen as a miserable place in preparation for the hope of entering joyful place, namely heaven. So the value of human earthly life was only a transitional value. The Renaissance rebelled at this idea and stressed that a human being has an important value in this earthly life. During the Renaissance period, they emphasized that human earthly life had a dignity that could not be abolished and mistreated. Human life on earth had a value independent of the value which is derived from a God-human relationship. The concept of dignity was designed to give a new self-awareness and self-confidence to human beings in order to improve the condition of the world and to assume the control of human fate[243].

There were many changes in social structures in the modern age: uniformity of values and hierarchical social structures had been replaced by a functional and complex society which nurtured great possibilities for the role of individuals and groups. The traditional concept of honor in which some people were honored based on their "blue blood" or position in the society, or master – slave relationship, was now being replaced by the concept of the dignity of human beings which is attributable to all human beings because all human beings have equal intrinsic values. Strictly speaking, the dignity of human life

---

and Human Dignity, Kluwer Academic Publisher, Dordrecht, 1996, pp. 95. Jean Brun, *Lo Stoicismo*, Xenia Edizioni, Milano, 1998, p. 9

[242] Martin Hailer and Dietrich Ritschl, "The General Notion of Human Dignity and The Specific Arguments in Medical Ethics", pp. 95 – 96

[243] Kurt Bayertz, "Human Dignity: Philosophical Origin and Scientific Erosion of an Idea" in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, p. 74

is closely related to the intrinsic value of a human being. No wonder that the growing awareness of the value of human life in the last century, has help society to make even greater progress in the awareness of human dignity.

In the last century, the notion of human dignity has played an important role in many international and national declarations, especially after the Second World War. There are some international institutions which have declared that human beings have an inherent dignity which become the basis of freedom, justice and peace. See for example: The Preamble of the Universal Declaration of Human Rights which was approved by the General Meeting of the United Nations on 10th December 1948; The United Nations Covenant on Civil and Political Rights which was approved in 1966; The European Convention on Human Rights which was adopted by the Council of Europe on 1950.[244]

In the post war constitutions of some countries such as Germany, France, Italy, Sweden and others, the theme of human dignity was invoked firstly to limit the intervention of the state toward individuals and to guarantee that human beings would be treated as subject and not objects so that the violation of human dignity would never be repeated in the future[245]. The practices of slavery in the last century and the horrors of the concentration camps during the Second World War were direct violations of human dignity. In these cases, the main goal of guaranteeing human dignity was not the protection of human beings as a whole - which carries the implication that individuals can be sacrificed for the sake of the whole – but on the

---

[244] Noëlle Lenoir, "Respect for Life and the Law of the Living", in Denis Noble, Jean-Didier Vincent, *The Ethics of Life*, Unesco Publishing, Paris, 1997, p. 174; Martin Hailer and Dietrich Ritschl, "The General Notion of Human Dignity and The Specific Arguments in Medical Ethics", in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, pp. 99 – 102

[245] Kurt Bayertz, "Human Dignity: Philosophical Origin and Scientific Erosion of an Idea" in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, p. 79 – 80; Martin Hailer and Dietrich Ritschl, "The General Notion of Human Dignity and The Specific Arguments in Medical Ethics", in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, pp. 91 – 92; Patrick Verspieren, "La Dignità nei Dibattiti Politici e Bioetica" in *Concilium Rivista Internazionale di Teologia*, 2(2003) 219 – 220; Eugene B. Brody, *Biomedical Technology and Human Rights*, Unesco Publishing, Paris, 1993, p. 23

contrary, its aim is to prevent individuals from being sacrificed for the sake of the whole[246].

In this frame of reference, it is understandable that since the 19th century, the dignity of human beings became a political tool for the European workers to ameliorate their social conditions. They strove for better salaries and for better working conditions in the name of the dignity of human beings which was manifested as the struggle for justice and the rights of the workers. In this way, the workers avoided being used as mere tools for production.

In these modern times of a pluralistic society in which there are so many value systems, religions and moral criteria, there is a growing awareness that human dignity could be the framework or platform on which could be built the common ground of ethical and juridical views because human dignity as a concept belongs to a pre-ethical or pre juridical or pre-political realm. The dignity of a human being – as we have seen before – is the value of the values from which emanates some others human values[247].

d. Dignity of Human Life in Bioethics

Among the many aspects of the dignity of human life, the principle of autonomy plays the most important role in bioethical discussions. The concept of autonomy in bioethics recognizes the human capacity for self-determination, and puts forward a principle that the autonomy of persons ought to be respected.

The primacy of the principle of autonomy in bioethics was clearly shown in the work of Tom L. Beauchamp and James F. Childress which had a very important role in shaping the newly born

---

[246] Kurt Bayertz, "Human Dignity: Philosophical Origin and Scientific Erosion of an Idea", p. 81; Noëlle Lenoir, "Respect for Life and the Law pf the Living", in Denis Noble, Jean-Didier Vincent, *The Ethics of Life*, Unesco Publishing, Paris, 1997, p. 173; Patrick Verspieren, "La Dignità nei Dibattiti Politici e Bioetica" in *Concilium Rivista Internazionale di Teologia*, 2(2003) 215 - 216

[247] Martin Hailer and Dietrich Ritschl, "The General Notion of Human Dignity and the Specific Arguments in Medical Ethics", in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, pp. 93 – 94; Patrick Verspieren, "La Dignità nei Dibattiti Politici e Bioetica" in *Concilium Rivista Internazionale di Teologia*, 2(2003) 217 – 218; Dietmar Mieth, *La Dittatura dei Geni: La Biotecnica tra Fattibilità e Dignità umana*, Queriniana, Brescia, 2003, p. 153

bioethics[248] especially in the English speaking countries. Some people regarded it as the main paradigm in bioethics[249] although James F. Childress denied it[250]. Tom L. Beauchamp and James F. Childress wrote a book entitled, *Principles of Biomedical Ethics*[251]. In their book, Beauchamp and Childress noted that the rapid development in biological sciences and in healthcare in the last few decades made the existing healthcare ethics often disappointing from the perspective contemporary biomedical ethics. Therefore, they felt the need to provide a new framework for moral judgment and decision making[252].

After examining the existing ethical theories such as utilitarianism, Kantianism, casuistry and so forth, Beauchamp and Childress came up with their principle-oriented medical ethics. In their theory, there is a hierarchical level of moral justification: At the bottom, one ought to act according to the moral rules; the moral rules are justified by reference to principles; and principles are grounded in ethical theory[253].

These principles are closely related to the dignity of human beings. These principles are respect for autonomy, nonmaleficence,

---

[248] The word bioethics was coined (invented) by Van Rensselaer Potter in his article, "Bioethics: The Science of Survival" in *Perspective in Biology and Medicine*, 14(1970) 120 – 153. Successively Potter wrote the first book which used the term bioethics for the first time: Van Rensselaer Potter. *Bioethics: Bridge to the Future*, Prentice-Hall, Englewood Cliff, 1971. This book was translated into many languages. The Italian Edition is Van Rensselaer Potter, *Bioetica: Ponte verso il Futuro*, Sicania, Messina, 2000. From now on, the bioethics developed rapidly and become independent science. Latter on there are many new words such as bio-law, bio-Medicine, bio-Technology and so on which got inspiration from the word of bioethics.

[249] Guy A. M. Widdershoven, "Alternatives to Principlism: Phenomenology, Deconstruction, Hermeneutics", in K.W.M Fulford, Donna L. Dickenson and Thomas H. Murray, *Healthcare Ethics and Human Values: An Introductory Text with Readings and Case Studies*, Blackwell Publisher, Oxford, 2002, p. 41

[250] James F. Childress denied that their work has a very big influence. He accepted that there were many critics on their work but it did not mean that their work gave a big influence. James F. Childress, *Practical Reasoning in Bioethics*, Bloomington, Indiana University Press, 1997, p. 26

[251] Tom L. Beauchamp, James F. Childress, *Principles of Biomedical Ethics*, Oxford University Press, Oxford, 1979. The lattest edition is the fifth edition in 2001

[252] Tom L. Beauchamp, James F. Childress, *Principles of Biomedical Ethics*, p. 3

[253] Tom L. Beauchamp, James F. Childress, *Principles of Biomedical Ethics*, p. 100 – 109. See also James F. Childress, *Practical Reasoning in Bioethics*, Indianapolis, Indiana University Press, 1997, p. 16.

beneficence, and justice. The principle of autonomy stressed the respect of the autonomy of patients; the principle of beneficence emphasized the pursuit of the good and the welfare of the patient; the principle of nonmaleficence emphasized the avoidance of harm to the patient; and the principle of justice stressed the treatment of persons fairly and equitably. Among the four principles, the principle of respect for autonomy enjoys the highest place. Whenever there is conflict among the four principles, the principle of respect for autonomy rules.

Beauchamp and Childress defined "autonomy" as a form of personal liberty of action where the individual determines his or her own course of action in accordance with a plan chosen by himself or herself. So the autonomous individual freely acts in accordance with a self-chosen plan[254]. In this line of argument, Beauchamp and Childress defined that "*To respect an autonomous agent is, at a minimum, to acknowledge that person's right to hold views, to make choices, and to take actions based on personal values and beliefs.*"[255]

Beauchamp and Childress believed that a person should be free to perform whatever actions he wishes - even if it involves serious risk for the agent and even if others consider it to be foolish or wrong[256]. This principle can only be overridden by competing moral considerations, such as endangering public health, or potentially harming innocent others, or requiring scarce resources for which no funds are available[257].

In exercising this principle, Beauchamp and Childress explain that it needs two essential conditions: liberty that is the independence from controlling influences and agency that is the capacity for intentional action which is another form of human rationality[258].

Beauchamp and Childress tried to place the dignity of human beings (autonomy, freedom and reason) at the center of bioethical decisions and formulated them into some principles. Because of the principle-oriented medical ethics which regulated moral judgment and

---

[254] Tom L. Beauchamp, James F. Childress, *Principles of Biomedical Ethics*, p. 121
[255] Tom L. Beauchamp, James F. Childress, *Principles of Biomedical Ethics*, p. 125
[256] Tom L. Beauchamp, James F. Childress, *Principles of Biomedical Ethics*, p. 121; Albert R. Jonsen, *The Birth of Bioethics*, Oxford University Press, Oxford, 1998, p. 335
[257] Tom L. Beauchamp, James F. Childress, *Principles of Biomedical Ethics*, p. 126
[258] Tom L. Beauchamp, James F. Childress, *Principles of Biomedical Ethics*, p. 121

decision making, many people called this theory "Principlism"[259]. Some people also called it "The Mantra of Georgetown" because the application of the principles is often mechanic and automatic like a mantra and because one of the writers, Tom L. Beauchamp, was a professor in Georgetown University, Washington D.C.[260].

Although Principlism got wide acceptance, there are many serious critics: Albert R. Jonsen and Stephen E. Toulmin said that Principlism appeared to promote a hierarchical form of reasoning that deduced ethical resolutions for complex clinical problems from fixed moral principles and rules[261]. Antonio G. Spagnolo noted that Principlism appeared to be end in itself and there is no clear common priority among the principles because it depends on the situation and the intuition of the subject[262]. David C. Thomasma criticized Principlism for failing to take into sufficient account the character of the agent, as well as the nuances of real life that situate and define the moral quandary[263]. Principlism places rationality as the sole grounds for moral norms. Principlism is too abstract and doesn't provide an authentic source for judging why one principle rather than the other ought to be given more weight in a particular case[264]. Principlism is too

---

[259] Guy Durand, Introduction Générale à la Bioéthique: Histoire, Concepts et Outils, Fides - Cerf, Montréal, 1999, pp. 60 – 62; Antonio G. Spagnolo, *Bioetica nella Ricerca e nella Prassi Medica*, Torino, Edizione Camilliane, 1997, p. 93. Ronald M. Green, "Method in Bioethics: A Troubled Assessment", in *Journal of Medicine and Philosophy* 15(1990) 179 – 197; K. Danner Clouser and Bernard Gert, "A Critique of Principlism", in *Journal of Medicine and Philosophy* 15(1990) 219 - 236

[260] Guy Durand, *Introduction Générale à la Bioéthique: Histoire, concepts et Outils*, Montréal, Fides - Cerf, 1999, p. 61; K. Danner Clouser and Bernard Gert, "A Critique of Principlism", in *Journal of Medicine and Philosophy* 15(1990) 219 – 236; K.W.M Fulford, Donna L. Dickenson and Thomas H. Murray, *Healthcare Ethics and Human Values: An Introductory Text with Readings and Case Studies*, Blackwell Publisher, Oxford, 2002, p. 41

[261] Albert R. Jonsen and Stephen E. Toulmin, *The Abuse of Casuistry: A History of Moral Reasoning*, Berkeley, University of California Press, 1988

[262] Antonio G. Spagnolo, *Bioetica nella Ricerca e nella Prassi Medica*, Camilliane, Torino, 1997, p. 93

[263] Edmund D. Pellegrino and David C. Thomasma, *The Virtues in Medical Practice*, Oxford, Oxford University Press, 1993, p. xi.

[264] David C. Thomasma, "Virtue Theory, Social Practice, and Professional Responsibility in Medicine", in R. B. Edwards and E. E. Bittar (eds.), *Advances in Bioethics: Critical Reflection on Medical Ethics, vol. IV*, London, JAI Press, 1998, p. 322. 324

far divorced from the realities of clinical ethics and the rich and varied history of individuals who struggle with decisions in the medical setting[265].

Although for many people, the notion of human dignity is closely associated with defending human life, it is interesting to note that it is also used to defend deliberate ending of human life (euthanasia and assisted suicide). In the case of euthanasia, for example, the proponents of euthanasia have the strong argument that human beings have the right to die with dignity. It means that a human being has the right to decide when and how to die. In this case, the dignity is understood as the capacity to decide and capacity to act for their own sake which is the application of autonomy and independency[266].

In his many famous books[267], Peter Singer (with his closed friend Helga Kushe) used the dignity of human being in a different direction. Singer minimized the difference between animal and humans and claimed that higher type of animals with sentience were worthy of more respect than humans with deficient brains or other handicaps[268]. His opinions were based of the notion on what makes a being merit respect. For Singer, the membership in the species human being (*homo sapiens)* is not relevant to the wrongness of killing human beings but rather rationality, autonomy, and self consciousness that make a different. Since the infants and the disabled lack of these characteristics so that killing them can not be equated with killing normal human being or any other self-conscious beings[269]. His extreme opinion made him (and Helga Kushe) under intense informal ban in some countries like Germany and Austria. Many angry people protested Helga Kushe's (who is closely associated with Peter singer) participation on the

---

[265] David C. Thomasma, "Beyond Autonomy to the Person Coping with Illness", in *Cambridge Quarterly of Healthcare Ethics*, 4 (1995): 12

[266] Patrick Verspieren, "La Dignità nei Dibattiti Politici e Bioetica" in *Concilium Rivista Internazionale di Teologia*, 2(2003) 223

[267] Peter Singer, *Animal Liberation*, Avon, New York, 1977; Peter Singer, *Practical Ethics*, Cambridge University Press, Cambridge, 1999; Peter Singer, *Rethinking Life and Death: The Collapse of Our Traditional Ethics*, Oxford University Press, Oxford, 1995; Peter Singer (ed.), *Applied Ethics*, Oxford University Press, Oxford, 1986

[268] Peter Singer, *Liberazione Animali: Il Manifesto di uni Movimento Diffuso in Tutto il Mondo*, Il Saggiatore, Milano, 2003, p. 35; Robert P. Kraynak and Glenn Tinder (eds.), *In Defense of Human Dignity: Essays for Our Times*, University of Notre Dame Press, Notre Dame, 2003, p. 4

[269] Peter Singer, *Practical Ethics*, pp. 182 - 183

conference on human dignity and sanctity of life which was held in Bielefeld, Germany, on October 1 – 3, 1992. The protest was so strong and violent that made some physical injuries of the participants that lead to the cancellation of the meeting[270].

4. Right to Life

After reflecting on the intrinsic and extrinsic values of human life and the dignity of human life, we now arrive at some conclusions which can be drawn from these notions. From those chapters, we have already seen some points regarding life as being a necessary condition for all good things. We have also seen that human life has inestimable value and uniqueness and that all people (normally) want to live. Based on these notions, in this chapter we will draw the conclusion that a human being has a right to life.

One of the most influential articles in defending abortion is entitled "A Defense of Abortion" by Judith Jarvis Thomson. It was published for the first time in the *Philosophy and Public Affairs* journal[271]. This article was so famous that it was reprinted wholly or in part in many books thereafter[272].

With her famous example of the violinist who has suffered from a fatal kidney ailment and the "you" who is forced to accept that the violinist's circulatory system is connected into your circulatory system

---

[270] Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, p. vii – viii

[271] Judith Jarvis Thomson, "A Defense of Abortion", in *Philosophy and Public Affairs* 1(1971) 47 – 66

[272] See for examples: Tom L. Beauchamp, LeRoy Walters, *Contemporary Issues in Bioethics* (4th edition), Wadsworth Publishing Company, Inc., Belmont, 1978, pp. 199 – 209; CB. Kusmaryanto, *Kontroversi Aborsi*, Grasindo, Jakarta, 2002, pp. 157 – 159; Eberhard Schockenhoff, *Etica della Vita: Un Compendio Teologico*, Queriniana, Brescia, 1997, p. 334; Louis P. Poijman, Francis J. Beckwith, *The Abortion Controversy: A Reader*, Jones and Barlett, Boston, 1994, pp. 131 – 146; Peter Singer (ed.), *Applied Ethics*, Oxford University Press, Oxford, 1986, pp. 37 – 56; Helga Kushe, Peter Singer (eds), *Bioethics: An Anthology*, Blackwell, Oxford, 1999, pp. 36 – 45; G. Ferranti and S. Maffettone, *Introduzione alla Bioetica*, Liguori, Napoli, 1992, pp. 3 – 24; Susan T. Nicholson, *Abortion and the Roman Catholic Church*, Religious Ethics Inc., Knoxwille, 1978, p. 50; Maurizio Chiodi, *Il Figlio Come Sè e Come Altro: La Questione dell'Aborto nella Storia della teologia Morale e nel Dibattito Bioetico Contemporaneo*, Glossa, Milano, 2001, p. 168

to supply fresh blood to the violinist, Thomson makes the statement that the right to life of the violinist falls behind the right of auto determination of the "you". In the case of a conflict of rights between the right to life and the right of self-determination, the right of self-determination wins over the right to life. The "you" who has the right of control over your body (the right of self-determination) has the right to unplug the circulatory system of the violinist although it would cause the death of the violinist. In the same way, the mother – who has the right of control over her body, and therefore the right to determine what can remain inside her body and what can not remain there – has the right to expel the embryo in her womb although this act of expelling the embryo causes the death of the embryo. We can discuss further the inconsistency and fallacy of this argument in which Thomson parallels the relationship between the violinist – "you" and embryo – mother, but there is one thing which is very clear and that is that Thomson wanted to state that the right to life falls behind the right of self-determination.

So, what does the right to life mean and is Thomson's argument defendable? J. Seifert – Rector of the International Academy of Philosophy, Princedom of Liechtenstein – defined the right to life as a "*certain objective claim, grounded in the nature of life and its value, to this life; or better said, the right to life is a certain objective entitlement to life... This rightful claim results from the dignity of human life but is distinct from it.*"[273] The difference of between the right to life and the dignity of life is that the dignity belongs to the human being and God, whereas the right to life is a claim among human beings. The right to life presupposes the contingencies of life and the dangers against life such as killing and torture. The life of God is never exposed to such danger, therefore, God does not need the right to life.

As we have seen in the previous chapter, human life has inestimable inherent value and dignity which exists at the same time of the beginning of the existence of the human life (at the end of the fertilization process) and remains until the same time of the finish of the existence of that human life (death). Therefore, for the length of the life of the human being, he has the right to life. Since the inherent human value is an inestimable value, so the right to life is inviolable.

---

[273] J. Seifert, "The Right to Life and the Fourfold Root of Human Dignity", in Pontificia Academia Pro Vita. *The Nature and the Dignity of the Human Person as the Foundation of the Right to Life: The Challenger of the Contemporary Cultural Context*, Libreria Editrice Vaticana, Vatican, 2003, p. 194

As we have seen in the previous chapter, the life of a human being is a basic right or a basic condition without which people can not do anything. In this case, Thomson failed to realize that the right of self-determination has a constitutive base, that is the right to life without which people can not have the right of self-determination. In other words, the right to life precedes the right of self-determination. So the right of self-determination cannot win over the right to life. The right to life is more than a fundamental right. It is an intrinsic and fundamental condition (basis) which makes possible any other rights, including the right of self-determination. The life of human a being is empirical and it is not a theory. Therefore the fact of life entitles the right to life[274].

People may doubt many things both the unseen and the seen, but people can not doubt the existence of their own life. Life is auto-proof, aware of itself, transparent to itself, and exists for itself. This means that life is indubitable. Precisely because life is the only indubitable thing, it is the most radical reality whose existence is the basis for anything else which relates to the human life. It is from the most radical reality (the fact of life) that emanate the other rights, including the right of self-determination. It is exactly this point that is one of Thomson' failures in her logical deduction.

Most of the rights are double-sided: one may use (exercise) it or one may decide not to use (renounce) it without any legal consequences (punishment). One can use his right to vote or not to vote in the elections without any legal consequences (punishment). Unlike many other rights, the right to life is different. The difference lies in the fact that people can not renounce the use of it because the renouncement of the right to life means that there is no more life to possibly enjoy the fruit of renouncement. People decide to use or to renounce their rights in the hope of enjoying the benefit of their acts. If people decide to renounce the right to life – for example in the case of suicide or euthanasia – they do not enjoy the fruit of their actions because there is no more life, no more human being.

Actually, people do not have to procure the right to life in order to have life because they have already been given their life. So the right

---

[274] M. D. Vila-Coro, "The Rights of Man and the Right to Life" in Pontificia Academia Pro Vita, *The Nature and the Dignity of the Human Person as the Foundation of the Right to Life: The Challenger of the Contemporary Cultural Context*, Libreria Editrice Vaticana, Vatican, 2003, p. 222

to life is not a right to procure life but the right against offenses or eliminations of life. Human beings are born with the indissoluble right to life which is connected to their nature as human beings[275]. What people have to make sure is that the right to life is recognized legally and socially so that both preservation and protection of life are guaranteed legally and socially. So the right to life has a double meaning, a negative one and a positive one. Negatively it means that every single human life must be protected against killing, torture or inhuman degrading punishment or exposed to dangerous threats against life. Positively it means that human life has to preserve its physical and moral integrity.

There are many international institutes which oblige countries and other institutions to guarantee the right to life, for example: The UN Universal Declaration of Human Rights (1948)[276], Article 3, stated, "*Everyone has the right to life, liberty and security of person.*"[277] The UN Covenant on Civil and Political Rights (1966) Article 6, paragraph 1, stated that, "*Every human being has the inherent right to life. This right shall be protected by law. No one shall be arbitrarily deprived of his life.*" The European Convention on Human Rights, Article 2, paragraph 1, stated that, "*Everyone's right to life shall be protected by law. No one shall be deprived of his life intentionally, save in the execution of a sentence of a court following his conviction of a crime for which this penalty is provided by law.*"

In these declarations, the term 'everyone' or 'every human being' is interpreted as the person after birth because the proclamation of those declarations had the basic goal to counter the act of execution and atrocities committed by some regimes – such as the Nazi regime – and to proscribe the acts of torture and persecution and also – a fortiori – to brand the crime of genocide.[278]

---

[275] Velasio de Paolis, "La Protezione Penale del Diritto alla Vita", in Pontificio Academia per la Vita, *Commento interdiciplinare alla Evangelium Vitae*, Libreria Editrice Vaticana, Vatican, 1997, p. 503

[276] Eugene B. Brody, *Biomedical Technology and Human Right*, Unesco Publishing, Paris, 1993, pp. 261 - 267

[277] Eugene B. Brody, *Biomedical Technology and Human Right*, p. 262; Noëlle Lenoir, "Respect for Life and the Law of the Living", in Denis Noble, Jean-Didier Vincent, *The Ethics of Life*, Unesco Publishing, Paris, 1997, p. 174

[278] Noëlle Lenoir, "Respect for Life and the Law of the Living", p. 175; Antonio Tarantino, *Diritti Umani e Questioni di Bioetica Naturale*, Giuffrè Editore, Milano, 2003, pp. 215 - 216

Certainly, now we can challenge this interpretation. With the advances of modern biology, especially human embryology, we know for sure that the life of a human beings starts at the end of fertilization so that this protection needs to be applied not only to the person after birth, but must be applied from the moment the existence of the life of a human beings begins, which is at the end of the fertilization process. In other words, from the beginning of the existence of human life, this life needs to be protected against being killed. The integrity of physical and moral life must be preserved and the continuity of their life needs to be guaranteed. Briefly, the right to life is essentially a right not to be intentionally killed[279]. Human life has intrinsic value and dignity so that one must never intentionally kill an innocent human being.

5 Sanctity of life

a. Terminology and Context of the Sanctity of Life

Many people have presumed that the doctrine of the sanctity of human life is a specialty of Catholicism's view on human life. But James F. Keenan, S.J. – an associate professor of Moral Theology at the Weston School of Theology in Cambridge – made an interesting observation in response to this perception[280]. He discovered that there were very few bibliographies, even in the places where one would normally expect to find it, such as the *New Catholic Encyclopedia* and theological dictionaries such as *The New Dictionary of Theology*, *The Oxford Dictionary of the Christian Church*, and *The Theological Dictionary*. In these dictionaries and encyclopedia, Keenan did not find any entries referring to the sanctity of human life. The terminology of sanctity of human life is not present either in the authoritative documents of the Second Vatican Council nor in any successive important documents such as *The Declaration on Procured Abortion* and *The Declaration on Euthanasia*[281].

---

[279] John Keown, *Euthanasia, Ethics and Public Policy: An Argument Against Legalisation*, Cambridge University Press, Cambridge, 2002, p. 40

[280] James F. Keenan, "The Concept of Sanctity of Life and its Use in Contemporary Bioethical Discussion", in Kurt Bayertz, *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, pp. 1 - 18

[281] James F. Keenan, "The Concept of Sanctity of Life and its Use in Contemporary Bioethical Discussion", p. 4

When I searched for this entry in the newly published Italian dictionary of bioethics, *Dizionario di Bioetica* (2002)[282] by the noteworthy Italian bioethicist, Dionigi Tettamanzi, who is the Catholic Archbishop of Milan, I did not locate any entry on the sanctity of human life, although there is an entry entitled 'quality of life'. This same occurrence happens in the book of Elio Sgreccia, the vice president of the Pontifical Academy for Life, an academy of the Vatican. In his two voluminous books entitled *Manuale di Bioetica*[283] which explain the Catholic teaching on bioethics, one would hope to find a treatise on the sanctity of life. But, once again, there is no such treatise. However, Sgreccia does have an extensive treatise on the quality of life in the first chapter of his second book under the title "Bioetica, Società, Sanità, e Qualità della Vita"[284]. Even in the Lexicon which was published by the Pontifical Council for the Family, "*Lexicon Termini Ambugui e Discussi su Famiglia, Vita, e Questioni Etiche*"[285], there is no entry for the sanctity of human life even though there is an entry for the quality of life. It is more surprising that even in the official Catholic teaching, *Catechism of the Catholic Church,* I do not find the term sanctity of life.

It is evident that the Church's documents do not invoke the term 'the sanctity of life' *per se* although the Church does want to emphasize its application through other terminologies such as the inviolability of human life and the absolute value of human life. Although the Church does not use the term 'sanctity of human life' *per se,* she does explain why human life is sacred. For example in the Instruction on Bioethics Respect for Human life, *Donum Vitae,* we read, "*Human life is sacred because from its beginning it involves the creative action of God and it remains forever in a special relationship with the creator, who is its sole end.*"[286]

---

[282] Dionigi Tettamanzi, *Dizionario di Bioetica,* Piemme, Casale Monferrato, 2002

[283] Elio Sgreccia, *Manuale di Bioetica: I. Fondamenti ed etica Biomedica,* Vita e Pensiero, Milano, 2003 and Elio Sgreccia, *Manuale di Bioetica: II. Aspetti Medico-sociali,* Vita e Pensiero, Milano, 2002

[284] Elio Sgreccia, *Manuale di Bioetica: II. Aspetti Medico-sociali,* Vita e Pensiero, Milano, 2002, pp. 3 – 25

[285] Pontificio Consiglio per la Famiglia, *Lexicon: Termini Ambigui e Discussi su Familgia, Vita, e Questioni Etiche,* Edizioni Dehoniane Bologna, Bologna, 2003

[286] *Donum Vitae*, introduction no. 5. All the citations from *Donum Vitae* are taken from Vatican Translation of the *Instruction on Bioethics Respect for Human life: Donum Vitae*, St. Paul Books & Media, Boston

Surprisingly, too, Keenan found that the concept's origin and its development have not been explored adequately so that the sanctity of human life is very often misinterpreted and used inadequately[287]. David C. Thomasma had the same observation. He said, "*The Sanctity of human life as a doctrine or assumed value in medicine has been both neglected and overstated in the past twenty five years.*"[288] This overstatement creates an increasingly shrill cry by the members of the pro-life movement but, unfortunately, without adequate reflection.[289] John Keown makes the same observation, "*The moral and legal principle of the sanctity/inviolability of life is often advocated but much less often understood, even by senior judges who claim to uphold it.*"[290]

Etymologically, the word 'sanctity' has different meanings although they are still in the same field. *The American Heritage Dictionary* defines the meaning of sanctity as: *1. Holiness of life or disposition; saintliness. 2. The quality or condition of being considered sacred; inviolability. 3. Something considered sacred.* While *The Random House Webster's Dictionary* defines it as: 1. *holiness, saintliness, or godliness. 2. sacred or hallowed character. 3. a sacred thing*

From his observation, James F. Keenan concluded that "*sanctity is a quality which is revered as somehow touched by divinity and therefore untouchable for humans: sanctity is that which the divinity protects from violability.*"[291]. So in this sense, sanctity does not denote a duty which one has to accomplish but rather a limit beyond which people cannot go (trespass), for example, the sanctity of the temple means that people cannot violate (trespass) the temple because of its sanctity.

Leon R. Kass gave an inspiring definition of the sanctity of life. "*In the strictest sense, sanctity of life would mean that life is in itself something holy or sacred, transcendent, set apart – like God himself...*

---

[287] James F. Keenan, "The Concept of Sanctity of Life and its Use in Contemporary Bioethical Discussion", p. 1

[288] David C. Thomasma, "The Sanctity-of-Human-Life Doctrine", in Edmun D. Pellegrino, Alan I. Faden, *Jewish and Catholic Bioethics: An Ecumenical Dialogue*, Kluwer Academic Publisher, Dordrecht, 1999, p. 54

[289] David C. Thomasma, "The Sanctity-of-Human-Life Doctrine", p. 54

[290] John Keown, *Euthanasia, Ethics and Public Policy: An Argument Against Legalisation*, Cambridge University Press, Cambridge, 2002, p. 40

[291] James F. Keenan, "The Concept of Sanctity of Life and its Use in Contemporary Bioethical Discussion", p. 3

In more modest but also more practical term to regard life as sacred means that it should not be violated, opposed or destroyed, and, positively that it should be protected, defended and preserved."[292]

There are other reasons for Devine protection. One is related to possession by God. For example, the life of a human being belongs to God and that is why it is protected against violation. The second is related to the Devine touch (blessing). For example, places of worship or liturgical objects are touch or blessed by God and therefore protected against violation.

b. Biblical Bases

Although there is no terminology for the sanctity of human life in the Bible, this doctrine is deeply rooted in the Bible, especially in the history of salvation. David C. Thomasma made an interesting observation in his article entitled "The Sanctity-of-Human-Life Doctrine"[293]. In this article, Thomasma demonstrated that the doctrine of the sanctity of human life comes in first place from the history of the salvation of the redeemed people and then from creation.

Thomasma said that from the history of the chosen people, Israel, Yahweh was known first of all as the liberator, a saving God, who saved Israel from the slavery of Egypt. Yahweh intervened, liberated, and directed Israel through the desert for forty years. He made a covenant with Israel, chose Israel as God's people and then he gave them the Promised Land.

Throughout those years, Yahweh was worshipped as the one god that chose and sanctified his people through the original and then renewed covenant. God said, "*You shall be for me a priestly kingdom and a holy nation.*"[294] So the notion of the sanctity of life – although it is not mentioned clearly – is related to the fact that Israel is a holy nation which was chosen by God in a special way. Since the only holy

---

[292] Leon R. Kass, *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics*, Encounter Book, San Francisco, 2002, p. 234; Leon R. Kass, "Death with Dignity and the Sanctity of Life", in Michael M. (ed.) Uhlmann, *Last Rights?: Assisted Suicide and Euthanasia*, William B. Eerdmans Publishing Company, Grand Rapids, 1998, p. 203

[293] David C. Thomasma, "The Sanctity-of-Human-Life Doctrine", in Edmun D. Pellegrino, Alan I. Faden, *Jewish and Catholic Bioethics: An Ecumenical Dialogue*, Kluwer Academic Publisher, Dordrecht, 1999. pp. 54 – 73

[294] Exodus 19: 6

nation is Israel, a holy war then is possible with other nations. Sometimes it was even demanded in order to destroy false gods and people who would engage in combat with the chosen people.[295]

With the destruction of the Temple, the Israelites were forced into exile in Babylon. Here they were forced to reconfigure and reinterpret their faith. There was no longer the Temple nor the Ark of the Covenant to be used as their points of reference in their sacrifices and daily lives. In the exile, they finally learned that they could be faithful to God without the Temple and the Ark of the Covenant, even in a foreign land. So, their understanding of God was re-configured. They learned that the God of Israel is not a God who is tied to a specific land or territory but is a God who is everywhere. Unlike the gods of many nations who were limited to a certain area, the God of Israel is without confines. He saved the Israelites from the foreign land (Egypt), planted them in the Promised Land, and was worshipped in the land of exile (Babylon). From their history of salvation, the Israelites began to see that God not only saved them but was also the master of human and natural history, the creator of the universe and of all lands and peoples. This is the reason why it is believed that the understanding of God as the Creator of the universe was conceived after the exile of Babylon[296]. Thus, the sanctity of human life is firstly understood on the basis of the status of the chosen and holy people of Israel and then on the basis of the creation of human beings.

In the Christian tradition, the biblical base of the sanctity of human life is found in the history of redemption, since the creation of the world until the coming of Christ. As we have previously seen human beings were created by God in his image and likeness[297]. Since it is God who creates human beings, so then the owner of the lives of human beings is God. Human beings cannot violate this life whether by killing other peoples or by committing suicide. *Donum Vitae* summarizes this teaching when it says, "*Human life is sacred because from its beginning it involves the creative action of God and it remains forever in a special relationship with the Creator, who is its sole end.*"[298]

---

[295] David C. Thomasma, "The Sanctity-of-Human-Life Doctrine", p. 55
[296] David C. Thomasma, "The Sanctity-of-Human-Life Doctrine", p. 55
[297] Genesis 1: 27
[298] *Donum Vitae*, Introduction no. 5

The prohibition of killing was pronounced solemnly in the Ten Commandments. The fifth commandment is "Thou shalt not murder". Although God did not explicitly state why murder is prohibited, we can trace its reason in the Bible itself. The first murder, which is recorded in the Bible, is Abel's murder by his brother Cain. After killing his brother, Cain tried to hide his crime with a lie and denied that he knew his brother. Then God said, "*Listen; your brother's blood is crying out to me from the ground!*"[299]

In Biblical terminology, blood is not only the biological blood but it is first of all identified as life itself, "*for the blood is the life.*"[300]. So Cain's crime against his brother is a crime against life itself[301]. The core of this point is the universal basis of the prohibition against killing. The prohibition against killing is right and acceptable not only because God wills it but because God's will is rooted in the universal predisposition that killing a human being is a crime against life itself. It is a fundamental principle in which non-believers (atheists) and non-Christians share the same opinion; that is, that killing innocent people is a crime against life itself. *Evangelium Vitae* affirmed this interpretation and employed it as the subtitle of its first chapter, "*Cain rose up against his brother Abel, and killed him (Gen 4:8): the roots of violence against life.*"[302]

The universality of the prohibition of killing is expressed clearly in the story of the covenant with Noah after the flood[303]. After the destruction of human beings in the flood, God made a covenant with Noah. One of the covenants that God pronounced in it is "*Whoever sheds the blood of a human, by a human shall that person's be shed; for in his own image God made humankind.*"[304] It is important to note that this time was the first time in which God promulgated the law of the prohibition of killing, a time in which there were neither Jews, Christians, Muslim nor members of other religions[305]. Theologically

---

[299] Genesis 4: 10
[300] Deuteronomy 12: 23
[301] Luis Alonso Schökel. *Dov'è Tuo Fratello?*, Paideia, Brescia, 1987, p. 48
[302] *Evangelium Vitae* no. 7
[303] Genesis 9: 1 – 17
[304] Genesis 9: 6
[305] Leon R. Kass, *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics*, Encounter Book, San Francisco, 2002, p. 239; Leon R. Kass, Death with Dignity and the Sanctity of Life", in Michael M. (ed.) Uhlmann, *Last Rights?:*

speaking[306], human beings are as if were being "rebooted" by the flood into their original condition (natural state). Right in that condition, the law against killing was promulgated. It is, therefore, the best evidence that the prohibition of killing is universal, beyond all kind of religion[307].

It is well worth reflecting upon the punishment for killing a human being found in the prescripts of this law. It is said, "*Whoever sheds the blood of a human, by a human shall that person's be shed;*" Unlike the punishment of the first sin, wherein the punishment is applied from generation to generation, the punishment for the killing of a human being in this passage is applied to an individual person. Thus, it underlines the equality among all people. There is no person whose value is twice or triple that of another person. On the contrary, each and every person is of equal value.

Evangelium Vitae interpreted this biblical passage in a greater spiritual perspective. "*Brother kills brother. Like the first fratricide, every murder is a violation of the "spiritual" kinship uniting mankind in one great family, in which all share the same fundamental good: equal personal dignity.*"[308] The crime of killing is the crime against the brotherhood of all humankind. All of mankind shares the same dignity as being made in the image and likeness of God hence all people are united as brother and sisters. This brotherhood achieves its highest peak in the redemption of Christ because all people share the same dignity as the redeemed people, the children of God. Christ's redemption lifts up the status of human life so that human beings are not only made in the image and likeness of God but also as the children of God and are brothers and sisters. Unlike the Israelites who believe that the only chosen and holy people is Israel, Christ widens this perspective to all people. All people are invited to become his chosen and holy people. Hence the crime of killing a human being takes on a new dimension. It is not only a crime against life which belongs to God but also a crime against the brotherhood among all peoples.

Assisted Suicide and Euthanasia, William B. Eerdmans Publishing Company, Grand Rapids, 1998, pp. 207 - 208

[306] I said that it is "theologically speaking" because chronologically, it may not be true that the Genesis is written previous to the Exodus (The Ten Commandment).

[307] Leon R. Kass, *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics*, p. 239

[308] *Evangelium Vitae* no. 8

c. Sanctity of Life in Bioethics

In any bioethical discussion, the term 'sanctity of human life' is used for almost every issue regarding the life of a human being in all the spans of life. In the beginning of life, the sanctity of life is discussed in relation to abortion, genetic engineering, cloning, research using the human embryo and so on. Throughout the stages of life, sanctity of life is discussed in relation to war, healthcare, legitimate defense, torture and so forth. In the last stage of life, the sanctity of life is discussed in relation to euthanasia, assisted suicide, capital punishment, killing and so forth. So the theme of sanctity of human life touches almost every bioethical discussion.

When it is used in bioethical debates, it holds different meanings. The first meaning is from a restrictive vantage point in which people can not transgress a border of human life: because human life is sacred, people can not commit suicide or murder; because human life is from God, only God has dominion over human life; and because God is the creator of human life and a human being is only the administrator of life, people can not eliminate the life of another nor the life of themselves[309].

The second meaning is from a positive perspective. It describes the obligation of human beings in relation to the life of human beings; that is what people are required to do to uphold life. The emphasis of this view is stewardship of life. It informs us about our obligations as we face questions regarding human life[310].

As well, there are different attitudes regarding the acceptance of the sanctity of human life. The first attitude to take note of is *Vitalism*. Vitalism contends that the entire physical and historical life of a human being is filled with God's holy presence. Thus one must respect all stages (forms) of human life from conception to natural death as being redeemed and grace-filled. One cannot deliberately destroy human life at any stage for whatever reason because all stages of human life have the absolute qualities of the Divine. In this view, there is no place for autonomy or self-determination. In the absolute form of *Vitalism*, there are no life supports, treatments, and medical interventions that can be

[309] James F. Keenan, "The Concept of Sanctity of Life and its Use in Contemporary Bioethical Discussion", p. 11

[310] James F. Keenan, "The Concept of Sanctity of Life and its Use in Contemporary Bioethical Discussion", p. 11

withdrawn from any dying patient. In the relative form of *Vitalism*, a balance between the burden (efforts) and the benefit (outcomes) of the patients is sought. If the burdens are too high and the outcome is very low then proper respect for the sanctity of human life calls for letting go of our human interventions and allowing God himself to call the person[311].

The other attitude is "the consistent ethic of life" which was championed by Joseph Cardinal Bernardin of Chicago[312]. Thomasma summarized this view,

> *a prima facie duty to respect all forms of human life because they are created and redeemed by God, but does not rule out the formalized process of determining when other value might override such duties, values such as defense of one's country or property, or public punishment for murder and social mayhem. More important for bioethics, this nonvitalist position signifies that, although human life is intrinsically valuable, it is not an absolute value."*[313]

The non-absolute value of human life is the conclusion which is derived from the fact that the social circumstances of the people play an important role. The social circumstances of human beings must be included in the calculation for the respect of human life for human beings do not live in isolation but in certain real circumstances and in relationship with other people.

d. Sanctity of Human Life Versus the Quality of Human Life

It is interesting to note that in the history of medical ethics until a few decades ago western medical ethics was dominated by the notion of the sanctity of life and not the quality of life although the discussion about the quality of life was not new[314]. We can trace the discussion about the quality of life back to the time of the ancient Greek

---

[311] David C. Thomasma, "The Sanctity-of-Human-Life Doctrine", in Edmun D. Pellegrino, Alan I. Faden, *Jewish and Catholic Bioethics: An Ecumenical Dialogue*, Kluwer Academic Publisher, Dordrecht, 1999, p. 60

[312] James F. Keenan, "The Concept of Sanctity of Life and its Use in Contemporary Bioethical Discussion", p. 13, David C. Thomasma, "The Sanctity-of-Human-Life Doctrine", p. 61

[313] David C. Thomasma, "The Sanctity-of-Human-Life Doctrine", p. 62

[314] Massimo Reichlin, *L'Etica e la Buona Morte*, Edizioni di Comunità, Torino, 2002, p. vii

philosophers. In the book of Crito, there is a scene where Crito and Socrates were discussing human life. At a certain point, Socrates argued that people had to adhere to the opinions of those who had good knowledge about not harming our human bodies. Then Socrates asked, "*Is life worth living with a body that is corrupted and in bad condition?*"[315] Moreover he stated, "*The most important thing is not life, but the good life*"[316]. Crito was puzzled over what it meant to live well and what kind of life is worth living. These same puzzles are still not answered satisfactorily in modern times.

As we have seen previously, the sanctity of life receives a strong foundation in Christian theology and philosophy, but it does not belong exclusively to Christianity. Although Christian theology and philosophy develop this notion extensively, it is not the specific property of Christianity but is the common basis for moral judgments for many other religious traditions such as Judaism, Islam, Hinduism and so on. Moreover Helga Kushe even contends that the sanctity of human life does not necessarily come from any religious background[317].

Since the 1950s, there is a progressive changing in this base. Sanctity of life as the basic norm of medical ethics is being challenged and substituted progressively by quality of life because of the rapid changing (improvement) in many aspects of life such as medical technology, awareness of good environment (ecology), leisure and so forth[318]. In recent bioethical publications, the terminology of quality of life is used frequently in certain contexts such as, the treatment of patients, allocation of scarce resources, the treatment of terminally ill patients and the prolongation of the end of life and so on. The ancient statement of Socrates reemerges, "*The most important thing is not life, but the good life.*" It is not enough that one lives a life but it has to be a good quality of life. If the quality of life is not good enough, this kind of life is not worth living and can be ended or terminated. In this sense the quality of life is frequently opposed to the sanctity of life.

---

[315] Crito 47e. John M. Cooper and D. S. Hutchinson, *Plato: Complete Works*, Hacket Publishing Company, Indianapolis, 1997, p. 42

[316] Crito 48b. John M. Cooper and D. S. Hutchinson, *Plato: Complete Works*, p. 42

[317] Helga Kushe, *Sanctity-of-Life Doctrine in Medicine: A Critique*, Clarendon Press, New York, 1987, p. 3.5

[318] Salvino Leone, "Qualità della Vita", in Salvino Leone and Salvatore Privitera (eds.), *Nuovo Dizionario di Bioetica*, Istituto Siciliano di Bioetica, Acireale, 2004, p. 979 – 980

According to James J. Walter and Thomas A. Shannon this change is the direct impact of modern society that stresses too much the good quality for everything people want to have[319]. People who want to buy cars, computers, houses and so on, want to receive the best quality goods and vendors try hard to ensure that their goods are of top quality. Moreover it certainly affects the producers of the goods to apply a strict quality control over their products so that their products can be sold competitively. The products that do not meet a certain level of good quality will be disposed of or eliminated or they will be sold at very low costs because of their lower value. Good vendors only sell good quality products.

This way of thinking is applied not only to the properties that people possess but also applied to the very life of human beings. Thus, it can be seen that there are many people who find no place in the global economic system either as producers or consumers. Today these people are labeled as disposable or thrown away people. The statement of Socrates that it is not enough to live but to live well continues to confront us. Life is not merely a biological life but it has to have good quality to be worthy of life. Traditionally, the desirable quality of life is analyzed in term of happiness or beatitude.[320] Some people claim that people who live lives in a poor condition of health are called "condemned to live" because those people are forced to accept a miserable condition of life (quality of life) which does not have much value attached to it[321].

The application of quality of life in medical ethics creates unavoidable tensions. The tension between the sanctity of human life and the quality of human life is one of the leading bioethical questions of our day[322]. Even on many occasions – especially in regard to questions about the end of life – the application of these two moral

---

[319] James J. Walter, Thomas A. Shannon, *Quality of Life: The New Medical Dilema*, Paulist Press, New York, 1990, p. 1

[320] William Aiken, "The Qualità of Life" in James J. Walter, Thomas A. Shannon, *Quality of Life: The New Medical Dilemma*, Paulist Press, New York, 1990, p. 18

[321] Lorenzo Biagi, *La Pena di Vivere: Il Problema Morale nel Suicidio*, EDB, Bologna, 1993, pp. 30 – 31

[322] Ronald M. Green, "Jewish Teaching on the Sanctity and Quality of Life", in Edmun D. Pellegrino, Alan I. Faden, *Jewish and Catholic Bioethics: An Ecumenical Dialogue*. Kluwer Academic Publisher, Dordrecht, 1999, p. 26; See also the title of this book: James J. Walter, Thomas A. Shannon, *Quality of Life: The New Medical Dilema*, Paulist Press, New York, 1990

criteria bring to the forefront a highly irreconcilable dilemma that forces people to choose one of them.

In brief, there is a dilemma that forces people to choose between the sanctity of life and the quality of life. On many occasions, people cannot posses both of them. Our critical questions are: Is the dilemma defendable? If we have to choose one of them, which choice is reasonable and morally right?

First of all we have to note that the term 'quality of life' is used with different meanings by different users. Social scientists generally use the term 'quality of life' as the evaluative property to determine degrees and to serve as a comparative tool of measurement. They strive to find indicators of social well-being analogous to the economic indices of economic well-being to produce a 'quality of life' measure equivalent to the Gross National Product measure with which to make inter-societal or inter-group comparisons[323].

Moralists use the term 'quality of life' "*as a value designator such that appeals to the enhancement or preservation of one's "quality of life", provides a good moral reason for acting or refraining from acting.*"[324] They strive to establish the limits of quality necessary to live a minimal human life. Under such a limit, it can be ascertained whether it is not a human life anymore and whether it can be ended or at least whether that kind of life is not a life lived well.

Some bioethicists use the term 'quality of life' as a term to capture the very essence of how we evaluate the benefit-burden ratio involved in various medical treatments that are offered to us. Some people also employ the term as a judgment about whether one should live or not[325].

Because there are so many definitions, its concrete application in bioethics is problematic. There are so many criteria with which to measure the quality of life. For example: Allan Williams, from the University of York in England, proposed the measure which he called QALY (Quality Adjusted Life Year) and received wide attention[326]. In

---

[323] William Aiken, "The Quality of Life", in James J. Walter and Thomas A. Shannon, *Quality of Life: The New Medical Dilemma*, Paulist Press, New York, 1990, p. 17

[324] William Aiken, "The Quality of Life", p. 18

[325] James J. Walter and Thomas A. Shannon, *Quality of Life: The New Medical Dilemma*, Paulist Press, New York, 1990, p. 1

[326] *"The essence of a QALY is that it takes a year of healthy life expectancy to be worth one, but regards a year of unhealthy life expectancy as worth less than 1. Its*

his proposal, Allan Williams argued that health care priorities should be influenced by our capacity both to increase life expectation and to improve peoples' quality of life[327]. This signifies that if medical intervention does not improve quality of life and life expectation, medical intervention is not needed and the patients are allowed to die.

Other people have proposed the CBA (cost-benefit analyses) and CEA (cost-effectiveness analysis). The CBA analyzes the value of all outcomes of the therapy in terms of economic cost, including lives or years of life and morbidity. The CEA serves to place priorities on alternative expenditures without requiring that the dollar value of life and health be assessed[328].

Anthony Shaw proposed a more mathematical criterion of quality of life. His proposal is QL = NE x (H + S). QL represents **Q**uality of **L**ife. NE represents the patient's **N**atural **E**ndowment (physical and intellectual). H represents the contributions to that individual by his **H**ome and family. S represents the contributions made to that individual by **S**ociety. The quality of life (QL) may be improved for many individuals with an impaired (NE) by increasing the contribution of (H) and/or (S)[329].

Although the term and its criteria in concrete application may differ from one to another, the final outcome is the same: those who do not match a certain level of quality of life will be eliminated. It is not difficult to imagine that this will also be applied to human cloning. There will be criteria to measure the quality of the cloned embryo to

---

precise value is lower the worse the quality of life of the unhealthy person (which is what the "quality adjusted" bit is all about). If being dead is worth zero, it is, in principled possible for a QALY to be negative, ie for the quality of someone's life to be judged worse than being dead.

The general idea is that a beneficial health care activator is one that generates a positive amount of QALYs and that an efficient health care activity is one where the cost per QALY is as low as it can be. A high priority health care activity is one where the cost-per-QALY is low, and a low priority activity is one where cost-per-QALY is high." Allan Williams, "The Value of QALYs", in *Health and Social Service Journal* 3(1985) 3

[327] Alan William, "Response: QALYfying the value of Life" in *Journal of Medical Ethics* 13 (1987) 123

[328] Allen Buchanan, "Health-Care Delivery and Resource Allocation" in Robert M. Veatch, *Medical Ethics*, Jones and Bartlett, Sudbury, 1997, p. 327

[329] Anthony Shaw, "Defining the Quality of Life", in James J. Walter and Thomas A. Shannon, *Quality of Life: The New Medical Dilemma*, Paulist Press, New York, 1990, p. 91 - 92

determine which embryo will be implanted in the uterus and which cloned human embryo will be discarded. While the pregnancy is still progressing, if the embryos have malformation or genetic abnormality or major physiological defect, they will be expelled. In fact, this type of killing is a form of eugenics[330] because the embryo was killed not because of his wrongdoing but because of his genetic defect or physical condition which was not his responsibility.

6. Inviolable Value of Human Life

a. Inviolable Value of Human Life in the Christian Tradition

This chapter on the inviolable value of human life actually must be united with the previous chapter about sanctity of life because the two subjects are closely interrelated. On many occasions, people interpret them as one and the same thing. Some people differentiate between sanctity and inviolable human life by referring to sanctity as belonging to religious terminology while inviolability belongs to non-religious (lay) terminology[331].

In non-religious terminology the reason for the inviolability of human life is expressed in the inherent dignity of human life. However, both the sanctity of human life and the inviolability of human life refer to the prohibition of intentional killing because human life belongs to

---

[330] Eugenics is a theory that deals with the improvement of heredity qualities by means of the principles of genetics. This word comes from a Greek word meaning wellborn and was coined by Francis Galton, a cousin of Charles Darwin, in 1883. (Linda Tagliaferro, *Genetic Engineering: Progress or Peril?*, Lerner Publications Company, 1997, p. 70 and Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, Oxford, Oxford, 1998, p. 230.). There are many ways to improve the quality of the offsprings. One of them is the killing of the bad offspring. Eugenics is not a new practice but it is an old practice. In his work, *Republic*, No. 459 – 462, Plato suggested that the offspring has to come from a good quality of parents. In Republic V, 459,d, Plato said, "*the best men must have sex with the best women as frequently as possible, while the opposite is true of the most inferior men and woman, and, second, thatif our herd is to be of the highest possible quality, the former's offspring must be reared but not the latter's.*" John M. Cooper, D. S. Hutchinson (eds.), *Plato: Complete Works*, Hacket Publishing Company, Indianapolis, 1997, p. 1087

[331] John Keown, *Euthanasia, Ethics and Public Policy: An Argument Against Legalisation*, Cambridge University Press, Cambridge, 2002, p. 40

God alone. In other words, there is no reason other than God himself that can take the life of a human being.

However, this has not always been the case. Although human life is sacred it does not mean that it always has the ultimate value which can not be sacrificed for the sake of another. There are conditions in which human life can be sacrificed for the sake of others. Here, we will discuss these conditions in order to see if the cloning of a human being can be justified or can not be justified based on these notions.

In the long history of the Church, Jesus' command to take care of the sick, the poor, the disabled, the weak, the suffering and so forth has been carried out by Christians not only as a manifestation of Christian love but also as a manifestation of respect for life. As we have seen before, we are created in the very image and likeness of God[332]. We can therefore appreciate life itself as revelatory of the very God who desires to be in relation with us. Through faith, we understand life itself as a precious and sacred gift, created and redeemed by God. It is evident then that as children of God we share in the same dignity and carry the seed of eternity. Hence it can be seen that life is a fundamental good: "*Human life is the basis of all goods, and is the necessary source and condition of every human activity and of all society. Most people regard life as something sacred... gift of God's love which (believers) are called upon to preserve and make fruitful.*"[333] As a divine gift life is oriented to the building up of the people of God and entails a task that is both social and individual and therefore is owed compassion and care. Furthermore, as Christians, we share the same dignity as children of God and redeemed people so that we may have eternal life. As a consequence, respect for life forms an underpinning of Christian teaching.

Since the beginning of Christianity, respect for life has played a very important role in the shaping of Christian identity. People who wanted to become Christians had to renounce the practices or professions which contradicted the ideal of Christian life. The early Christians believed that the Kingdom of God was coming very soon so that Christians should not compromise their way of life in the world[334].

---

[332] Genesis 1: 26

[333] Congregation for the Doctrine of Faith, *Declaration on Euthanasia*, no. I. St. Paul Books & Media, Boston, 1992, pp. 6 – 7. All the citations from this declaration are taken from this publication.

[334] Lisa Sowle Cahill, *Love your Enemies: Discipleship, Pacifism, and Just War Theory*, Fortress Press, Minneapolis, 1994, p. 39

Practices such as abortion, contraception, and infanticide which were practiced widely in the Roman Empire, were not suitable to the Christian life. The Didache classified these acts as the way to death[335]. Professions such as those of gladiators and soldiers were not compatible with Christian life because they required the killing of people. Those who wanted to become Christians had to renounce these professions. Christians had to commit themselves to an attitude of non-violence, like Jesus did[336].

Furthermore, Jesus set very high ethical standards for his followers, including an unbounded willingness to forgive wrongdoing, non-retaliation against evil, and love of enemies[337]. Jesus even admonished one of his disciples for using a sword to defend him at his arrest[338]. Most of his early followers seem to have interpreted Jesus' commands as to prohibit all uses of force by Christians, even in the defense of the innocent. Paul echoed Jesus' nonviolent message in his Letter to the Romans, "*Do not repay anyone evil for evil.... never avenge yourselves.*"[339]

Some Fathers of the Church such as Tertullian (160 – 220) and Origen (185 – 254) opposed Christians' participation in military service because it contradicted Christian discipleship in its commandment not to kill. Hippolytus (170 – 236) thought that Christians should not join the army; but if they were already in the army, they must disobey orders to kill[340]. Canon 12 of the First Council of Nicea (325) enacted severe penalties for Christians who re-enlisted in the army[341]. In the

---

[335] Didaché 2: 1 See *Didaché Dottrina dei Dodici Apostoli: Nuova versione Testo Greco a Fronte*, San Paolo, Cinisello Balsamo, 1999, p. 37

[336] Lisa Sowle Cahill, *Love your Enemies: Discipleship, Pacifism, and Just War Theory*, pp. 40 – 42

[337] Matthew 5

[338] John 18: 10 - 11

[339] Romans 12: 17. 19

[340] Lisa Sowle Cahill, *Love your Enemies: Discipleship, Pacifism, and Just War Theory*, pp. 41 – 54; David C. Thomasma, "Assisted Death and Martyrdom", in *Christian Bioethics* 4(1998) 122 - 142

[341] Canon XII. *"Di coloro che, dopo aver lasciato il mondo, vi sono poi ritornati: 'Quelli che chiamati dalla grazia, dopo un primo entusiasmo hanno deposto il cingolo militare, ma poi sono tornati, come i cani, sui loro passi, al punto da versare denaro e da ricercare con benefici la vita militare, facciano penitenza per dieci anni, dopo aver passato tre anni fra gli audientes. Ma, per questi penitenti, bisognerà guardare la loro volontà ed il modo di far penitenza. Quelli, infatti, che col timore, con le lacrime, con la pazienza, con le buone opere dimostrano con i*

Middle Ages, those who used the sword or knife in their previous professions (soldiers) had a canonical impediment for the priesthood. Although they could become brothers, they could not become priests[342].

Notwithstanding these Christian beliefs on human life, earthly life was never regarded as always of such ultimate value (absolute good) that it could not be sacrificed for the sake others[343]. Since the beginning of the Church – especially as seen clearly in the time of persecution – martyrdom has always been highly esteemed as the participation in Christ's suffering and death[344]. Although they did not look for death, however, if the situation forced them to choose, they did not hesitate to forfeit their lives as testimony of their faith or for the sake of the Kingdom of God or for the sake of other people. This act was not the same as giving up their lives or committing suicide because they did not seek death for itself but the death is a direct consequence of defending Christian values (faith). In this perspective, although earthly life is a wonderful gift from God, it is God himself as the giver of life who is greater and more important than the life of human beings. Therefore, they gave their lives in order to obtain the greatest gift of life: communion with God. In this case, one essential element that cannot be omitted is the consent and free choice of the person. There had to be a conscious willingness of the person to accept death in this way. In other words there cannot be other people who forced the person – whether directly or indirectly – so that he was sacrificed by other people.

When the persecution of the Christians was completed and Christians began to participate in national institutions such as the military, they had to resolve the problem of conformity between Christian discipleship and being citizens of the Roman Empire. St.

---

fatti, e non simulano la loro conversione, costoro, compiuto il tempo prescritto da passare fra gli audientes, potranno essere ammessi ragionevolmente a partecipare alle preghiere; dopo ciò, il vescovo potrà prendere nei loro riguardi qualche decisione anche più mite. Ma quelli che si comportano con indifferenza, e credono che per la loro espiazione sia sufficiente questa penitenza, devono senz'altro scontare tutto il tempo stabilito.'" Giuseppe Alberigo (ed.), Decisione dei Concili Ecumenici, UTET, Torino, 1978, pp. 109 – 110

[342] David C. Thomasma, "Assisted Death and Martyrdom", p. 128

[343] Helmut Weber, *Teologia Morale Speciale: Questioni Fondamentali della Vita Cristiana*, San Paolo, Cinisello Balsamo, 2003, p. 67

[344] Eberhard Schockenhoff, *Etica della Vita: Un Compendio Teologico*, Queriniana, Brescia, 1997, *p.* 195

Augustine (354 – 430) presents answers to this question, especially regarding the use of war. St. Augustine agreed with the use of violence under certain conditions: that the war was waged by a legitimate civil authority that is understood as coming from God; that the war was necessary to punish crime or to uphold the peace; and that the combatants intended to establish justice rather than hatefully to inflict suffering upon their enemies[345].

St. Thomas Aquinas (1225 – 1274) while quoting Augustine extensively, further developed Augustine's teaching on just war. Aquinas developed the right (reasons) for going to war (*jus ad bellum*) and the just means in war (*jus in bello*)[346].

From this brief history, we can see that in the long history of the Church, earthly human life has not always been regarded as an absolute good. In modern times Pope John Paul II reaffirmed this teaching in *Evangelium Vitae*. "*Certainly the life of the body in its earthly state is not an absolute good for the believer, especially as he may be asked to give up his life for a greater good.*"[347]

Theologically speaking, this quotation of *Evangelium Vitae* demonstrates that this earthly life is not our eternal dwelling place and that earthly life is relative. The absolute life of a Christian is life eternal in heaven. "*For we know that if the earthly tent we live in is destroyed, we have a building from God, a house not made with hands, eternal in heavens.*"[348] So death is the real *dies natalis* in which we live new lives[349]. Briefly, since the most precious life for the Christian is life in union with God, earthly life can be sacrificed for God's sake in order to achieve this union. To accentuate this teaching, *Veritatis Splendor* quotes Saint Ignatius of Antioch, "*Hence martyrdom is also the exaltation of a person's perfect "humanity" and of true "life."*"[350]

Sacrificing life for the greater good can also be seen as an act of love toward our brothers and sisters. The kenosis of Jesus is in the same

---

[345] Lisa Sowle Cahill, *Love your Enemies: Discipleship, Pacifism, and Just War Theory*, p 58

[346] Lisa Sowle Cahill, "La Tradizione Cristiana della Guerra Giusta: Tensione e Sviluppo", in *Concilium: Pivista Internazionale di Teologia* 37(2001) 296 – 308

[347] *Evangelium Vitae* no. 47

[348] 2 Corinthians 5: 1

[349] Donal Clancy, "Il Valore Assoluto e Relativo della Vita Umana", in Pontificio Academia per la Vita, *Commento interdiciplinare alla Evangelium Vitae*, Libreria Editrice Vaticana, Vatican, 1997, p. 386

[350] *Veritatis Splendor*, No. 92

vein. He offered his life for the salvation of the human race. In this case, it is important to mention certain crucial points that cannot be omitted. There is always the consent of the one who wanted to sacrifice his life and that death itself is not the goal. The goal is always the salvation of others which in special circumstances motivates someone to sacrifice his or her life in order to save other people.

Thus, we can summarize some conditions in which the sacrifice of human life can be justified:

- The motivation of the sacrifice is for the greater good.
- There is consent from the person who desires to sacrifice his/her life
- The direct motive of the sacrifice is not death itself but the greater good which in special circumstances costs a person's life.

b. Inviolable Value of Human Life in Philosophical Context

As we have seen in the previous chapter, human life has inherent dignity and that a human being from the beginning of his life is a person. Dionigi Tettamanzi reaffirmed what Romano Guardini had said, that human life cannot be violated because a human being is a person. A person is a being who has the capacity of auto-dominion, personal responsibility, live in the truth and in moral order[351].

Also in the philosophical context, although most of the ethicists agree – as Dionigi Tettamanzi and Romano Guardini – human life is inviolable but in certain circumstances such as legitimate self defense, the just war, and death penalty some ethicists agree that human life is not an absolute value so that human life can be ended[352].

In the case of legitimate defense, St. Thomas Aquinas elaborated the principle of the double effect (*duplex effectus*) in which he distinguished the direct intention from the indirect intention. The direct intention of the person in this case is to save his life while the killing of the aggressors is not intended. Saving his own life is lawful because it

---

[351] Dionigi Tettamanzi, *Nuova Bioetica Cristiana*, Piemme, Casale Monferato, 2000, p. 40; Eberhard Schockenhoff, *Etica della Vita: Un Compendio Teologico*, Queriniana, Brescia, 1997, p. 192

[352] Paolo Cattorini, *La Morte Offesa: Espropriazione del Morire ed Etica della Resistenza al Male*, Edizione Dehoniane Bologna, Bologna, 1996, p. 175; Leon R. Kass, *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics*, Encounter Book, San Francisco, 2002, p. 236

is natural to everything to keep itself in being, as far as possible[353]. Since the justification of a moral act is based on the intention of the act, so the killing of the aggressors in this case is justifiable if it uses the necessary violence. On the contrary, one may defend his life unlawfully if he uses more than necessary violence[354]. Some people consider that such valuation which based only on the situation of the individual and the aggressors is not enough. It is necessary to include the general protection of the citizens against possible aggressors[355]. In this case, Thomas Aquinas also said that the public authority "*is lawful to kill an evildoer in so far as it is directed to the welfare of the whole community.*"[356] From this point, some people concluded the justification of the death penalty, provided that the evildoer lost his right to life for the welfare of the whole community.

Nowadays, there are many discussions about the justification of such a death penalty. In ancient times, many people regarded capital punishment as the only effective means to defend the welfare of the whole community, so that capital punishment was justified. In the modern world, on the contrary, capital punishment has lost its justification because there are many available means to reduce criminality so that capital punishment is not the only effective means anymore to defend the welfare of the whole community. Therefore, there are many countries that have abolished the death penalty[357].

Concerning the just war, Thomas Aquinas said that there are conditions in which war is justified. Those conditions are: "*First, the authority of the sovereign by whose command the war is to be waged. Secondly, a just cause is required, namely that those who are attacked, should be attacked because they deserve it on account of some fault. Thirdly, it is necessary that the belligerents should have a rightful intention, so that they intend the advancement of good, or the avoidance of evil.*"[358]

The *jus ad bellum* (the right to go to war) – which has been mentioned in the previous chapter – is the descriptions to determine

---

[353] Thomas Aquinas, Summa Theologia II-II, q.64, a.5 *"everything naturally loves itself, the result being that everything naturally keeps itself in being, and resists corruptions so far as it can."*

[354] Thomas Aquinas, *Summa Theologiae* II – II, q.64, a.7

[355] Eberhard Schockenhoff, *Etica della Vita: Un Compendio Teologico*, p. 196

[356] Thomas Aquinas, *Summa Theologiae* II – II, q. 64, a. 3

[357] Eberhard Schockenhoff, *Etica della Vita: Un Compendio Teologico*, p. 194

[358] Thomas Aquinas, *Summa Theologiae* II – II, q.40, a.1

which sets of political and military circumstances to justify a military response. It focuses on the legitimate authority, just cause, intention and objectives of war to construct the peace and attempts to determine whether use of force to redress a given wrong has a reasonable hope of success. It can be applied after considering that the non-violent alternatives gave no success. Briefly, the criteria of the *jus ad bellum* include: legitimate or competent authority, just cause (the safeguard of the welfare of the whole community), right intention (the intention of the war is peace and not revenge or destruction), announcement of intention, last resort (there is no other means to achieve the intention), reasonable hope of success, proportionality[359].

The *jus in bello* (right conduct within the war) is the just means to conduct military operations. The central idea of this theory has two points. The first is *discrimination*: using force against those who are morally and legally responsible for the attack and not deliberately against others. The second is *proportionality*: a reasonable balance between the damage done in the responding attack and the military value of the targets destroyed[360].

The above traditional criteria – in which the sacrifice of human life is justifiable – now are being questioned. Some people argue that such criteria are not suitable anymore in the modern world where the machines of war are sophisticated and can not distinguish the enemies from the civilians. Furthermore the social situation is changing dramatically so that the conditions are very different from the Middle Ages when the doctrine was composed.

On the contrary, in biomedical research some organizations proposed other criteria in which human life can be sacrificed for the purpose of the research. For example, The Warnock Committee justified the use of the human embryo for research before the age of 14 days, even though it means the killing of the embryo, provided that the

---

[359] James F. Childress, *Moral Responsibility in Conflict: Essays on Nonviolence, War, and Conscience*, Louisiana State University Press, Baton Rouge, 1982, pp. 64 – 65; Lisa Sowle Cahill, "La Tradizione Cristiana della Guerra Giusta: Tensioni e Sviluppo" in *Concillium: Rivista Internazionale di Teologia* 2(2001) 100 – 101

[360] James F. Childress, *Moral Responsibility in Conflict: Essays on Nonviolence, War, and Conscience*, p 64 – 65; Lisa Sowle Cahill, "La Tradizione Cristiana della Guerra Giusta: Tensioni e Sviluppo", pp 100 – 102

benefit of the research is greater than the value of the embryo[361]. There are many disputes against this justification.

[361] Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, p. 62

CHAPTER III

DANGER OF HUMAN CLONING

After discussing the biological aspect of human cloning in the chapter one and the properties of human life in chapter two, in this chapter we will interface these two chapters to clarify the real and eminent problems of human cloning. These problems refer to how and why human cloning threatens or assaults human dignity in many aspects, how and why human cloning jeopardizes moral principles that have been guiding human conduct for centuries as well as how and why human cloning endangers human and familial values which have been guiding human relationships for centuries.

As a new discovery, human cloning simultaneously creates confusion and fear as well as hope. Some of the fears are based on the misconception of human cloning itself but many of them are real and substantial. Some of the confusion exists because so many interests come into play in this new discovery whether they be business, pride, scientific hunger to explore nature as well as ethics, belief, and religion. Human cloning touches the most essential value of human life and shakes the common inner value of humanity. Because of these reasons, there is no wonder that Ronald M. Green, one of the leading bioethicists from the Ethics Institute Dartmouth College New Hampshire, said, "*No biomedical technology has produced more ethical controversy or fear than has human cloning.*"[1]

We will investigate and evaluate these problems in order to get a clearer understanding of them and then draw some conclusions to elucidate our standpoint on human cloning. In fact, human cloning is a kind of medical intervention on human embryo. The Church gave many inspiring guidelines regarding the intervention on human embryo in Vatican instruction *Donum Vitae*. One of the most important guidelines

---

[1] Ronald M. Green, "Ethical Implications of Cloning", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 477

in *Donum Vitae* is that respect of the human embryo as being be the center of our moral evaluation. *"A preliminary point for the moral evaluation of such technical procedures is constituted by the consideration of the circumstances and consequences which those procedures involve in relation to the respect due the human embryo."*[2]

The major part of this discussion will be centered on cloning to create human beings and only a small part of the discussion will be dedicated specifically to cloning to create the therapeutic means. This is due to the fact that cloning to create therapeutic means is nothing less than murder, the killing of an innocent human being. As we have seen in the previous chapter (II.A), when fertilization is finished, the life of a human being begins. So any kind of deliberate ending of this life is called killing of an innocent human being. We have also explained in the previous chapter (I.D.7.b) that the embryo is destroyed in order to harvest embryonic stem cells because the most important part of the embryo (embryoblast) is taken away so that the embryo cannot continue to live. Briefly, cloning to create therapeutic means is a form of killing innocent human beings. It is murder[3]. Pope John Paul II gave a strong warning against this kind of murder in his encyclical *Evangelium Vitae* when he said, *"the commandment 'You shall not kill' has absolute value when it refers to the innocent person."*[4]

The moral problems of cloning to create therapeutic means are doubled than cloning to create human being: most of the moral problems of the cloning to create human being are applied to the cloning to create therapeutic means; in addition there are the serious moral problems of killing innocent human beings (abortion). This point was clearly stated by the permanent observer of the Holy See to the United Nations, Archbishop Celestino Migliore, when he made remarks on October 21, 2003, on Item 172 of the agenda of the 58th General Assembly on the International Convention Against the Cloning of Human Beings. When he spoke about stem cells, he said, *"A cloned embryo, which is not destined for implantation into a womb but is created for the sole purpose of extraction of stem cells and other materials, is destined for pre-programmed destruction."* Further he

---

[2] *Donum Vitae* II

[3] cf. Pontificia Academia pro Vita, *Declaration on the Production and the Scientific and Therapeutic use of human Embryonic Stem cell,* Libreria Editrice Vaticana, Città del Vaticano, 2000, pp. 14 – 15

[4] *Evangelium Vitae* no. 57

said, "*If the United Nations were to ban reproductive cloning without banning cloning for research, this would, for the first time, involve this body in legitimizing something extraordinary: the creation of human beings for the express purpose of destroying them.*"[5]

A. Human Beings Playing God

"Human beings are playing God" is a commonly used phrase in biotechnological discussions. There are several meanings of this phrase[6] but the most used in biotechnological discussions is in relationship to its theistic and non-theistic meaning. In the theistic circles, this phrase is used to affirm that God is the creator of the universe and that the human being is a creature. God is the Lord of the creation (human being) and a human being is the administrator of his life. In this case, the term "playing God" is invoked to warn human beings not to act as though he were the lord of his life (the owner) with power over his life. In the non-theistic environment, this phrase is used to affirm that there are fixed genetic barriers which divide species or at most genuses. Crossing these lines is wrong in much the same way that crossing a property line is wrong[7]. So, the term "playing God" is used to give a warning to human beings not to go beyond their appropriate limits in remolding or "recreating" their human nature[8]. With the advance of the genetic and medical technologies, the dangers are imminent both in the theistic and in the non-theistic environment. People can change the nature of human beings with genetic engineering and they can even create human beings with cloning.

The theme of "playing God", though, is not a new issue in biological discussion, especially in the era of biological revolution. Mary Wollstonecraft Shelley who created the famous story of

---

5 http://www.vatican.va/roman_curia/secretariat_state/2003/documents/rc_segst_20031021_migliore-cloning_en.html

6 Allan Verhey, "Playing God and Invoking a Perspective", in Richard Sherlock and John D. Morrey (eds.), *Ethical Issues in Biotechnology*, Rowman & Littlefield, Lamham, 2002, p. 73 – 78

7 Allan Verhey, "Playing God and Invoking a Perspective", in Richard Sherlock and John D. Morrey (eds.), *Ethical Issues in Biotechnology*, Rowman & Littlefield, Lamham, 2002, p. 71

8 Robert M. Veatch, *The Basics of Bioethics*, Prentice Hall, Upper Saddle River, 2003, p. 149

Frankenstein in 1817 actually provided an alternative title, *The Modern Prometheus*, for his story[9]. In the Greek legend, Prometheus was a god who molded the clay figures that became humans. He also stole fire from heaven and made it available for human beings. It means that Prometheus gave human beings power that they ought not to possess. Prometheus had done something that crossed the border which he should not have done because it was a prerogative right of the gods.

With the success of Dolly, the danger of crossing the border is imminent so that Renato R. Martino, the Permanent Observer of the Holy See to the United Nations, when he made remarks to the United Nations on Human Cloning on November 19, 2001, said, "*The practice of cloning would usurp the role of creator and would thus be seen as an offense before God.*"[10]

This view is not a specifically Christian view because almost all religions teach that God is the creator of the universe and of human beings though they may explain creation in different ways. The role of Creator is God's prerogative rights, and human beings should not usurp this right. If human beings traverse this border, it means that these human beings are playing God because they are taking over the role which is reserved exclusively for God.

In this chapter we will discuss more deeply the meaning of 'playing God' in relation to human cloning and why human cloning crosses over borders into territory which is reserved for God alone.

1. God as Creator and Human Beings as Creatures

In modern times when the success of technology is unveiling so many mysteries of the universe, the teaching that God created the universe and created human beings is challenged from many directions. For example, Peter Vardy, the Vice-Principal of Heythrop College, University of London, discussed comprehensively this issue in his book *Being Human: Fulfilling Genetic and Spiritual Potential*[11]. In one of his conclusions in this book, he wrote, "*Some will, of course, find this*

[9] Robert M. Veatch, *The Basics of Bioethics*, Prentice Hall, Upper Saddle River, 2003, p. 149

[10] Renato R. Martino, "Remarks to the United Nations on Human Cloning", in *The National Catholic Bio thics Quarterly* 2(2002) 140

[11] Peter Vardy, *Being Human: Fulfilling Genetic and Spiritual Potential*, Darton Longman & Todd, London, 2003

uncomfortable and will still want to insist that each person is directly created by God. When little was known about reproduction, this position made sense but today it is far more difficult to justify."[12]

It may be true that some people are finding it more and more difficult to comprehend that God created the universe and its contents, but it may not necessarily be because of the advance of the genetic and other biological sciences. Actually, this difficulty is not held only in relation to God as creator of the universe, but it is also due to the loss of the sense of God in general. *Evangelium Vitae* gives some causes of this loss, such as *ecolatria* (the divinization of nature which is an ideology that considers it unlawful to interfere in any way with nature)[13], techno-scientism (an ideology that regards scientific truth as the only truth and thus allows people to manipulate nature or other people without limit.)[14], and many others.

The ideologies of *ecolatria* and techno-scientism are in opposition to each other, yet they exist simultaneously in our society. On one side, those who espouse the ideology of *ecolatria* forget that nature is neither an absolute good, nor an absolute evil, nor a supreme principle of human morality. Nature has value but these depend on God and this value is never above human beings[15]. On the other side, adherents to the ideology of techno-scientism try hard, almost at any cost, to dominate nature in order to relieve their thirst for power, dominion, and selfish egoism. Unfortunately, both ideologies lead to the degradation of human dignity because both of them refuse to acknowledge God as creator of the universe. The loss of the sense of God as creator also means the loss of the dignity of human life, even the loss of the human being itself[16] as *Gaudium et Spes* stated, "*For*

---

[12] Peter Vardy, *Being Human: Fulfilling Genetic and Spiritual Potential*, p. 54

[13] *Evangelium Vitae*, no. 22

[14] *Evangelium Vitae*, no. 22. *Fides et Ratio* no. 88. All citations from this encyclicals are taken from John Paul II, *Faith and Reason: Encyclical Letter Fides et Ratio*, Catholic Truth Society, London, 1998

[15] Gerardo Del Pozo Abejón, "Dio Creatore e Signore della Vita Umana", in Pontificio Academia per la Vita, *Commento interdiciplinare alla Evangelium Vitae*, Libreria Editrice Vaticana, Vatican, 1997, p. 323

[16] Gerardo Del Pozo Abejón, "Dio Creatore e Signore della Vita Umana", in Pontificio Academia per la Vita, *Commento interdiciplinare alla Evangelium Vitae*, Libreria Editrice Vaticana, Vatican, 1997, p. 323

without the Creator the creature would disappear. When God is forgotten, however, the creature itself grows unintelligible."[17]

The belief in God as Creator in Christian teachings is based on the first passages of the Bible. The book of Genesis, chapters 1 and 2, narrate the creation of the universe. There is sometime discussion on how God created the universe. Did God create the universe step by step as it is narrated in the book of Genesis? Some people say 'yes', yet others say 'no'. Although people may disagree on how God created the universe, most people do agree that God created the universe. It is important to note that the belief in God as Creator can be understood perfectly if it is not separated from the history of salvation. The history of Israel which was recorded in the Bible is the history of a loving salvation in which God created human beings because of his love and He does not abandon them. God always takes care of His human beings in any of life's situations regardless of the response of these human beings.

There are some important points to be noted regarding the creation of the universe and the creation of human beings.

a. Human Beings as Creatures

God created human beings as the highest peak of creation on the sixth day. The dignity of the human being is not only indicated in the chronological order of creation but also in the words of God. Scripture says, "*God created humankind in his image, in the image of God he created them.*"[18] From this passage we can see clearly that the human being is a creature of God and that God is the creator. But human beings are not ordinary creatures like the animals. They are special creatures because they are the only creatures which are created in the image and likeness of God.

As God's image, the human being lives constitutively in relation to God. This relation embraces every dimension of his existence. Eberhard Schockenhoff, a professor of moral theology at Albert-Ludwigs-Universität Freiburg, Germany, gave a very inspiring explanation of this important point. "*He (*humankind *ed.) owes his creaturely existence neither to a decision taken by his own freedom nor to a gift bestowed by someone else, but only to the creative address by*

[17] *Gaudium et Spes*, no. 21
[18] Genesis 1: 27

God's word. This means that he comes into existence as one called by God and is maintained in existence by the continuation of this creative address."[19] So the existence of a human being is caused by the creative work of God and his survival depends on God's continuing creative work.

This point is underlined by a special divine decision to create a human being. God said, "*Let us make humankind.*"[20] This passage indicates a solemn act and a deliberate decision of God[21]. This special divine decision was made only for the creation of a human being and not for the creation of other creatures (earth, plants, animals), therefore human beings must surely have a special meaning. This being special is to be found in the special relationship to God as the creator of his creature.

As we have seen in the previous chapter (II.B.3.b), it is this special relationship with God which gives a human being the dignity of a dialogue partner with God and makes him a human person[22] although this partnership is not an equal partnership in dignity because God is the creator of the human being and the human being is the creature. This partnership dialogue is a dialogue of salvation in which God, as the creator of the human being, takes care of this human being and draws him to a loving union with Himself in eternal life. God as the Creator is the almighty and lifts the human being who is powerless so that humankind may have a special relationship with God. This special relationship is very important to a human being because this relationship is a relationship of dependence in which the life of this human being depends on God. In other words, the human being will live as long as this human being has a relation with God and God holds him in being[23].

---

[19] Eberhard Schockenhoff, *Natural Law & Human Dignity: Universal Ethics in an Historical World*, The Catholic University of America Press, Washington D. C., 2003, p. 229

[20] Genesis 1: 26

[21] Claus Westermann, *Genesi: Commentario*, Piemme, Casale Monferrato, 1989, p. 25

[22] Eberhard Schockenhoff, Natural Law & Human Dignity: Universal Ethics in an Historical World, p. 230; Livio Melina, "Riconoscere la vita: Problematiche Epistemologiche della Bioetica", in Angelo Scola (ed.), *Quale Vita?: La Bioetica in Questione*, Mondadori, Milano, 1998, p. 97

[23] Eberhard Schockenhoff, *Etica della Vita: Un Compendio Teologico*, Queriniana, Brescia, 1997, p. 111

As the creator of the universe, only God has the full power over humankind. *Evangelium Vitae* reaffirmed this long lasting Church teaching. "*God alone is the Lord of life from its beginning until its end: no one can, in any circumstance, claim for himself the right to destroy directly an innocent human being.*"[24] This prohibition is based on the divine origin of human life which is created in the image and likeness of God, on life as a gift from God, and on the participation in the divine life (salvation)[25]. Therefore, it is God who has dominion over the life of the human being and the human being is only the administrator of his life. Consequently the human being cannot take his own life (suicide) or the life of another person (murder). *Evangelium Vitae* affirmed this point saying, "*man is not the absolute master and final judge, but rather—and this is where his incomparable greatness lies—he is the 'minister' of God's plan. Life is entrusted to man as a treasure which must not be squandered, as a talent which must be used well. Man must render an account of it to his Master.*"[26]

If we apply the paradigm of God's creation to human cloning, we will see the problems clearly. In human cloning, the creator of the human being is not God but another human being. It is a form of transgression of God's law in which God is the sole creator of the universe and humankind. This human creation is even worse because the so-called creator cannot give his creature (the cloned human being) a salvific relationship which leads to eternal life.

In cloning to create therapeutic means matters are even worse. A human being acts as if he were the creator and owner of the life of a human being. The cloner creates a human being and then kills him just as though the cloner had full power over the human being and, therefore, can create and terminate the life of this human being. This is a serious transgression of the border which human beings should not trespass because it is no less than the murder of an innocent human being. Human beings are not the owner of their lives but the administrator who have to safeguard their life from its existence until its natural death.

---

[24] *Evangelium Vitae*, no. 53
[25] cf. *Evangelium Vitae*, no. 39.53
[26] *Evangelium Vitae*, no. 52

b. Created as Man and Woman

The book of Genesis, chapter 1: 27 reads, "*in the image of God he created them; male and female he created them.*" In the creation of human beings, womanhood and manhood of the human being are not additional. It is an integral part of human nature that human beings are created as either man or woman[27]. God does not want his image and likeness are only reflected in man or only in woman, but God wants both woman and man to reflect his image and likeness. When God creates something, He always has a special intention or purpose for it. This is evident in the creation of woman and man. One of God's intentions in creating human beings as man and woman is the procreation or begetting of children.

There is given in creation a connection between the differentiation of the sexes and the begetting of a child. According to Silvio José Báes, right after human creation, the Genesis 1: 28 says "*God blessed them, and God said to them, 'be fruitful and multiply.*" Only God has the authority to bless because only God has the power to give life and to transmit the fecundity power. Thus, "to bless" means to multiply, to make fecundity, to grow the life so that it can be transmitted[28]. Gilbert Meilaender, a Lutheran theologian from Valparaiso University stated, "*the sexual differentiation is ordered toward the creation of offspring and children should be conceived within the marital union.*"[29]

In Catholic teaching, begetting children has always been a central theme in the doctrine of matrimony. In the context of marriage resides the only licit way of begetting children. Although there has been some discussions regarding whether or not begetting children was the first *finis* (good) of matrimony, there was never a doubt regarding whether or not begetting children is licit or illicit outside the sexual relationship in a marriage. The Vatican Instruction *Donum Vitae* gives three reasons why it is wrong to generate human life outside the marital act. Firstly, it is based on the inseparable connection between the unitive and

---

[27] Silvio José Báes, "L'Uomo nel Progetto di Dio: Genesi 1 – 3", in Bruno Moriconi (ed.), *Antropologia Cristiana: Bibbia, Teologia, Cultura*, Città Nuova, Roma, 2001, p. 179

[28] Silvio José Báes, "L'Uomo nel Progetto di Dio: Genesi 1 – 3", p. 179

[29] Gilbert Meilaender, "Begetting and Cloning" in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 40

procreative meaning of the marital acts. "*The Church's teaching on marriage and human procreation affirms the "inseparable connection, willed by God and unable to be broken by man on his own initiative, between the two meanings of the conjugal act: the unitive meaning and the procreative meaning.*"[30]

Secondly it is based on the 'language of the body' as the expression of personal love and mutual self-gift between husband and wife. Since the union of body and soul in human beings is an inseparable union, therefore all human acts involve both body and soul including the marital act. The sexual relationship between husband and wife is not merely a biological act (bodily) but it is a personal act and a conjugal act which involves both body and spirit. In other words, to be a personal act, procreation requires a free and responsible act of the couple which involves the body and soul being inseparable. Taking procreation out of a sexual relationship is the same as separating the body from the soul. It is a form of producing human being mechanically and therefore it means separating life from love[31]. *Donum Vitae* states this point emphatically when it says that,

> *The moral value of the intimate link between the goods of marriage and between the meanings of the conjugal act is based upon the unity of the human being, a unity involving body and spiritual soul. Spouses mutually express their personal love in the "language of the body," which clearly involves both "spousal meanings" and parental ones. The conjugal act by which the couple mutually expresses their self-gift at the same time expresses openness to the gift of life. It is an act that is inseparably corporal and spiritual. It is in their bodies and through their bodies that the spouses consummate their marriage and are able to become father and mother. In order to respect the language of their bodies and their natural generosity, the conjugal union must take place with respect for its openness to procreation; and the procreation of a person must be the fruit and the result of married love. The origin of the human being thus follows from a procreation that is "linked to the union, not only biological but also spiritual, of the parents, made one by the bond of marriage. Fertilization achieved outside the bodies of the couple remains by this very fact deprived of the meanings and the values which are expressed in the language of the body and in the union of human persons*[32].

---

[30] *Donum Vitae* no. II.4.a
[31] Maria Luisa Di Pietro, Elio Sgreccia, *La Trasmissione della Vita nell'Insegnamento di Giovanni Paolo II*, Vita e Pensiero, Milano, 1989, p. 15
[32] *Donum Vitae* no. II.4.b

Thirdly, it is based on the obligation of parents to regard the child always as a person and never as a product. When a human being comes into being through a marital act, it is a gift of the marital act and it becomes the crown of the marital act. As we have seen in the previous chapter (I.C.3) in the natural fertilization of a human being, the parents cannot "make" a child according to their will. They cannot decide their genome or physical form or other similar things except to accept their child as he is. This is a true begetting of a child and not a making of a child. In begetting children, the husband and wife are 'not making love' because conjugal love has been present in their relation. Rather, they are expressing their conjugal love in a reciprocal gift as irreplaceable and non-substitutable persons complementary in their sexuality, and opening themselves to the gift of human life[33]. Thus, from the point of view of the parents, a child is the crown of their mutual love and self-giving. Their child is not the product of 'making' a baby. The child is not the product of a technique which can be regarded as an object. *Donum Vitae* underlines this important point when it says that:

> *Only respect for the link between the meanings of the conjugal act and respect for the unity of the human being make possible procreation in conformity with the dignity of the person. In his unique and unrepeatable origin, the child must be respected and recognized as equal in personal dignity to those who give him life. The human person must be accepted in his parents' act of union and love; the generation of a child must therefore be the fruit of that mutual giving which is realized in the conjugal act wherein the spouses cooperate as servants and not as masters in the work of the Creator who is Love."*[34]
>
> *"In reality, the origin of a human person is the result of an act of giving. He cannot be desired or conceived as the product of an intervention of medical or biological techniques; that would be equivalent to reducing him to an object of scientific technology. No one may subject the coming of a child into the world to conditions of technical efficiency which are to be evaluated according to standards of control and dominion*[35].

From this perspective, it is clear that cloning a human being cannot be justified. First of all, this position is related to the fact that

---

[33] William E. May, *Catholic Bioethics and the gift of Human Life*, Our Sunday Visitor, Huntington, 2000, p. 70

[34] *Donum Vitae* no. II.4.c

[35] *Donum Vitae* no. II.4.c

human cloning is an asexual reproduction of a human being as well as a product of a technique which separates the marital act from the fecundity. If contraception separates the unitive and procreative meaning of the marital act because the couple does not want a baby as a result of the marital act, on the contrary in human cloning, people separate the unitive and procreative meaning of the marital act because they want a baby without the marital act. In both ways, "the language of the body" is speechless because it is used improperly and gives a false signal which leads to distortion. The marital act which is meant to be the communication of love, understanding, and mutual self-giving, is used improperly; consequently the aim of communication cannot be achieved.

Cloning a human being is also a form of degradation of human procreation. In a definite sense we cannot even call it 'begetting' because the cloned human being is a product of a manufacturer. In this manufacture, a human being is made according to the will and the taste or the style of those who want it. Unfortunately, taste and style is always changing, but a human being, once it is made, cannot be changed or destroyed because a human beings' right to life has to be respected and we cannot just discard them. In this case, Leon Kass' comment on human cloning is very appropriate: "*cloning represents a giant step (though not the first one) toward transforming procreation into manufacture, that is, toward the increasing depersonalization of the process of generation as artifacts, products of human will and design.*"[36]

c. Created and Loved

As we have seen thus far, the creation and salvation of a human being share an inseparable union as the expression of God's creative work, He who takes care of His human beings. God's creative work in creating a human being is motivated and performed by love. He creates human beings, man and woman, out of love. When John Paul II gave a discourse to the priests who participated in a seminar on "Responsible Procreation", he underlined this point when he said, "*The origin of each*

[36] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, p. 27

human person is God's creative work: nobody comes into existence by chance. He is always the final destination of God's creative love."[37]

God's creative love achieved its fullness in the redemption of the world. God has always taken care of his human beings and loved them so deeply and personally that when they were separated from Him, He sent his only Son as Savior to redeem the world. "*For God so loved the world that he gave his only Son, so that everyone who believes in him may not perish but may have eternal life.*"[38]. Because of this redemptive love each human being is made into a new creation. "*So if anyone is in Christ, there is a new creation: everything old has passed away: see, everything has become new.*"[39] It is only because of the love of the Father that humankind can become the children of God. "*See what love the Father has given us, that we should be called children of God; and that is what we are.*"[40]

Thus, there is an inseparable relation between the creation of the world (humankind) and the love of God. God who is love[41] embraces humankind from the time of their creation until they are called to their full union with God. Because God is love and all of his acts toward humankind are acts of love, it is no wonder that God commands human beings to love God and to love each other. In fact the greatest comandmend of God is the comandment to love God and to love our neighbour[42].

As the partner of God, a human being participates in God's creative work in procreating a new human being. *Evangelium Vitae* affirmed that "*Begetting is the continuation of Creation.*"[43] Certainly, in procreating a new human being, a human person need to be in harmony with God and use the same criteria as God uses, that is that of love. This is the reason why the Catholic Church always insists that children must be the fruit of the parents' love. "*In reality, the origin of*

---

[37] John Paul II, "Discorso ai Sacerdoti Participanti a un Seminario di Studio su 'La Procreazione Responsabile", September 17, 1983, in *Insegnamenti di Giovanni Paolo II*, Vol VI/2, p 562. Translation is mine.

[38] John 3: 16

[39] II Corinthians 5: 17

[40] 1 John 3: 1

[41] I John 4: 8. 16

[42] Matthew 22: 37 – 40

[43] *Evangelium Vitae*, no. 43

a human person is the result of an act of giving. The one conceived must be the fruit of his parents' love."[44]

Once a child is conceived, he must be respected in an absolute way. After giving many philosophical reasons in previous chapters such as the dignity of a human being and his uniqueness[45], *Donum Vitae* gives another spiritual reason for this respect. It states that human beings are the only creatures on earth that God has wished for himself.

> *From the moment of conception, the life of every human being is to be respected in an absolute way because man is the only creature on earth that God has "wished for himself" and the spiritual soul of each man is "immediately created" by God; his whole being bears the image of the Creator. Human life is sacred because from its beginning it involves "the creative action of God" and it remains forever in a special relationship with the Creator, who is its sole end. God alone is the Lord of life from its beginning until its end: no one can, in any circumstance, claim for himself the right directly to destroy an innocent human being*[46].

The inseparability of creation and love cannot be easily identified in the creation of human beings through cloning. There were studies which demonstrated that the majority of the motivations of the one who wants to clone himself is not love toward the cloned human being but it is a selfish and confused motivation[47]. We have seen in the previous chapter (I.E.1) some prospective candidates for cloning to create human beings such as the homosexual person, the one who wants to replace a loved one, the sterile couple and others. We can well imagine that the motivation of those people is not love for the cloned human being as much as it is more for the self-satisfaction or egoism of those who clone them. Let us take an example. Mr. X clones his dead child whose name is A. From this process of cloning is born the baby B. From this fact we can investigate many interesting points. First of all, the existence of baby B is not because of love for this particular baby B as he is, but because of love for another person, A, which is diverted to this baby B. Mr. X may love baby B also but baby B is loved not because of his personal qualities but because of his similarity to another

---

[44] *Donum Vitae* no. II.4.c
[45] *Donum Vitae* Introduction 3
[46] *Donum Vitae* no. 5
[47] Carson Strong, "Cloning and Infertility" in Glenn McGee, *The Human Cloning Debate*, Berkeley Hills Book, Berkeley, 2002, p. 187

person, A. In other words, baby B is loved not because of he is a person but because of something else which is outside of his personality. This love is not love for the sake of love but it is love to satisfy Mr. B's desire. It is a form of egoism which is manifested in creating another human being.

2. Life of Human Beings as a Gift from God

The discussion of life as a gift in bioethics has a close relationship with the value of life. The Catholic Church holds that the life of a human being has value because it is a gift from God and has the image and likeness of God in its origin. (See previous chapter II.B.3.b).

John Kleinig observed that the notion of "life is a gift" is awkward because it does not follow the normal understanding of gift[48]. In the normal understanding of a gift, there are two persons, one who gives the gift and another who receives the gift. But this understanding does not work with the notion of life as a gift. There is no preexisting person who receives the gift. The receiver exists together with the gift itself. Kleinig argues that it makes more sense if we speak of continuing life as a gift since God takes care of human beings and it is God's providential activity toward the already living beings.

Kleinig is right when he says that there is no preexisting person who receives the gift but I have some objections to Kleinig's position. I assume that a person who can receive something is a living person and not a dead one. If so, it means that after receiving the gift of life from God the person has two lives, doesn't he? The next question might well be "from where does the person get his first life?" So the notion of life as a gift is very special one. The specialty of this gift lies in the receiver and the gift itself. The receiver is special because the gift marks the beginning of his existence. The gift itself is very special because of the value of the gift itself and what is represented by the gift. This gift is the life of a human being.

The value of the life of a human being is self-proof because without the life of a human being there is no other value. Richard A. McCormick summarized rightly his view on the life of a human being when he said, "*Life as a condition for other values and*

---

[48] John Kleinig, *Valuing Life*, Princeton University Press, Princeton, 1991, p. 64

achievement."[49]. The gift of life also has value because of what is represented by the gift. The book of Genesis narrates about God creating humankind when it says, "*The Lord God formed man from the dust of the ground and breathed into his nostrils the breath of life; and the man became a living being.*"[50] Claus Westermann commented that this passage is a miracle of life in which a human being is God's creature in all of his existence[51]. The breath which is breathed into man's nostrils is the breath of God. It represents God himself because the gift represents the giver[52]. According Joseph Cardinal Ratzinger the breath of God in human beings means that the Divine reality enters into the world. In human being, heaven and earth are interconnected[53]. The value of life is even more valuable because this is a gift which comes from God who is the source of life[54].

It is no wonder that in the teaching of the Catholic Church, the notion that life is a gift from God becomes the centerpiece of procreation. In the many teachings of the Church, it is always stressed that the life of a human being is a gift from God[55]. The solemn affirmation that life is a gift is at the opening phrase of *Donum Vitae*, "*The gift of life which God the Creator and Father has entrusted to man...* "[56] In this encyclicals, it is stated that life as the gift of God is a fundamental principle that must be placed at the center of one's reflection thereby enabling human beings to resolve the moral problems of human reproduction. "*The gift of life which God the Creator and Father has entrusted to man calls him to appreciate the inestimable value of what he has been given and to take responsibility for it: this fundamental principle must be placed at the center of one's reflection in order to clarify and solve the moral problems raised by artificial*

---

[49] Richard A. McCormick, *How Brave A New World: Dilemas in Bioethics*, Georgetown University Press, Washington D.C, 1981, p. 405
[50] Genesis 2: 7
[51] Claus Westermann, *Genesi: Commentario*, Piemme, Casale Monferrato, 1989, p32
[52] Jean Laffitte, "Vita Umana: Dono, Vita e Perdono" in Angelo Scola (ed.), *Quale Vita?: La Bioetica in Questione*, Mondadori, Milano, 1998, pp. 282 – 283
[53] Joseph Cardinal Ratzinger, *Creazione e Peccato*, Edizione Paoline, Cinisello Balsamo, 1986, p. 37
[54] cf. Psalm 36.9
[55] Catechism of the Catholic Church, no. 2260, *Evangelium Vitae*, no. 19
[56] *Donum Vitae*, Introduction, 1

interventions on life as it originates and on the processes of procreation."[57]

Naturally in each gift, there is always a deep relationship between the giver and the receiver which goes beyond a duty-relationship or obligation-relationship. In giving something, the giver passes over the limit of obligation or duty and enters in the realm of an intimate relationship. So the gift is more than justice in which one is obliged to give what is due to another. The motivation of doing this act goes beyond justice to love. Love for another person moves the giver to act for more than merely duty or obligation. The giver's act is oriented to the good of the receiver so that the giver is ready to renounce something that he possesses. Thus, if God gives life to a human being, it is an expression of God's love in which God acts beyond the limit of obligation. When human beings chose to separate from God's love, God did not hesitate to send his only Son to the world. The Son is ready to renounce his equality with God in order to redeem human beings[58]. Briefly, the life of a human being is a gift but it is a special gift because it is a gift from God, which is a gift of love. *Donum Vitae* gives the reason why God loves humankind, "*man is the only creature on earth that God has 'wished for himself'*"[59].

Since the life of a human being is a loving gift from God, so too is the origin of life from God. Since it comes from God and it will return to God, it bears the 'signature' of God. As we have seen in the previous chapter about the sanctity of life (II.B.5) the divine origin and the final destination of life makes human life sacred and inviolable by human beings. *Donum Vitae* underlines this point nicely when it says, "*Human life is sacred because from its beginning it involves the creative action of God and it remains forever in a special relationship with the Creator, who is its sole end.*"[60]

The inviolability of human life also comes from the fact that the life of a human being belongs to God. Since the life of a human being is a loving gift from God, so this life itself does not belong totally to the human being. The human being is not the master of his life but he is the administrator or custodian of his life. Thus, this gift is a gift that bears the responsibility for human beings to safeguard it carefully. Since the

---

[57] *Donum Vitae*, Introduction, 1
[58] cf. Philippians 2: 6 – 11
[59] *Donum Vitae* no. 5
[60] *Donum Vitae*, Introduction no. 5

power of the human person over his life is only as administrator or custodian and not as master, therefore what people ought to do is always in the line of humanization and never manipulation[61].

On a biological level, there is clear sign that the life of a human being is a gift. We have seen in the previous chapter (I.C.3) in natural fertilization in which the natural beginning of the life of a human being occurs, parents cannot decide the genomic identity or even get involved in "making up" their children. What they can do is all that is necessary that the ovum and the sperm can meet each other at the right place and right time in order to facilitate fertilization. The rest is beyond the parents' power. They cannot determine which sperm must meet the ovum nor what the genome of their child will be. They cannot determine the color of the child's eyes and so forth. Briefly, parents do not "make" their child because actually all they do is to prepare the necessary factors for fertilization and arrange the meeting of the sperm and ovum. A child, as the fruit of fertilization, is not the product of their intention or design or desire, but is the fruit of nature which works like a "lotto by chance". The players (mother and father) cannot determine the final result because it is unpredictable. In the lotto, although there may be no written law which regulates the acceptance of the final result, there is a consensus that all the players must accept the final result as it is and not the way they want it to be. The only thing that they can do is to receive whatever the final result is. If the final result is bad, they cannot complain to the owner with the lotto and if the final result is good, they are happy. Although they are happy with the favorable final result, they must remember that this good final result is not the fruit of their projects or design but their good fortune. Thus, children that parents long for are a gift that they cannot determine or demand according to their will or desire. The new life which emerges at the fusion of the parents' DNA is a new genome which is unique and unrepeatable. (See chapter II.A.3). Although the father and mother contribute half of the child's genome, they cannot claim that the new genome is theirs. The new genome of the child is neither the mother's genome nor the father's genome. Since the beginning of life, a child's genome is totally different from his father's and his mother's genome. Briefly, from the point of view of genetics, the emerging of a new

[61] Dionigi Tettamanzi, *Nuova Bioetica Cristiana*, Piemme, Casale Monferato, 2000, pp 110 – 111

human life is a gift because a child's existence is beyond the parents' design and determinations[62].

If we reflect on human cloning with the criterion that the life of a human being is a gift from God, we will see the problems clearly because it is totally contrary to all we have said above. In human cloning, the existence of new a human being is not a gift but it is the product of techniques which are applied according to human design and desire. The new human being is not the expression of love of the giver. The givers of life are the machines and the ability of human beings to manipulate human cells. The cloners act as though they are the masters of life and, therefore, can manipulate and direct the development of life according to their wills. The cloners take human cells and place them into a laboratory where they manipulate, control, and direct the development of these cells and literally "make" a new human being according to their design. The power of the cloner is seemingly unlimited. Not only can they direct and manipulate human life but they also have the power to kill this human life if the results do not correspond to the existing design. And in the case of cloning to create therapeutic means they kill to harvest their stem cells. Pontificia Academia pro Vita stated rightly that one of the roots of this problem resides in the way people view human being either as a gift of love or as an industrial product. "*The difference should again be pointed out between the conception of life as a gift of love and the view of the human being as an industrial product.*"[63]

3. Dominion over the Earth and Participation in God's Creative Work

Unlike the above position on the creation of the world wherein we arrive at the conclusion that human life is a gift with all that it implies, some people find other moral obligations to rule or dominate the world from the creation account in the book of Genesis. And they come to an opposite conclusion. In the book of Genesis, we can read

---

[62] Gilbert Meilaender, "Begetting and Cloning", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 42

[63] Pontificia Accademia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p 15

that after God created humankind, God said to them, "*Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth.*"[64]

From the history of humankind, one can learn that the most effective way to dominate the earth is through science because science has dramatically improved the quality of life of human beings. Through science, a human being can plan, direct, and exploit the earth for the well-being of humankind. Some people affirmed that this moral obligation to dominate the earth needed to be applied also in the case of the procreation of human beings so that human existence could be better planned, more rational and progressive[65]. Cloning a human being can be seen as the application of this principle in the procreation of a human being so that human existence is no longer under the dominion of uncertainty, but that it is more regulated, planned, and guided by human beings themselves. The one who procreates is a human being, thus it is the procreation of a human being. It is logic that the human being would have the power to regulate, to decide, and to make the procreation.

We will see further whether or not this affirmation can be defended either theologically or ethically.

In the last century, the above citation from Genesis aroused many controversies especially in its relation to the unlimited exploitation of the environment. Some people targeted the devastation of the environment as being caused by a religious conception of the universe which is based on the above passage. The anthropocentrism of the biblical teaching of presenting the human being as made in the image of God and as having the power to rule the world, stirred up many misunderstandings and controversies.

Certainly, if we reduce the Scriptures only to this passage, this narrow view may yield controversy regarding how humankind must deal with the universe, especially in the area of technology. Scripture provides many passages from which we can learn how to deal with technology. For example, the building of the Tower of Babel[66] is a good example of how technology can destroy humankind and forced

---

[64] Genesis 1: 28

[65] Robert M. Veatch, *The Basics of Bioethics*, Prentice Hall, Upper Saddle River, 2003, p. 150

[66] Genesis 11: 1 – 9

people to group according to their language (division of human languages and nations). But scripture also points out that technology is not always bad. It is the work of the Divine Spirit[67].

Let us look at the controversial passage in the Genesis 1: 28. Claus Westermann, a professor of the Old Testament in Berlin and Heidelberg, offered an interesting opinion on this point. According to Claus Westermann, the word "dominion" in Genesis 1, 28 does not mean exploitation at all but – according to the ancient understanding - it was used to indicate the dominion of the king in which the king took responsibility personally for the prosperity and welfare of his people. So the king's dominion served the common good and the well being of those over whom the king had dominion. So in this case, human beings taking dominion over the universe which is represented by fish, birds, and all living things that move upon the earth, means that human beings take responsibility personally for the well being of this universe[68].

Joseph Cardinal Ratzinger insisted that the unjust accusation against Christianity regarding exploitation of the earth is caused by incompleteness in reading the Genesis. In Genesis 2: 15, "*The Lord God took the man and put him in the garden of Eden to till and keep it.*" It is clear that the human's duty is to till and to keep the universe. The duty to dominate the world has to be performed in such away that it will not destroy the world and human beings[69].

Almost in the same line, Charles M. Murphy explained that human dominion over the world has to be carried out on behalf of God so that the divine rules become the norm of human behavior. God rules the world with love and justice. The dominion of the world has to be understood as "caring for" and not manipulating or to exploiting[70].

On many occasions, the Catholic Church admonishes humankind regarding the obligation to care for the universe and not to exploit it or to manipulate it. For examples, in the encyclical *Redemptor Hominis*

---

[67] "*See I have called by name Bez'alel son of U'ri son of Hur, of the tribe of Judah: and I have filled him with divine spirit, with ability, intelligence, and knowledge in every kind of craft to devise artistic designs, to work in gold, silver and bronze, in cutting stones for setting, and in carving wood, in every kind of craft.*" Genesis 31 : 2 – 5

[68] Claus Westermann, *Genesi: Commentario*, Piemme, Casale Monferrato, 1989, p. 25

[69] Joseph Cardinal Ratzinger, *Creazione e Peccato*, pp. 30 – 31

[70] Charles M. Murphy, *At Home on Earth: Foundations for a Catholic Ethic of the Environment*, Crossroad, New York, 1989, pp. 92 – 93

John Paul II says, *"Yet it was the Creator's will that man should communicate with nature as an intelligent and noble 'master' and 'guardian,' and not as a heedless 'exploiter and 'destroyer.'"*[71]

In the encyclical *Evangelium Vitae*, John Paul II states again in different words,

> *In fact, the dominion granted to man by the Creator is not an absolute power, nor can one speak of a freedom to 'use and misuse,' or to dispose of things as one pleases. The limitation imposed from the beginning by the Creator himself and expressed symbolically by the prohibition not to 'eat of the fruit of the tree' (cf. Gen 2:16-17) shows clearly enough that, when it comes to the natural world, we are subject not only to biological laws but also to moral ones, which cannot be violated with impunity*[72].

So, it is obvious that the command to dominate the world must be understood in the global sense of God's redemptive plan to save the world. Human progress in the sciences or in technology must be understood in the framework of dominion of the world, but it must be judged with the criterion of salvation. In the encyclical *Redemptor Hominis*, John Paul II speaks clearly about the criteria to be used to measure human progress in science and technology when he says, "*Does this progress, which has man for its author and promoter, make human life on earth "more human" in every aspect of that life? Does it make it more "worthy of man"?*"[73] What John Paul means by more human, "*is becoming truly better, that is to say more mature spiritually, more aware of the dignity of his humanity, more responsible, more open to others, especially the neediest and the weakest, and readier to give and to aid all.*"[74]

John Paul II repeated this in different words in the encyclical *Evangelium Vitae* when he says,

> *God created man in his own image and likeness: "male and female he created them" (Gn. 1:27), entrusting to them the task of "having dominion over the earth" (Gn. 1:28). Basic scientific research and applied research constitute a significant expression of this dominion of man over creation. Science and technology are valuable resources for man when placed at*

[71] *Redemptor Hominis* no. 15
[72] *Evangelium Vitae* no. 42
[73] *Redemptor Hominis* no. 15
[74] *Redemptor Hominis* no. 15

his service and when they promote his integral development for the benefit of all[75].

Briefly, it is true that humankind is granted the power to dominate the earth with its power and liberty. But this power is a ministerial power. Humankind needs to exercise this power in such away so that it does not destroy, exploit, and manipulate the universe but that it cares for and conserves this universe[76].

Benedict Ashley, a professor at the John Paul II Institute for Studies on Marriage and Family, Washington D.C, gave a summary of this topic of human dominion over the earth when he said,

(1) In creating us intelligent and frees, God has given us a share in his dominion over the world and our own lives; but (2) this co-dominion is a stewardship which is to be exercised in cooperation with God in the completion of his creation according to his wise plan for our own happiness; and (3) therefore, human technology is not an absolute but a relative dominion under the guidance of God's loving wisdom and care and empowered by his grace[77].

If we apply the above principles in human cloning, we see the problems clearly. The following questions must be applied to human cloning: Does human cloning make human life on earth more human in every aspect of that life? Does it make it more worthy of human beings? We will see further in the next chapters that human cloning is contrary to the dignity of human beings. Human beings, in fact, do not become more human in cloning, but they are degraded to the level of a product of technology instead of the fruit of love and self-gift of married persons.

Human cloning cannot be justified on the basis of the command to dominate the world because the command to dominate the world is for the well being of humankind and to make human beings more human. On the contrary, human cloning harvests evil and destruction for human beings. There is a limit in exercising a human's dominion

---

[75] *Donum Vitae* no. 2

[76] Dionigi Tettamanzi, *Nuova Bioetica Cristiana,* Piemme, Casale Monferato, 2000, pp. 111 – 113

[77] Benedict Ashley, "Dominion or Stewardship?: Theological reflection", in Kevin WM. Wildes, Francesc Abel, *Birth, Suffering, and Death: Catholic Perspective at the Edges of Life*, Kluwer Academic Publisher, Dordrecht, 1992, p. 87

over the earth. The limit is one of good and evil. Actually, Scripture itself indicated this limit when God placed Adam and Eve in the Garden of Eden. Although all the fruit of the Garden was at Adam's and Eve's disposition, there was a limit to their exercising dominion because they could not eat from the tree of the knowledge of good and evil. "*You may freely eat of every tree of the garden; but of the tree of the knowledge of good and evil you shall not eat, for in the day that you eat of it you shall die.*"[78]

Unfortunately, distinguishing good from evil is not always easy for modern man who has both the power to destroy and to build the earth. It is the challenge for modern man to put limits on his actions so that this good and evil may be distinguished more easily. In its reflection on human cloning, Pontificia Academia pro Vita sees clearly this problem when it says that "*Cloning risks being the tragic parody of God's omnipotence. Man, to whom God has entrusted the created world, giving him freedom and intelligence, finds no limits to his action dictated solely by practical impossibility: he himself must learn how to set these limits by discerning good and evil.*"[79]

[78] Genesis 2: 16 – 17

[79] Pontificia Academia Pro Vita, *Reflexions on Cloning,* Libreria Editrice Vaticana, Città del Vaticano, 1997, pp. 14 – 15

B. Human Cloning as Against Human Dignity

When Dolly was announced as the first born clone of the mammalians, many reactions came up around the world. Most of the opposing positions against cloning were based on the notion that cloning is against the dignity of the human being. For example, the director general of the World Health Organization (WHO), Dr. Hiroshi Nakajima, said, "*WHO considers the use of cloning for the replication of human individuals to be ethically unacceptable as it would violate some of the basic principles which govern medically assisted procreation. These include respect for the dignity of the human being.*"[80] The UNESCO Declaration on the Human Genome and Human Rights which was unanimously adopted on November 11, 1997, article 11 states, "*Practices which are contrary to human dignity, such as reproductive cloning of human beings, shall not be permitted.*"[81] The Council of Europe Additional Protocol to the Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine, on the Prohibition of Cloning Human Beings said,

> *Considering the purpose of the Convention on Human Rights and Biomedicine, in particular the principle mentioned in Article 1 aiming to protect the dignity and identity of all human beings, have agreed as follows: article 1.2. Any intervention seeking to create a human being genetically identical to another human being, whether living or dead, is prohibited*[82].

In the Catholic Church, the reference to the dignity of the human being was also emphasized in opposing cloning human being. The Pontificia Academia Pro Vita, - a Vatican academy which deals with bioethical issues – made an official statement regarding the newly announced cloning, "*Human cloning must also be judged negatively with regard to the dignity of the person cloned, who enters the world by virtues of being the "copy" (even if only a biological copy) of another*

---

[80] *Nature*, 387 (1997) 754

[81] Arlene Judith Klotzko (ed.), *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001, p. 284, p. 310

[82] Appendix III in Council of Europe, *Ethical Eye: Cloning*, Council of Europe Publishing, Strasbourg, 2002, pp. 187 – 188

being."[83] This Catholic Church's position was restated by Renato R. Martino, the Permanent Observer of the Holy See to the United Nations, when he made same remarks to the United Nations on Human Cloning on November 19, 2001. He said, "*The act of cloning ... denies the human dignities of the child and makes him or her a slave to the will of others.*"[84]

Even though many other authoritative national and international institutions invoked human dignity as one of the reasons for banning human cloning, some people opposed this argument. One of the most prominent oppositions is from John Harris from the University of Manchester, UK. He said, "*A first question to ask when the idea of human dignity is invoked is: Whose dignity is attacked and How*?"[85] In his other article, he criticizes the invocation of the dignity of human being to oppose human cloning as vague and deserving of separate attention. He said, "*Appeals to human dignity, on the other hand, while universally attractive, are comprehensively vague and deserve separate attention. A first question to ask when the idea of human dignity is invoked is: whose dignity is attacked and how*?"[86]

For Harris, the duplication of most parts of the genome is not an attack on human dignity because natural twinning does the same thing; both persons have largely the same genome but nobody has said that this is against human dignity[87].

Based on the meaning of the dignity of human life which we have already discussed in the previous chapter (II.B.3), this chapter will discuss how and why human cloning attacks the dignity of human

---

[83] Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p. 12 (Note: The title of the declaration should be Reflections on Cloning in spite of Reflexions on cloning).

[84] Renato R. Martino, "Remarks to the United Nations on Human Cloning", in *The National Catholic Bioethics Quarterly* 2(2002) 140

[85] John Harris, "Is Cloning an Attack on Human Dignity?" in *Nature* 387 (1997) 754; John Harris, "Cloning and Human Dignity", in *Cambridge Quarterly of Healthcare Ethics* 7(1998) 163; John Haris, "Cloning and Human Dignity", in Michael Ruse and Aryne Sheppard (eds.), *Cloning: Responsible Science or Technomadness?*, Prometheus books, Amherst, 2001, p. 173

[86] John Harris, "Goodbye Dolly? The Ethics of Human Cloning", in *Journal of Medical Ethics* 23(1997) 354

[87] John Harris, "Is Cloning an Attack on Human Dignity?" in *Nature* 387 (1997) 754; John Harris, "Goodbye Dolly? The Ethics of Human Cloning", in *Journal of Medical Ethics* 23(1997) 354 – 355; John Harris, "Cloning and Human Dignity", in *Cambridge Quarterly of Healthcare Ethics* 7(1998) 163

beings and whose dignity is attacked. Are Harris' objections reasonable and defendable? I will show that the real problem is not just the duplication of the genome of the person itself but far beyond that because this duplication brings the unavoidable immense consequences which threaten the dignity of human life.

1. Confusing the Personal Identity

The personal identity is one of the most contested disputes in the discussion of human cloning. It touches the most radical and sensitive core of the philosophical dispute about person and individual and the unity of the "ego" (person) which is the foundation of the subject[88]. For example, Walter Glannon from the Institute for Ethics at the American Medical Association, said, *"Creating a genetically identical clone with the same physical traits as its parents or a sibling is not by itself inherently unethical because genetic identity is not equivalent to personal identity and thus does not threaten the distinctiveness of person."*[89]

We will examine whether the above position is defensible or whether we have to take the exactly position. Before continuing this discussion, I would like to clarify the difference between genetic identity (genomic identity) and personal identity. Genetic identity (genomic identity) is the identity of a person based on his genome (genes). Genetic identity is formed right at fertilization when the ovum is fertilized by a sperm. As we have seen in the previous chapter (I.C.3) in natural fertilization in humans both father and mother contribute half the chromosomes of the new child. The mix between them creates a new and unprecedented genome. It is a unique genome that has never existed before. The uniqueness of the human genome is the private property of the human being which is prohibited from being duplicated because every person has the right to a personal (proper) genome as his proper unique identity[90].

---

[88] Roger-Pol Droit, "L'Identité Perturbée", in Henri Atlan, Marc Augé, Mireille Delmas-Marty, *Le Clonage Humain*, Seuil, Paris, 1999, p. 124

[89] Walter Glannon, "The Ethics of Human Cloning", in Michael Ruse and Aryne Sheppard (eds.), *Cloning: Responsible Science or Technomadness?*, Prometheus books, Amherst, 2001, p. 159

[90] "*Sottolinea che ogni individuo ha diritto alla sua specifica identità genetica e che la clonazione umana è e deve continuare a essere vietata*", Parlamento Europeo,

Personal identity is the identity of a person as a whole. This is the identity which makes a person different from another person. It comprises the genotype (genetic constitution of an individual as determined by the particular set of genes it possesses), phenotype (the observable characteristic of an individual which result from interaction between the genes he possess and the environment), physical form, and personality.

In the previous chapter (I.D.4) we have discussed the similarity of genes between the one being cloned (master) and the cloned being. The similarity is 100% if the master is cloned using her own egg. If the master is cloned using another's egg, the similarity is not 100%. This is due to the fact that there is a very small number of genes which reside in the mitochondria (outside the nucleus) which mixes with the genes in the nucleus in forming the new genome of the cloned being. So – as the European Commission does – if I use the term "genetically identical" to mean "sharing the same nuclear gene set". It is not necessarily so that the genome of the master is 100% the same as the genome of the cloned being[91].

It is true that the genomic identity is only part of the whole personal identity. The personal identity is broader than the genomic identity but we cannot undermine the role of genomic identity. The genomic identity is formed at fertilization while the personal identity is formed during the lifetime of the person through the interactions of the person with the external stimuli and through how the person processes those stimuli internally and gives responses to those stimuli. In this case, there are many external stimuli that may influence the personal identity such as education, environment, belief, religion and so forth.

Brieftly, the genomic identity is not the same as the personal identity but it does play a very important role in shaping the personal

---

"Risoluzione sulla Clonazione" in Dionigi Tettamanzi, *Nuova Bioetica Cristiana*, Piemme, Casale Monferato, 2000, p. 635. "*For such somatic cell nuclear transfer cloning to violate a right to a unique identity, the relevant sense of identity would have to be genetic identity, that is a right to a unique unrepeated genome.*" National Bioethics Advisory Commission, "Cloning Human Being", in Gregory E. Pence, *Who's Affraid of Human Cloning?*, Rowman & Littlefield, Lanham, 1998, p. 50

[91] Opinion of the Group of Adviser on the Ethical Implications of Biotechnology of the European Commission, "Ethical Aspects of Cloning Techniques", in Arlene Judith Klotzko (ed.), *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001, p. 284

identity. Many aspects of the personal identity depend on the genomic identity whether directly or indirectly. Even in many cases the personal identity is determined by the genomic identity. For example: my personal identity as a male Javanese-Indonesian is different from that of a German. This personal identity is determined first of all by my genomic identity which was transmitted to me through my parents. This personal genomic identity will determine my behaviors in many respects. For example: although there are many beautiful beaches in Indonesia where the sun shines all year, almost no Indonesians (including myself) like sun-bathing while the Germans do. This fact does not depend on the religion or education or the environment but it depends on the human genome (genomic identity) which is so generous that it grants the Indonesians tanned skin so that we do not need to sun-bathe. There are many other examples which describe how the genomic identity plays a very great and decisive role in forming personal identity. Even many of the ideal qualities such as beauty, good manners, taste and so forth depend on the genomic identity.

Although it is true that personal identity is not 100% determined by the personal genomic identity, we cannot undermine the role of the genomic identity in shaping personal identity. The genomic identity is an important property of the person on which one builds up his personal identity. Personal genomic identity not only symbolizes the uniqueness of each human being and the independence from his parents that each human child rightfully inherited from his parents but it can also be an important support for living a worthy and dignified life[92]. It is without doubt that the physical and physiological life of people is written and encoded in the genomic identity (genetic material) of the person[93]. For this reason, there are many national and international institutions such as the European Council[94] and National Bioethics

---

[92] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, p. 35; Leon R. Kass, "The Wisdom of Repugnance", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 28.

[93] Roger-Pol Droit, "L'Identité Perturbée", in Henri Atlan, Marc Augé, Mireille Delmas-Marty, *Le Clonage Humain*, Seuil, Paris, 1999, p. 123

[94] «*Les Parties à la présente Convention protègent l'être humain dans sa dignité et son identité et garantissent à toute personne, sans discrimination, le respect de son intégrité et de ses autres droits et libertés fondamentales à l'égard des applications de la biologie et de la médecine.*» Conseil de l'Europe, « Convention pour la protection des droits de l'homme et de la dignité de l'être humain a l'égard des

Advisory Commission[95] that guarantee the integrity of personal identity against abuse of biology and medicine.

So the real problem of personal identity in relation to human cloning is that there is a person who determines the personal genome identity deliberately; he (the master) imposes upon another person (the cloned human) to receive his personal genomic identity which eventually becomes the personal identity of the cloned being. Renato R. Martino, when he made remarks to the United Nations on Human Cloning on November 19, 2001 – made a strong condemnation of cloning. One of his reasons is this point. He said, "*The act of cloning is a predetermined act which forces the image and likeness of the donor and is actually a form of imposing dominion over another human being which denies the human dignity of the child and makes him or her a slave to the will of others.*"[96]

It is true that in the (natural) fertilization of the ovum by the sperm, the parents also in a certain sense have determined the personal identity of the children. For example: if both the father and mother are black people, their children will be black children also. If both father and mother are white people, their children will be white children, and so on. Even some diseases are inherited by their offspring. So, in fertilization, parents also determine the personal genomic identity and personal identity of the children.

But in this case, there is a big difference between fertilization and cloning. If in cloning, there is one person who determines and imposes deliberately his personal genomic identity, in (natural) fertilization nobody does. As we have seen in the previous chapter (I.C.3) the parent cannot intervene actively in the determination of the child's genome. Both mother and father cannot determine and select which of their genes that should mix in the fertilization in order to form the future genome of their children. Each person has approximately 40.000 genes. It means that both father and mother together have approximately

---

applications de la biologie et de la médecine : Convention sur les droits de l'homme et la biomédicine, chapitre I, article 1, in *Medicina e Morale* 1(1977) 130

95 "*For such somatic cell nuclear transfer cloning to violate a right to a unique identity, the relevant sense of identity would have to be genetic identity, that is a right to a unique unrepeated genome.*" National Bioethics Advisory Commission, "Cloning Human Beings", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 50

96 Renato R. Martino, "Remarks to the United Nations on Human Cloning", in *The National Catholic Bioethics Quarterly* 2(2002) 14

80.000 genes. The mix of those numbers of genes creates immense possibilities for the future children so that the children always have unique genomes and unprecedented personal genomic identity.

Unlike in cloning in which one person (the master) determines and imposes his personal genomic identity on the cloned human to be his personal genomic identity, in (natural) fertilization the determination of the new genome is done unintentionally like in lottery. Both of the parents may hope to have a beautiful daughter who has beautiful eyes like her mother and blonde hair like her father, but they cannot do anything to make their dreams come true. Actually, this fact becomes a blessing for the children because it is through this "lottery" that the children have their proper personal genomic identity and eventually their personal identity.

On the contrary, this enforcement of personal genomic identity would make a tremendous impact on the psychological level. The continual comparison with the master who is his "*alter ego*" will impair his sense of self and give the feeling of already having lived[97]. The confusion of personal identity will arise from the fact that the cloned human being may be the twin of his father or even his grandfather. It will give psychologically unbearable burdens. People are likely always to compare his performances in life with his master who is his alter ego[98].

There are many people who want to clone their beloved deceased, whether husband, or wife, or children, or girlfriend and so on. Certainly this genetically identical make up of the cloned person will put burdens on him. On one side, he will discover that people love him and adore him not because of his good qualities as person but because he is the copy of the deceased person and has to follow in the footsteps of his deceased master. On the other side, he might know that people will hate and detest him, not because he does something wrong or because of his bad attitudes, but because he is the copy of a genotype that has already lived. In its document *Reflexions on Cloning*, Pontificia Academia pro Vita summarized this point when it says, "*Since the 'clone' was produced because he resembles someone who was*

---

[97] Nicholas Agar, "Cloning and Identity", in *The Journal of Medicine and Philosophy* 28 (2003) 9 – 26

[98] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, p. 33; Leon R. Kass, "The Wisdom of Repugnance", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 27.

'worthwhile' cloning, he will be the object of no less fateful expectations and attention, which will constitute a true and proper attack on his personal subjectivity."[99]

The above attack on human identity will lead the cloned person to alienation from his personal identity. He will be a stranger to himself[100].

Thus, it is clear that we cannot underestimate the negative effects that are caused by the genomic similarity between the master and the cloned human being. It brings tremendous impact that will be brought by the cloned human being for the rest of his life. For this reason, Pontificia Academia Pro Vita stated in its document, *Reflexions on Cloning* said, "*It should be stressed that the development of individuals obtained by cloning, apart from eventual possible mutations – and there could be many – should produce a body structure very similar to that of the DNA donor: this is the most disturbing result, especially when the experiment is applied to the human species.*"[101]

The council of Europe sees this danger to the cloned human being and therefore human cloning is prohibited," *Any intervention seeking to create a human being genetically identical to another human being, whether living or dead, is prohibited.*"[102] The personal identity of the human being is very important to each of us. It is this identity that makes us different from each other and it is this point that distinguishes each of us.

One may argue that the similarity is only on the level of genome in which a person shares with another person the same nuclear gene set. But we have to remember the inseparableness of body and spirit of human beings. We cannot separate the body and the spirit of the human being since they are one: *corpore et anima unus*[103]. The body which is separated from the human spirit is not a human body anymore and the spirit which is separated from the human body is not a human spirit. The human being is an incarnated spirit so that the separation of body

---

[99] Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p. 13

[100] Roger-Pol Droit, "L'Identité Perturbée"; in Henri Atlan, Marc Augé, Mireille Delmas-Marty, *Le Clonage Humain*, Seuil, Paris, 1999, p. 122

[101] Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p 7

[102] Appendix III in Council of Europe, *Ethical Eye: Cloning*, Council of Europe Publishing, Strasbourg, 2002, pp. 187 – 188

[103] cf. Gaudium et Spes, no. 14, par. 1

and spirit will end the existence of the human being. When treating the topic of medical intervention on the human body *Donum Vitae* delicately underlines the inseparableness of body and soul:

> *Each human person in his absolutely unique singularity, is constituted not only by his spirit, but by his body as well. Thus, in the body and through the body, one touches the person himself in his concrete reality. To respect the dignity of man consequently amounts to safeguarding this identity of the man "corpore et anima unus", as the Second Vatican Council says (Gaudium et Spes, no. 14, par. 1). It is on the basis of this anthropological vision that one is to find the fundamental criteria for decision-making in the case of procedures which are not strictly therapeutic, as, for example, those aimed at the improvement of the human biological condition*[104].

So, the cloning of a human being will alter human identity; although it is firstly at the level of human genome (genomic identity) it will have a very great impact on the human personal identity of the person because this sense of identity depends largely on the genetic identity. In fact each person has the right to a unique unrepeated genome[105]. We must not underestimate this impact on the life of the person because they expose the human personal identity to danger.

2. Limiting Freedom and Auto-determination

The advance of genetics, especially genetic engineering worries many people. Some people are afraid that our knowledge of genes and their function will eventually reveal that human destiny is determined by their genes. One of the widely reported statements is that of James Watson, one of the discoverers of the double–helix structure of DNA and first director of the Human Genome Project. He said, "*We used to think that our fate was in our stars. Now we know, in large measure, our fate is in our genes.*"[106] People are afraid that if our fate is

---

[104] *Donum Vitae* no. 3

[105] National Bioethics Advisory Commission, "Cloning Human Beings" in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 50

[106] Allen Buchanan, Dan W. Brock, Norman Daniels, Daniel Wikler, *From Chance to Choice: Genetic & Justice*, Cambridge University Press, Cambridge, 2001, p. 91

determined by our genes, it means that there is no more freedom. Certainly, Watson's statement has a solid basis. He did not say that our fate is completely determined by our genes but our fate in large measure is determined by our genes. It is true that if our fate is completely determined by our genes, it means that there is no freedom. But we cannot ignore the fact that our genes determine a large measure of our fate. Although we do not know how far our genes determine our fate, we know that they do so.

The role of genes in shaping the 'fate' of a person cannot be underestimated because they play a very important role. French Anderson, a pioneer of gene therapy, worried that some germline therapy might inadvertently destroy the human capacity for the contemplation of good and evil[107]. Anderson was afraid that the modification of genes through genetic engineering would cause deviation of the natural behavior of genes and have a negative impact on the behavior of the person. Robert Williamson, a scientific director of the Murdoch Children's Research Institute, Melbourne, underlined this important role of the genes that makes up the genetic identity of the person. He said, "*Our genetic identity is an essential part of this individuality, and it is our genetic differences that explain why societies which attempt to impose environmental conditions to achieve uniformity have not succeeded... I think most observers would agree that genotype is a major determinant of behavior.*"[108]

D. Nelkin and M. S. Lindee demonstrated in their book *The DNA Mystique: The Gene as a Cultural Icon*[109], that genes play an important role in determining the psychology and personality of a person (genetic essentialism). This fact is reinforced by the finding of new genes which cause depression and schizophrenia.

Because the human being is multi dimensional and cannot be reduced to one single cause of his existence, the genomic determinism

---

[107] French Anderson, "Genetics and Human Malleability" in *Hastings Center Report* 20(1990) 21 – 24

[108] Robert Williamson, "Human Reproductive Cloning is Unethical Because It Undermines Autonomy", in Michael Ruse and Aryne Sheppard (eds.), *Cloning: Responsible Science or Technomadness?*, Prometheus books, Amherst, 2001, pp. 231 – 232

[109] D. Nelkin and M. S. Lindee, *The DNA Mystique: The Gene as a Cultural Icon*, W. H. Freeman and Company, New York, 1995

in which our destiny is determined completely by our genes[110] cannot be accepted, but genes (in totality: genome) in our body do determine our fate in large measure. Since the human genome plays an important role in determining human behavior, imposing human genomic identity on another person creates a very big problem for the personal identity and especially for the freedom and the right of auto-determination of the person. As we have seen in the above chapter, this is exactly one of the serious problems regarding human cloning: imposing personal genomic identity (genes) on other human beings. The receiver (cloned human being) has no possibility to refuse or to choose another possibility. It is different from the case of natural fertilization: the receiver (child) also has no choice other than to receive the available genome but nobody is imposing his genome on the child. The genome of the child is completely new and nobody has ever had it before.

Regarding human freedom, we have seen in the previous chapter (II.B.3), that Immanuel Kant said that freedom is independence from being constrained by another's choice and freedom is the only original right belonging to every person by virtue of his humanity[111].

Freedom and auto-determination are important predispositions allowing people to become themselves. If a person is forced to do something which is not his choice, he will be alienated from his actions (behaviors) and unable to take responsibility for his actions. In this case, he cannot become himself through his actions.

Certainly, there are many things in human cloning which have been conditioned or 'prefabricated'. The cloned human being is forced to accept many things which are imposed by another person (master) so that he cannot have freedom like other people who are not forced to accept another's genome. Certainly, this determination by genome will not abolish freedom totally but it will reduce in large measure the freedom which people normally have.

Jürgen Habermas, a well known philosopher and an emeritus professor from the University of Frankfurt, Germany, gave an interesting explanation on how a pre-programmed genome can change a person's perception about his physical and mental life. When a person knows that his genome is pre-programmed by somebody else, he will

---

[110] Allen Buchanan, Dan W. Brock, Norman Daniels, Daniel Wikler, *From Chance to Choice: Genetic & Justice*, Cambridge University Press, Cambridge, 2001, p. 91

[111] Immanuel Kant, *The Metaphysics of Morals*, Cambridge University Press, Cambridge, 2003, p. 30

change his auto-perception toward his physical and mental existence. His recognition of self as the product of a pre-programmed person will overlap or even replace his spontaneous being. The failure to make a distinction between spontaneous and artificial will engrave his existential modality. This changing of auto-perception happens in his brain and it will affect his way of regard his existence[112].

Briefly, the changing of the pre-programmed genome will occur on two levels: the first level is in the determination of the genes toward the behaviors of the person. Although it is not in the term of genomic determinism but the genome of the person does have a great influence on the behaviors of the person. The second level is in the brain of the person in which change of auto-perception of his existence occurs.

Thus, cloning human beings - in which the genome of the cloned human being is preprogrammed because it is imposed by another person – will reduce the freedom of the cloned person and thus reduce his right of auto-determination of his life. He will be forced to live a life that has been pre-programmed by other persons whom he may not like.

One of the reasons to reject John Harris' opinion which is mentioned in the beginning of this chapter is this point. For Harris, the duplication of most parts of the genome is not an attack on human dignity because natural twinning does the same thing; both of the persons have a large part of the same genome but nobody says that it is against human dignity[113]. In fact, Harris' objection does not have a solid foundation because in natural twinning, each of the persons does not impose his genome on the other; on the contrary they simply receive an identical genome. One person does not determine the other's genome and thus one person does not determine some behaviors of another person. The twin has the same undiscounted freedom and the right of auto determination. Because of this reason, human cloning is against the dignity of the human being.

---

[112] Jürgen Habermas, *Il Futuro della Natura Umana: I Rischi di Una Genetica Liberale*, Biblioteca Einaudi, Torino, 2002, pp. 54 – 55

[113] John Harris, "Is Cloning an Attack on Human Dignity?" in *Nature* 387 (1997) 754; John Harris, "Goodbye Dolly? The Ethics of Human Cloning", in *Journal of Medical Ethics* 23(1997) 354 – 355; John Harris, "Cloning and Human Dignity", in *Cambridge Quarterly of Healthcare Ethics* 7(1998) 163

3. Making Unequal of Human Beings Otherwise Equal

In the previous chapter (I.C.3) when we spoke about the natural fertilization of human gametes we noted that a child has two complementary biological progenitors. A child gets 23 chromosomes or 50% of his chromosomes from each of the parents. The crossing and recombination of the genes is unpredictable and cannot be regulated. After fertilization, the fusion of the two sets of chromosomes makes the new unique genome of a new human being. The formation of the child's genome is determined by a combination of nature and chance, not by human design. Father and mother cannot intervene in the formation of the new genome. It is like a lottery in which the players cannot do anything to determine the result. It is a "lottery by chance" where players cannot do anything except to wait, to see, and to accept the result.

But this "lottery by chance" proves to be a blessing. Each human child shares the common natural human species genotype; each child is genetically equally kin to each of the parents, yet each child is also genetically unique. Because of such a process of begetting, every human being is at once equally human, equally enmeshed in a particular familial nexus of origin, and equally individual from the beginning of life until the end of life, even though they are different in genomic identity[114].

Certainly, this equality of human beings has to be applied in real life in which one cannot be discriminated against based on race, religion, sex, color and so on. The Catholic Church on many occasions stresses the equality among human beings such as in *Donum Vitae*: "*Only respect for the link between the meanings of the conjugal act and respect for the unity of the human being make possible procreation in conformity with the dignity of the person. In his unique and unrepeatable origin, the child must be respected and recognized as equal in personal dignity to those who give him life.*"[115] The same thing was restated in *Evangelium Vitae*: "*As far the right to life is concerned, every innocent human being is absolutely equal to all others. This equality is the basis of all authentic social relationships which, to be truly such, can only be founded on truth and justice, recognizing and*

---

[114] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, pp. 24 – 25

[115] *Donum Vitae* no. II.4.c

protecting every man and woman as a person and not as an object to be used."[116]

As well one cannot be discriminated against because of his genes (genetic heritage). There are some international institutions that guarantee against this discrimination. For example, article 11 of the Convention for the Protection of Human Rights and Dignity of the Human Being with Regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine, "*Any form of discrimination against a person on grounds of his or her genetic heritage is prohibited.*"[117]

It is obvious that natural begetting is very different from creating new human life through human cloning. The equality between human beings cannot be guaranteed in human cloning because there is a person (the master) who determines the others (cloned human beings). The master has a higher level because he has the power to determine and impose his personal genomic identity on his cloned human being. In the case of human cloning with genetic engineering, the case may be even worse. Not only does the master determine the genome of the cloned human being but also changes or manipulates the genome of the cloned human being according to his will so that the cloned human being becomes the product of the will. Certainly, the product is at a lower level than the producer or designer since the product is the fruit of the producer's decision and creation. In other words, the producer or creator has dominion over his product. This fact is a very delicate one for human rights. If there is no equality among human beings, it means that there is one or a group of people who will dominate other people and in many cases they may even use other people for their needs which is contrary to the principle that each person has his own finality in him self.

Evangelium Vitae gives warning of this danger when it says, "*The theory of human rights is based precisely on the affirmation that the human person, unlike animals and things, cannot be subjected to domination by others.*"[118]

---

[116] *Evangelium Vitae* no. 57

[117] Council of Europe, Convention for the Protection of Human Rights and Dignity of the Human Being with Regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine, article 11, in Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, p. 251

[118] *Evangelium Vitae* no. 19

So the real problem starts with the existence of the cloned human being and from the cloned human being himself: he will not be born equal to other human beings. The inequality is inherent in the nature of the cloned human being and not because other people treat him unequally.

In fact, equality among human beings is the basis for human relationships. Even according to Kant, equality among human beings is not really distinct from freedom and it is an innate equality which belongs to every person by virtue of his humanity[119]. That is the reason that all human beings are born equal; equality is the intrinsic property of human beings.

Unfortunately, cloning a human being destroys this equality as one of the most important elements of human dignity. This point is clearly expressed by The Pontificia Academia Pro Vita in its declaration on human cloning. "*At the level of human rights, the possibility of human cloning represents a violation of the two fundamental principles on which all human rights are based: the principle of equality among human beings and the principle of non-discrimination.*"[120]

The Pontificia Academia Pro Vita also states that human cloning is a form of human dominion over others and for that reason human cloning is unacceptable. "*The idea is fostered that some individuals can have total dominion over the existence of others, to the point of programming their biological identity – selected according to arbitrary or purely utilitarian criteria – which, although not exhausting man's personal identity, which is characterized by the spirit, is a constitutive part of it.*"[121]

Certainly, this inequality among human beings is a serious violation of human rights. The United Nations declared clearly that all human beings are born free and equal. The first article of the Universal Declaration of Human Rights states it clearly, "*All human beings are born free and equal in dignity and rights.*" This point is very important because it is not a specialty of a certain religious point of view but it is a universal value that applies to all people regardless of their belief or

---

[119] Immanuel Kant, *The Metaphysics of Morals*, Cambridge University Press, Cambridge, 2003, p. 30

[120] Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p 16

[121] Pontificia Academia Pro Vita, *Reflexions on Cloning*, p. 12

religion or culture. This universal right is previous to any belief or political system because it exists in all human beings as human beings.

It is understandable that Renato R. Martino – the Permanent Observer of the Holy See to the United Nations – when he made remarks to the United Nations on Human Cloning on November 19, 2001 used this point to argue against human cloning. "*That statement comes from the reference to the fundamental rights of equality, to freedom, and to nondiscrimination enshrined in the Universal Declaration of Human Rights, which are based upon the truth of the specific and inalienable dignity of every human being. That very dignity cannot be the object or the instrument of the will of other people.*"[122]

4. Transgressing the Right to not Know the Future

One of the most fervent promoters of human cloning is John Harris. As we have seen above, Harris argued that cloning is the same as natural twinning in which each twin posses the identical genome. Hans Jonas also agreed that the relationship between master and cloned human being is the same as between identical twins[123]. But Hans Jonas analyzed further that the twin of cloning is different from a natural twin. In the natural twin, they are contemporarily identical twins because they live at the same time. On the contrary, the master and the cloned human being are not contemporarily identical twins. They do not live at the same time but in a sequence of time: one after another. This difference is a very important point that constitutes the main difference between the two types of identical twins[124].

In the case of natural identical twins - Hans Jonas explained – both of them live together at the same time. Although they begin their life with the same genome, they start with the same ignorance about their future because they do not know the fate of their future. With the course of time, they will enrich their lives according to their

---

[122] Renato R. Martino, "Remarks to the United Nations on Human Cloning", in *The National Catholic Bioethics Quarterly* 2(2002) 140

[123] Hans Jonas, *Dalla fede antica all'uomo tecnologico: Saggi filosofici*, Il Mulino, Bologna, 1991, p. 241; Hans Jonas, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, Einaudi, Torino, 1997, p. 139

[124] Hans Jonas, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, Einaudi, Torino, 1997, p. 139; Hans Jonas, *Dalla fede antica all'uomo tecnologico: Saggi filosofici*, p. 241

preferences and choices. Although their lives to some extent will be determined by their identical genes, they start with the same ignorance as to what their genes will determine in the future. Thus they remain free to choose a future like other individuals who do not have a twin. In this case, ignorance about their future is a preliminary condition of freedom[125]. The future of their lives must be constructed by them selves. They have to discover their experiences for themselves and through their own power without pre-fabricated guidance so that they can guide themselves to live according to their own choices and preference. Only in this way can a human being become himself. Thus ignorance of the effect of their genome on their life is necessary for the spontaneous, free, and authentic construction of a life and self. Although natural twins have the same genome, because of their ignorance as to their future, they will have exciting and interesting experiences each time because these experiences will be new for them. That is the reason, Jonas holds that every one of us has the right to ignorance, the right to not know his future[126].

Jonas concludes that in this case, knowing the future is harmful. It paralyzes the spontaneity to become oneself and endangers the sincerity of relations with other people with him[127]. We can see this point exactly in human cloning. The cloned human being believes - although it may be a false belief – that he knows many things about himself because there was already a person who lived a life with his genome. It seems to him that his life has already been lived by another person so he feels that his fate is already determined. In this way, he will lose the spontaneity of authentically creating and becoming his own self. He will lose the sense of freedom to build his own future.

If the master is a famous person, the case is even worse. Many people who have known the master would expect to see all aspects of the master exhibited and present in his clone. Certainly, those who want to clone a famous figure may have very big expectations that the cloned human being will develop along the lines of the famous master. Those people will raise the cloned baby according to these expectations. This cloned person, who knows that he is a clone of a famous figure, does

---

[125] Hans Jonas, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, p. 144; Hans Jonas, *Dalla fede antica all'uomo tecnologico: Saggi filosofici*, p. 247

[126] Hans Jonas, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, p. 144; Hans Jonas, *Dalla fede antica all'uomo tecnologico: Saggi filosofici*, p. 247

[127] Hans Jonas, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, p. 146

not have many choices other than following these expectations. In this way, the cloned person will lose his freedom to be himself and to build his life according to his own choices.

Hans Jonas concluded his position on human cloning with a strong statement that we have to respect the right of every human being to find his own way and to be a surprise for himself[128].

Hans Jonas's opinion on human cloning gives another reason for refuting John Harris opinion. For Harris, the duplication of most parts of the genome is not an attack on human dignity because natural twinning does the same thing; both of persons have a large part of the same genome but nobody says that it is against human dignity[129]. One of the reasons for refusing to accept Harris' position is that natural twin live together in the same time-frame where they have the same freedom, spontaneity, and possibility of determining a life pattern for themselves. While the cloned human being who lives in a sequential time, does not have these rights and advantages. Certainly, it is against the human dignity of auto-determination which enables him to become himself.

5. Forcing to Live in the Shadow of Other Person

Almost in the same line of reasoning as Jonas' rights of not knowing, Søren Holm highlights a different aspect of human cloning which she calls "A life in the shadow"[130]. It seems that people want to clone somebody because of a certain quality of the person (intelligence, or beauty, or fame) or because of a special relationship (husband, wife, or children).

---

[128] Hans Jonas, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, p. 149; Hans Jonas, *Dalla fede antica all'uomo tecnologico: Saggi filosofici*, p. 251

[129] John Harris, "Is Cloning an Attack on Human Dignity?" in *Nature* 387 (1997) 754; John Harris, "Goodbye Dolly? The Ethics of Human Cloning", in *Journal of Medical Ethics* 23(1997) 354 – 355; John Harris, "Cloning and Human Dignity", in *Cambridge Quarterly of Healthcare Ethics* 7(1998) 163

[130] SØren Holm, "A Life in the Shadow: One Reason We Should not Clone Humans", in *Cambridge Quarterly of Healthcare Ethics* 7(1998) 160 – 162. The same article also appeared in Arlene Judith Klotzko (ed.), *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001, pp. 203 – 207 and in Michael Ruse and Aryne Sheppard (eds.), *Cloning: Responsible Science or Technomadness?*, Prometheus books, Amherst, 2001, pp. 189 - 193

From this observation, it is clear that a person is cloned with the expectation that the cloned baby will have the qualities of the master. These expectations certainly will influence how the people, especially those who raise the cloned baby, deal with this baby. Unlike in natural fertilization in which the parents do not know exactly how the baby will develop, people who raise a cloned baby will more or less already have formed in their minds quite a definite picture of how the cloned baby will develop, a picture based on the actual development of the original person (master). Certainly, this picture will control the way they raise the baby. They will try to prevent development that does not match the picture and promote or push some developments that are suitable to the picture. People will constant make comparison between the cloned baby and the master. Thus, the cloned baby will live in the shadow of the master's life.

In this way, the cloned human being will feel that he lives a life that is not his own. The cloned baby will be forced to live a life that may not be his by choice. This is a grave violation of the moral principle of autonomy and self-determination.

At the end of her article, Søren Holm suggests a way to resolve the problem of life in the shadow. She proposes that the cloned baby should be put up for adoption anonymously, so that no knowledge about the baby's origin is available to the social parents of the cloned baby.

I think that this way out is not the best one for several reasons. First of all, people who want to clone their dead child certainly want to raise the child for themselves. It would be in vain to clone their child and then give it to somebody else who is unknown to them. Furthermore, as we have seen in the previous chapter (I.E.4) human cloning is not cheap economically. It may cost millions of US dollars to finance it. I do not believe that there is a person who would spend that sum of money without any possibility of raising the cloned baby. Secondly, every human being has the right to know his genealogy. The cloned human being has the right to know his genealogy and how he has come into being.

The next problem that Søren Holm does not mention in her article but I think has a close relation with 'life in the shadow' is the psychological harm of the cloned human being. The cloned baby will know that people love or adore him not because of his good personal qualities or his achievements but because he is the shadow of his master. On the contrary, the cloned human being will know that people

hate or despise him not because of his wrong doing or negative personal qualities but because he is the shadow of his master. Briefly, he will be punished or rewarded not for the things he has done but simply because another person (his master) has done something. This treatment will destroy his psychological harmony and certainly this is contrary to the principles of justice.

C. Transmission of life

We have discussed in the previous chapter (I.E.1) that one of the prospective candidates for cloning to create human beings are homosexual people, either gay or lesbians[131]. The success of Dolly offered not only relief for their anguish to have children in their genetic track but also its actualization. To give each other support in their situation, some of them founded "Cloning Rights United Front" (CRUF). They took a militant stance and took to the streets of New York City to protest against legislation which would ban human cloning[132].

The core of their argument is based on the right of everybody to reproduce. It is in this argumentative base that they strive for liberalization of the civil laws, ethics of reproduction, and procreative liberty[133]. In their analysis, the government does not have the right to keep them from reproducing themselves. Since in a pluralistic society, there is no unanimous definition of good and bad, right and wrong, society must protect the freedom of each and every individual. The state is not allowed to infringe upon the right and freedom of citizens. This individual freedom includes the freedom to reproduce. Another

---

[131] Lori Andrews, "Mom, Dad, Clone: Implications for Reproductive Privacy", in Arlene Judith Klotzko (ed.), *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001, p. 248; Michael Tooley, "The Moral Status of the Cloning of Humans", in James M. Humber and Robert F. Almeder, *Human Cloning*, Humana Press, Totowa, 1998, p. 90

[132] Timothy F. Murphy, "Our Children, Our Selves: The Meaning of Cloning for Gay People", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, pp. 141 – 142

[133] Lori Andrews, "Mom, Dad, Clone: Implications for Reproductive Privacy", p. 248 - 249

argument seems to be that the very nature of human beings is open-ended, indeterminate, and unpredictable. Human beings are always reevaluating and redefining themselves, their values and their way of interacting with other people. Technology as the expression of human freedom and the exploration of the universe helps people to reevaluate and to rearticulate those points. This is exactly what happens in the relation between sexual intercourse and procreation. New technologies offer other possibilities to have children so that we have to reevaluate the traditional way to link sexual intercourse and procreation. To ban cloning because this technology changes the traditional way of having children is unjustifiable[134].

It would also seem that lesbians have some other reasons to be happy with the success of cloning. For them, the success of cloning means that as women they can take total control of their reproduction. They do not need men to reproduce. It signifies implicitly the superiority of women over men. With cloning as the new technology of reproduction, the sexual relationship of heterosexuals to beget children may be seen as historically obsolete. This way to beget children is designated 'the traditional method of reproduction' or 'the more traditional way'[135].

In this chapter we will discuss this transmission of life holistically. Unlike the above homosexual's perspective which sees the case of human reproduction mostly from their own point of view (the perspective of the master), we will now also discuss cloning from the perspective of the cloned human beings and their well-being, as well as explore the difference in meaning between creating and begetting human beings.

The well being of cloned people has to be one of the most important elements in evaluating the cloning to create human being. There are some reasons for the appeal of cloning human beings. First of all, it relates to the exercising and application of the human rights. The basic human rights are usually applied to human beings as persons or individual agents. As we have already mentioned, there is a common rule for the application of human rights. Human rights can be applied

---

[134] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, pp. 89 – 90

[135] Timothy F. Murphy, "Our Children, Our Selves: The Meaning of Cloning for Gay People", pp. 141 – 142; Lori Andrews, "Mom, Dad, Clone: Implications for Reproductive Privacy", p. 248

widely as long as they do not infringe on the rights of other people who bear the same rights. The right of reproduction is never solely a personal right which does not impact on other people. In the heterosexual reproduction, it relates to man and woman and their children. In the cloning to create human beings, it is related to the master and the cloned human being. So the consideration of both parties, parents and children or master and cloned human being, is inseparable. Both of them need to be taken into account and whenever the exercise of one's right infringes another's rights, it cannot be continued.

Secondly, this is related to the nature of the survival of the species. All living beings are equipped naturally with tools to continue their species so that their species will not become extinct. In the higher animals and human beings, this tool is the sexual desire which becomes the effective means to reproduce through sexual intercourse in order to guarantee the continuing existence of the animal or human beings. So, in this case, there is a twofold interest in this procreation: the interest of the parents and the interest of the children. If the interest (well-being) of the children is not guaranteed, then there is no guarantee of the continuity of the species of human beings. It means, therefore, that the natural means of reproduction is in vain since the aim of reproduction is jeopardized or possibly might even have no result.

In the transmission of life as a means to safeguard the existence of human species in the world, there are some essential differences between begetting and creating new human beings. As we have discussed in the previous chapter about natural fertilization of human gametes (I.C.3) and the technique of cloning (I.D.3.b), there are some constitutive differences in the way of creating and the materials needed for producing human beings. Those differences create unavoidably very important philosophical and natural differences. In the natural fertilization process, human beings come together as male and female complementarily to give existence to another new human being. Their status of male and female is not a supplement but essential and basic to generate a new human being. The absence of one party makes it impossible to generate a new human being. The generation of the new human being is even richer because from a male and a female parent can be born both female and male children. Above all, in the natural fertilization, the new generation is begotten exactly as we are and by what we are without any intervention in it.

In clonal reproduction, by contrast, and in the more advanced forms of the manufacture of human beings, we give existence to a being not by what we are but by what we intend and design[136]. The clonal reproduction is, therefore, poorer than the natural reproduction. In the clonal reproduction, from the male master can only be produced male cloned people and from the female master can only produce female cloned people.

Hans Jonas had some very inspiring thoughts regarding the existence of a being and its continuation. First of all, he stated that the state of being is absolutely better than nonbeing. This is what he called fundamental self-affirmation. This being has the ability to be concerned with something even if it is only with itself. From this fact we can learn about the presence of purpose from within. This purpose of the being is not the only one purpose, but it can be manifold and maximized along with the growing wealth of goals striven for so that the being makes itself worth its own effort. Secondly, it is logical that the continuation of a being is very effort because being is absolutely better than nonbeing. Even though the continuation of a being needs a price to be paid, preservation is certainly a good compared to the alternative of annihilation or impoverishment[137]. In other words, Hans Jonas would disagree with human cloning whether in the present time because of the annihilation of so many human beings who have died during the process of cloning as well as in the future with its possibility of a higher success rate because human cloning impoverishes the human being itself.

For Jonas, cloning a human being is an irresponsible act toward another human being. According to Jonas, the responsibility is not only "*the ex post facto account for what has been done, but the forward determination of what is to be done.*"[138] With this statement, Jonas wanted to underline that we have a responsibility not only to the consequences of what we have done in the past but also for what has a claim on my acting in the future. Jonas very much underlined this point

---

[136] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, pp. 38 - 39; Leon R. Kass, "The Wisdom of Repugnance", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 29

[137] Hans Jonas, *The Imperative of Responsibility: In Search of an Ethics for the Technological Age*, University of Chicago, Chicago, 1984, pp. 81 – 82

[138] Hans Jonas, *The Imperative of Responsibility: In Search of an Ethics for the Technological Age*, 1984, p. 92

and called this type of responsibility as "responsibility for the future"[139]. He opened one of his articles with the statement, "*Care for the future of mankind is the overruling duty of collective human action in the age of a technical civilization that has become 'almighty' if not in its productive then at least in its destructive potential.*"[140] This responsibility is not only for what lies inside of me but also for what lies outside of me, but in the effective range of my power and in need of it or threatened by it. Those responsibilities become mine because the power is mine and has a causative relation to just this matter. That is the reason why Jonas said, "*The well-being, the interest, the fate of others ... has come under my care, which means that my control over it involves at the same time my obligation for it.*"[141] We can then conclude that cloning a human being is an irresponsible act because it impoverishes a human being and it fails to take care of the well-being, interest, and the fate of others and in that way it jeopardizes the future of human beings.

Thirdly, as we have seen in the previous chapter (III.A.1.b) in Catholic teaching on the transmission of life, it must be done in the context of a sexual relationship in a family which is based on love and understanding. In the teaching of the Catholic Church, the relationship between human sexuality and procreation has never been separated. They have an inseparable relationship.

Here we will review briefly human sexuality and its relationship with human procreation. Human sexuality is more than merely a genital or physical phenomenon, it is directly related to human existence. A man becomes a man because of his male sexuality as a man and a woman becomes a woman because of her female sexuality. So the manhood and womanhood of human beings are expressed in and from the body, and become an integral part of his being[142]. Human sexuality is not an additional attribute to human existence, but it is an integral part of human existence. Consequently, we cannot say that human beings have sexuality but that a human being is sexual being, a man or

---

[139] Hans Jonas, *The Imperative of Responsibility: In Search of an Ethics for the Technological Age*, p. 93

[140] Hans Jonas, "*Responsibility Today: The Ethics of an Endangered Future*", in *Social Research* 43(1976) 77

[141] Hans Jonas, *The Imperative of Responsibility: In Search of an Ethics for the Technological Age*, p. 93

[142] Elio Sgreccia, Manuale di Bioetica vol I: Fondamenti ed Etica Biomedica, Vita e Pensiero, Milano, 2003, p. 398

a woman. Sexuality is inscribed in being human because it is rooted in the human nature and it marks the life of a human being.

But the existence of a woman and a man is not an existence for herself or himself, otherwise there is no need to be a man or a woman. The existence of a woman is in relationship to a man and vice versa. Human sexuality has an intrinsic and complementary relationship with other human beings. On the level of biology, this intrinsic and complementary relational can be identified right in the human genome in which each man and each woman has 46 chromosomes, but there is a pair of chromosomes which is different from each other. A man has a pair of sex chromosomal designated as XY whereas the corresponding pairs in a woman are chromosomes XX. These chromosomal differences are expressed or manifested in the anatomic structure of the human body which is different from each other but complementary to each other. In another level of human life, we can identify this intrinsic and complementary relationship in the fact that a man is interested in a woman (vice versa) in a variety of ways such as spiritually, sexually (genitally), psychologically, personally, and so forth.

Elio Screccia summarized this fact by saying that human sexuality has a complementary character and is presented as the capacity of openness to the act of conjugality. The structure of the human body (chromosomes, sexual phenotype, endocrine and so on) indicates that the human body is differentiated and complementary in order to be oriented toward a heterosexual union so that man and woman may experience their fullness[143]. In fact the relationship between woman and man is expressed in the deepest and special way in the sexual relationship in which they can give each other totally to one another.

The sexual relationship between husband and wife is not only a physical union but also a total union which involves body, spirit, and heart (love). In other words, this sexual relationship is an act of a person which means a personal and conscious act.[144] If a sexual relationship lacks one of these aspects, this act is an incomplete human union because the physical union is not the expression of a total reciprocal union of the two persons.

In the order of nature, a sexual relationship between a woman and a man – which is the expression of the total union of a man and a

---

[143] Elio Sgreccia, Manuale di Bioetica vol I: Fondamenti ed Etica Biomedica, p. 404

[144] cf *Donum Vitae* I.4. Encyclical *Mater et magistra*, III: *A.A.S.* 53 (1961), 447.

woman – has inscribed in it the procreation of human beings. So the sexual union between a woman and a man should have a unitive and procreative character. Since the order of nature regulates that a woman is not fertile all the time, consequently, she cannot get pregnant all time, the character of a sexual union is not always procreative, but it is always open to the procreation.

In the long history of the Church, the inseparable union between unitive and procreative character of the sexual relationship between husband and wife have always been underlined and emphasized. We can see, for example, in the Pastoral Constitution *Gaudium et Spes*, that "*When it is a question of harmonizing married love with the responsible transmission of life, the moral character of one's behavior does not depend only on the good intention and the evaluation of the motives: the objective criteria must be used, criteria drawn from the nature of the human person and human acts, criteria which respect the total meaning of mutual seif-giving and human procreation in the context of true love.*"[145] The same teaching was restated in *Donum Vitae* which says that "*Human procreation requires on the part of the spouses responsible collaboration with the fruitful love of God; the gift of human life must be actualized in marriage through the specific and exclusive acts of husband and wife, in accordance with the laws inscribed in their persons and in their union.*"[146]

From this perspective, cloning to create a human being is not licit because it is against this principle of generating a human being which has to be done in the context of a sexual relationship between a husband and a wife. Human cloning is an asexual creation of life. This generating of a new human life is deprived of the sexual relationship between a husband and a wife.

This reasoning is clearly expressed by Renato R. Martino, the Permanent Observer of the Holy See to the United Nations, when he gave the following remarks to the United Nations on Human Cloning on November 19, 2001. He said, "*In fact, this discussion is based upon the generation of a child outside the act of personal love. Such an act excludes paternity and maternity and is an asexual and agamic*

[145] *Gaudium et Spes* no. 51
[146] *Donum Vitae* no. 5

conception, thus resulting in a lack of union between the person and the gametes."[147]

The same rationale was repeated by the Holy See's mission at the United Nations on March 3, 2002. He described one of the Holy See's positions on human cloning was described as follow: "*As a form of unnatural asexual reproduction, it represents a radical manipulation of the constitutive relationship and complementarity that are at the origin of human procreation as a biological act and an exercise of human love. Cloning objectifies human sexuality and commodifies the bodies of women.*"

Briefly, in the cloning of a human being, there is a radical fracture of the natural and essential correlation between love-sexuality-procreation. It started with contraception which separates sexual relationship from procreation. The fissure became wider with assisted reproduction (IVF), and it finally became a radical fracture with human cloning[148].

From the above discussion it is clear that we must resist those who have begun to refer to sexual reproduction as the "traditional method of reproduction," as though sexual reproduction is only a matter of tradition whereas cloning is seen as a matter of a modern method of reproduction. Further on we will see how sexual reproduction is first of all not merely a traditional way of reproducing a new human being, but that it is actually the best licit way to achieve the aims of reproduction. Sexual reproduction is essentially different from cloning both in the way of the action as well as the product of the action. We will see in greater detail these implications in the following points.

1. Cloning as Against the Right to be Conceived in Natural Way

In the previous chapter about natural fertilization and the natural development of a human embryo (I.C.3-4), we have discussed how the embryo was conceived and its natural development comes to term. We learn that the natural fertilization of an ovum by a sperm was

---

[147] Renato R. Martino, "Remarks to the United Nations on Human Cloning", in *The National Catholic Bioethics Quarterly* 2(2002) 140

[148] Roberto Colombo, "La Clonazione Umana: Aspetti Antropologici e Morali", in *L'Osservatore Romano* August 20, 2003, page 5

done without human intervention. The fertilization is a process which starts when a sperm encounters an ovum and then the sperm enters into the ovum and they merge together to form a completely new genome which has never existed before. The whole process of fertilization takes about 24 hours.

People may disagree on whether a zygote is a person or not but there is no doubt that the life of a human being as an organism starts right in the end of the fertilization process where the two nuclei of sperm and ovum merge together to form a new being and the future of this being is determined right at this event. In her report on *Nature* magazine, Helen Pearson wrote, "*Your world was shaped in the first 24 hours after conception.... Just five years ago, this statement would have been heresy. Mammalian embryos were thought to spend their first few days as a featureless orb of cells. Only later, at about the time of implantation into the wall of the uterus, were cells thought to acquire distinct 'fates' determining their positions in the future body*"[149]. From this quote we can see how important the fertilization is because it in fact determines the future of a human being. Among the many events which happen in the fertilization, the determination of sex and genome are regarded as very important events.

The human genome is the genomic identity which will determine a great part of the life of a human being biologically which also makes a very great impact on the life of human being personally (see chapter III.B.1). The genome of a child is 100% the heredity which he received from his parents. Half of them (23 chromosomes) he received from the ovum of his mother and the other half (23 chromosomes) he received from the sperm of his father. Outside the ovum and the sperm, there is no other element which adds or reduces to the formation of the new genome of child.

Although the formation of the new genome of the child depends entirely on the genome of father and the genome of the mother, but the new genome of the child conceived cannot be predicted or fixed by them. Neither the father nor the mother can determine the genome of their children because it is formed in the womb of the mother where cannot receive interference. Furthermore, neither the father nor the mother can determine which of their genes have to encounter each other to form a new genome. Since there are about 25.000 – 40.000

[149] Helen Pearson, "Your destiny, from Day One", in *Nature* 418 (2002)14

genes in of each human being[150], the possibility of making a new genome is almost unlimited. Briefly, in the natural fertilization, the genome and sex of the children cannot be pre-determined.

The process of making a human being by cloning is very different. Both the genome and the sex of the new human being are determined by the master (donor). If the master is a man so the new human being will be a man, and if the master is a woman so the new human being will be a woman. The genome of the new human being can be predicted and determined easily. Since the genome of the new human being comes almost entirely from the donor (master), the new genome of the new human being will be very similar to the genome of the donor. If the donor of the nucleus and the donor of the enucleated ovum is the same person (woman), then the genome of the new human being will be 100% the same as the genome of the donor.

The two different ways of making a new human being will have great impacts to the well being of the children. In the natural fertilization, the children will have completely a new genome which never existed before. The new genome is formed like a lotto in which the parent cannot determine nor impose the formation of the new genome. It happens by chance. But this "lotto by chance" becomes a blessing for the child. The parents cannot determine their children's personality and future therefore the child himself has to build and discover his future and personality. Only in this way can a child become himself.

In the case of cloning, it is almost completely the opposite. Since the genome and the sex of the new human being are determined, he cannot become himself. He will not become himself because he will become like onto the donor (master) whose future and personality is more or less determined.

One can easily imagine that cloning a human being will not simply be inserting the nucleus of the donor into an enucleated ovum but that it will also be accompanied by genetic engineering. In this way, the genome of the new human being will be designed according to the taste or aspiration of those who order the human being or according to the buyer's specifications. Some people may prefer the red hair with

---

[150] Burton Guttman, Anthony Griffiths, David Suzuki, Tara Cullis, *Genetics*, Oneworld Publications, Oxford. 2002, p. 207; Renato Dulbecco, *La Mappa della Vita: L'Interpretazione del Codice Genetico*, Sperling Kupfer Editori, Milano, 2001, p. 62

blue eyes but somebody else might well prefer the blonde hair with yellow eyes and so on. So, children will not become themselves but they will become the object of the desire of their parents. As the taste of everything changes in the course of time, so the taste for designed children will change also. Unfortunately, once a human being is made, we cannot change him and we cannot discard him.

We can easily imagine the next problem. Since every generation has it own taste, so it can be predicted with a reasonable accuracy that there will be differences in the taste between parents and child. What a parent likes will not be necessarily the same as what the child likes. Unfortunately, the child cannot do anything to form the genome that he likes best and apply it to be his own genome. He can do nothing for his own genome except to receive it. If this differences in taste happens, the child will blame his parents and will bear this burden for all of his life. He will be forced to carry out the things that he does not like. Certainly it will be a very negative impact on the personality of the child and consequently the child might well not be happy with himself. The case is very different with the natural fertilization. It may happen that a child does not like his appearance but he cannot blame anybody because nobody made him like this. It happened by chance.

This point is rightly mentioned by Renato R. Martino, the Permanent Observer of the Holy See to the United Nations. When he gave his remarks to the United Nations on Human Cloning on November 19, 2001, he said, "*The child would be seen as an object and a product of one's desires rather than as a unique human being, equal in dignity to those who 'created' him or her.*"[151]

The same point was stated by Leon Kass. He stated that, "*Cloning represents a giant step toward transforming procreation into manufacture, that is, toward the increasing depersonalization of the process of generation and, increasingly, toward the 'production' of human children as artifacts, product of human will and design.*"[152]

The consequence of this approach is clear. In order that children may become themselves and for the well being of the children, they ought not to be the object of the design and aspiration of the parent. In other words, children have to be conceived in natural way.

---

[151] Renato R. Martino, "Remarks to the United Nations on Human Cloning", in *The National Catholic Bioethics Quarterly* 2(2002) 140

[152] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, p. 27

It is obvious that every single human being has the right to pursue his well being and happiness. In relation to the process of making children we have seen that cloning a human being infringes upon and even ruins the pursuit of the children's well being. Therefore, children have the right to be conceived in a natural way.

2. Children at Any Cost?

In the history of human civilization, children are most often regarded positively. There are many reasons to regard children in such away. In almost all cultures, children are important to continue the family history, especially in relation to the name of the family as well as the wealth of the family or the power of the family. In an agricultural society, children are needed as manpower to work in the fields. When the parents are old and unable to work anymore in the field, there is somebody, namely their children, who will take the responsibility to feed the whole family. In many religious teachings, children are regarded as a blessing from God so that women who do not have any children are often regarded as cursed or condemned by God.

It is understandable that many families want to have children because, in fact, it is good to have children. There are families who have been trying to have children and are using all possible means to accomplish their dream to have children. These parents often turn to the fertility therapy and undergo many tentative pregnancies in spite of the fact that they have to spend a lot of money. Even with all of these efforts, many of them return home without any positive result. Often they have no hope of having a biological child because of the irregularity of their reproductive organs.

With the advance of cloning technology, it seems that their hope is now renewed. Cloning seems to resolve many problems related to the irregularity of reproductive organs which is an important factor in being able to have biological children. If the reason for not being able to have children lies in a woman's reproductive organs, then they can hire another woman to carry out the pregnancy from their cloned baby. If the problem is in the man's reproductive organ, then they can take the nucleus from the man's cell and insert it into the enucleated ovum of his wife so that both husband and wife contribute to the genome of the new children. Briefly, cloning can be an answer to their

desire to have biological children which they are unable to have it through the natural fertilization or even assisted reproduction.

In evaluating this desire to have children there are many considerations to be taken into account. First of all, this desire to have children is a good desire and also those who help to realize this desire are doing a good job. But the goodness of the desire does not only lie in the desire itself, but also lies in what he desires and the relation between those who desire and what is desired. The object of the desire has to be good in itself and has to be good for those who desire it because of the honest way to get it[153].

In relation to the desire to have children, it has to be noted that life of a human being is always a good in itself[154]. The Bible gives many answers why the life of a human being is a good in itself. Some examples are that the life which God gives man is quite different from the life of all the other living creatures although the human being is formed from the dust of the earth and the other living beings are created from nothing[155]; the life of a human being is a manifestation of God in the world, a sign of his presence, a trace of his glory[156]; God gives human beings a sublime dignity and places them at the summit of God's creative activity and unites them with an intimate bond with his Creator so that in man there shines forth a reflection of God himself[157]; among the very many creations in the world, it is only the human being whom God wants to be his own self[158].

In the philosophical sphere, the life of a human being is a basic human right and a condition or requirement for other values and achievements (see chapter II.B.1). The life of a human being has an intrinsic value which is to be found within life itself (see chapter II.B.2).

On a biological level, the life of a human being is constituted by the completeness of the human genome which was formed at the end of fertilization. As we have seen in the previous chapter (I.C.3), the genome of a child is completely new genome. Although his genome is 100% comes from his parents with his mother contributing 50% and his

---

[153] Roberto Colombo, "La Clonazione Umana: Aspetti Antropologici e Morali", in *L'Osservatore Romano* August 20, 2003, page 5

[154] cf. *Evangelium Vitae* no. 34.

[155] cf. Genesis 2:7, 3:19; Job 34:15; Psalm 103:14; 104:29

[156] cf. Genesis 1:26-27; Psalm 8:6

[157] cf. Genesis 1: 1 – 2:3; *Evangelium Vitae* no. 34.

[158] cf. *Gaudium et Spes* no. 34

father contributing 50%, but the final result is totally different from both of his mother or his fathers genome. It is a new human genome that has never existed before. So a child is a different entity from his mother or his father. He is a different person. A child exists for himself and has value within himself.

Briefly, the life of a child (human being) is a good in itself, separate from the desire of his parent or anybody who wants him. The life of a child – like the life of all human beings – exists for itself and has value in itself. So the desire to have a child has never been justified except for the child itself and for the good of the child itself. In other words, it needs unconditional recognition of the child as he is in himself is needed.

In the case of human cloning, it is totally opposite to this recognition. The child's existence is the result of his parent's desire to have a biological child but it happens in a way that sacrifices the goodness of the child (the cloned human being). The right to procreate cannot be procured at any cost. It can not sacrifice the goodness of the child.

The exercise of all human rights cannot be performed in a way that transgresses or violates the rights of other people, especially if the exercising of that right endangers the life of another human being. The right of procreation is a very special right. Usually rights belong to individuals and, therefore, can be exercised individually. The right to procreate, however, is different. It is a right whose exercise always involves other people either as a partner (man and woman) or as a result (child). It cannot be performed alone without involving other people. That is why, the well being of other people – especially the well being of the children – have to be considered seriously as an important element in exercising this rights. Without considering the well being of the children, it is an act of individualism. If the right to procreate is performed individualistically, it will jeopardize the well being of other people, especially the cloned human being. The good desire itself is not enough to justify procuring a child through the process of cloning a human being[159]. The decision needs a holistic approach which must take many aspects of human life into consideration.

Secondly, Carson Strong, a professor in the Department of Human Values and Ethics at the College of Medicine, University of Tennessee, mentioned that from many studies on why many people

---

[159] cf. *Donum Vitae* II.5

want to have genetically related children, the researcher found out that their motivation to have genetically related children is selfish and confused[160]. Carson strong said that people want to have genetically related children to demonstrate their virility or femininity. In a society where husband and wife have "social obligation" to have child, the absent of child is an embarrassment. Even in some Islamic societies, like Indonesia, a woman who cannot bear a child is regarded lower. Her inability to have child is enough reason to divorce her. In such situation, it is not difficult to find men and women who will try hard to have child at any cost to demonstrate their virility or femininity without considering the well being of their children. Those people will find an excellent way out in cloning human being.

3. Distortion of Familial Relationship

Those who support human cloning and other types of assisted reproduction base their argument on procreative liberty[161]. They argued that it is a part of a free choices to be able to choose what sort of child to have, what means to employ to create a child, when and how the child will be born, as well as whether or not to have child at all. All of this is a free choice which depends completely on the will of the person (couple). As we have seen in the above chapter, that this view has an egregious defect since it disregard the interest of the child. It is an egoistic and individualistic view of liberty[162].

The second defect in this view is regarding to the important values which are at the heart of family, parents, and children. This view also impoverishes and reduces rich family values merely to a few values, primarily to values of autonomy and control[163].

---

[160] Carson Strong, "Cloning and Infertility" in Glenn McGee, *The Human Cloning Debate*, Berkeley Hills Book, Berkeley, 2002, p. 187

[161] Lori Andrews, "Mom, Dad, Clone: Implications for Reproductive Privacy", p. 248 - 249

[162] José Alfredo Peris Cancio, "Diritti Sessuali e Riproduttivi", in Pontificio Consiglio per la Famiglia, *Lexicon: Termini Ambigui e Discussi su Familgia, Vita, e Questioni Etiche*, Edizioni Dehoniane Bologna, Bologna, 2003, p. 227

[163] Thomas H. Murray, "What Are Families For?: Getting to an Ethics of Reproductive Technology", in *Hasting Center Report* 32 no. 2(2002) 41 - 45

Before continuing our discussion on this point, let us, first of all, look at the family and its values in order to see more clearly how human cloning disregards many of these family values.

In the sociological sphere, sociologists usually divide the types of families into "common family" which refers to a father, mother and children living together, or the "extended family"[164] which refers to a father, mother, children and other blood relatives (grand father/mother, nephew, aunt and so on) living together[165]. In both types of families, there is a constant and lasting relationship between the members of family. The basis of the familial relationship is characterized by a lasting union between a man and a woman who loves one another and who are open to the transmission of life[166]. Thus, the status of a man and a woman is not an additional status in family life but it is a constitutive status without which there can be no family. *Familiaris consortio* gives an interesting definition of family by stating that "*The family, which is founded and given life by love, is a community of persons: of husband and wife, of parents and children, of relatives.*"[167] This communion is a natural and original institution which is not created by any public authority since matrimony has precedence over any public authorities or public institution[168].

This lasting communion and unity of the family is based, first of all, on conjugal love which is manifested in the reciprocal self-gift between a husband and a wife. This reciprocal self-gift finds its deepest

---

[164] In common language recently, there is also other model of family. They are "traditional family" and "new model of family". These terms are used mainly in special circumstances, especially among those who want to legalize homosexual matrimony. Traditional family refers to matrimony of heterosexual person while new model of family refers to matrimony of homosexual person.

[165] Giorgio Campanini, "Famiglia allargata" in Pontificio Consiglio per la Famiglia, *Lexicon: Termini Ambigui e Discussi su Familgia, Vita, e Questioni Etiche*, Edizioni Dehoniane Bologna, Bologna, 2003, p. 305

[166] cf. Catechism of the Catholic Church no. 1601; Hayden Ramsay, "Famiglia e Filosofia", in Pontificio Consiglio per la Famiglia, *Lexicon: Termini Ambigui e Discussi su Familgia, Vita, e Questioni Etiche*, Edizioni Dehoniane Bologna, Bologna, 2003, p. 324

[167] *Familiaris Consortio* no. 18. All the citation of the *familiaris consortio* is taken from a Vatican translation of the Apostolic Exhortation of John Paul II *The Role of the Christian Family in the modern world. Familiaris Consortio*, St. paul Books & Media, Boston, 1994

[168] Family, Marriage and de facto Unions no. 9. All the citation from this document is cited from The Pontifical Council for the Family, *Family, Marriage and de facto Unions*, Libreria Editrice Vaticana, Città del Vaticano, 2000.

manifestation in the matrimonial sexual relationship which is oriented toward procreation. This conjugal love is not merely a sentiment, a blind impulse, and an irresistible passion, but it is a human act which flows from one person toward another person. It is a human act because it is born from the noble part of the person, the will of the person, and it is directed toward another person for the well being of the person he loves. So it is a decision and commitment of the person to embrace freely the permanent union to another person[169].

The second basis for the unity and communion of the family are blood ties. Parents and children are united lastingly because of the blood ties, and this also applies to the members of the extended family. The blood ties of families are very important in all societies. The blood ties have a great significance sociologically, psychologically, as well as affectively. In social life, blood ties indicates many things such as those related to the obligation and rights, for examples the obligation of the parents to take care and to educate their children. The negligence of this obligation is a violation of the law and can be prosecuted under the law. Blood ties also bring some prerogative rights such as the right to inheritance and proxy. Those obligations and rights are prerogative rights and obligations because of the blood relation between parent and child. Certainly, others members of blood ties other than parents also have different obligation and right. For example an uncle does not have the obligation and right to raise and educate his nieces and nephew as the parent does. Therefore, as we can see, different levels of blood ties also have different level of rights and obligations under the law and in society. It is obvious that the appellations such as father, mother, children, uncle, nephew, grand father grand mother and so on are not only a matter of tradition but they are very important in the society because they bring with them certain prerogative rights and obligations which exist precisely because of those relationship ties as father, mother, children and so on.

In the sphere of psychology, the blood ties are very significant. We can find easily people who are looking for their ancestors or their biological father or mother. Many adopted children are in anguish whenever they discover that the mother and father who raised them are not his blood parents. Many of them eventually find themselves in a difficult situation psychologically and blame their stepfather or stepmother for not telling them the truth. In a positive sense, the blood

[169] Cf. Gaudium et Spes no. 49

ties also have much significance. For examples, the first reaction of many people in encountering danger or attack is to defend their family. Parents will protect their children and children will protect their parents. These strong physiological ties can be explained only as blood ties. There are also many other examples regarding these psychological ties which are related to the blood ties. In an extreme situation, people will defend in an instinctive way their close blood relatives rather than those people who do not have close blood ties. These are "built in" psychological ties which exist because of the blood ties between members of the same family.

On the level of the affective sphere, a mother usually has by instinct a special relationship with her children. Even if mother and children are separated by distance, a mother can often feel her children's condition. Through the intuition, there are many mothers who know accurately if her children are gravely sick or in despair. This special effective connection exists because of blood ties and especially during pregnancy at which time the embryo depends totally to his mother. Furthermore, having, raising and loving a child are profoundly life-altering experiences both for the mother as well as for the father[170].

There are still many others human phenomena which exist because of blood ties (familial relationship), and these are not only merely blood ties as such but the blood ties which organize people according to a certain level of relationship. This certain level of relationship brings with it certain rights and obligations as well as a wider implication in the life of each person. This is an organization of people which happens naturally without any general meeting to discuss and establish the basis of its existence. That is the reason why the family is usually called the small unit of society.

Let us see how human cloning destroys the above familial relationship. First of all, human cloning is an asexual reproduction with only a single parent for the offspring. It is a radical departure from the natural human way of begetting children. The cloned human being is not the fruit of a reciprocal self-gift between husband and wife which is a manifestation of openness to begetting offspring. Thus it deprives the person from a sexual relationship which is the most intimate expression of a reciprocal self-gift and the natural way of begetting children. In

---

[170] Thomas H. Murray, "What Are Families For?: Getting to an Ethics of Reproductive Technology" in *Hastings Center Report* 32 no. 3(2002) 42

human cloning, children are not the fruit of reciprocal self-giving but the fruit of desire and technique.

Secondly, cloning a human being creates a confusion regarding the normal understanding of father, mother, sibling and son on and its moral relationship[171]. A woman may give birth her biological grand father or grand mother or grand children or even her self. Theoretically, woman can give birth whoever either her blood ties family or any other people. If this happens, this creates much confusion. Is the cloned human being an offspring or a sibling? How does the cloned human being called the woman who gives birth to him? How does the cloned human being call the other members of the blood ties family? As we have seen above, those appellations are not merely a tradition but they bear many consequences in the real life. The lineages of biological blood ties identify rights and responsibilities[172].

Before the invention of reproductive technology which leads to the surrogate mother, for some reasons people may not know exactly the identity of the biological father of a child but the identity of the mother is always known. "*Homo vagans mater semper certa*"[173]. The mother of the children is clear. It is the woman who gives birth to the child. Now the confusion is much greater because now not only it is possible for the identity of the father not to be known, but the identity of the mother of the child may not be known as well. The mother of a child is not always the woman who gives birth to the child. She may be anyone else who may not have any blood ties whatsoever with the woman who gives birth to the child. In its declaration on human cloning, the Pontificia Academia pro Vita rightly stated this point when it said, "*In the cloning process the basic relationships of the human person are perverted: filiations, consanguinity, kinship, parenthood. A woman can be the twin sister of her mother, lack a biological father and be the daughter of her grandfather.*"[174]

---

[171] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, p. 26; Leon R. Kass, "The Wisdom of Repugnance", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, p. 28

[172] Robert Wachbroit, "Genetic Encores: The Ethics of Human Cloning", in Richard Sherlock and John D. Morrey (eds.), *Ethical Issues in Biotechnology*, Rowman & Littlefield, Lamham, 2002, pp. 577

[173] Silvia Vegetti Finzi, *Volere un Viglio: La Nuova Maternità fra Natura e Scienza*, Arnoldo Mondadori, Milano, 1999, p. 227

[174] Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p 11

With the advance of reproductive technology, especially human cloning, we must redefine the terminology for the family especially those term used in reference to the blood ties relationship. Can we always use the term "child/children" for the cloned human being in his relation to the woman who gives him birth? What do we call the relationship of the woman gives birth to her biological grandfather? What terms do we use to name this cloned human being? How will we call the cloned human being if he is the biological grand father of the woman who gives birth to him? Is he her great grandfather or sibling or twin? There are many more problems regarding family ties in relation to the cloning of human beings.

As we can see from daily life, familial relationships are the foundations for fulfilling the social dimensions (both rights and obligations) of human nature. If the familial relationship is destructed, how can we fulfill those social dimensions? While incest creates a serious ambiguity of familial relationship, cloning of a human being is even worse because it destroys all the basic of human relationship.

Thirdly, cloning human being will attack the basis of familial relationship. In the natural procreation, the familial relationship happens as it is, not by human intervention and plan. For example: Mr. X is the nephew of Mr. Y. This familial relationship happens without human intervention and plan. The only thing that can be planned by the parent of Mr. X is that "we want to have a baby". But they cannot plan the genome, the sex, and the physical form of the baby. It is very different from the cloning. The familial relationship between people will be an interrelation by choice. People can choose the sex, genome, and physical form of their nephews or whatever the cloned human beings will be called. Certainly, first of all, it has to be resolved the terminology of nephew, son, daughter and so on. This interrelation by choice may be motivated by unworthy motivations such egoism, racialism, eugenic and so forth which are contrary to the human dignity.

Fourthly, cloning human being will confuse the parental responsibility. In the natural procreation, parent will receive their child as he is, whether their child is normal or abnormal. This attitude is based on the natural parental responsibility in which parents receive the fruit of their love. The problem is very different with cloning. Who has responsibility if the cloned human being has defect? Do the 'parents' want to take responsibility of the defect so that they will accept the cloned human being as he is? Or do we have to blame the clonner? Do

the 'parents' will be responsible for his up bringing in the same way true parents who are the cause of child's origin and contribute equally to the genome of their children? I believe that this problem will end up in the killing of the embryo while he is still in the womb of a woman. This is a form of eugenic that cannot be justified morally because a person (the cloned human being) is condemned to death not because of his false or guilt but because of his human condition which is not his responsibility.

Furthermore if there is something wrong in the future regarding the cloned human being, who has responsibility of this? Is this responsibility of the 'parents' or the cloners? The cloners would be responsible of making human being according to the order and the desire of those who order. As long as the product matches the criteria of the order, his responsibility is finished. So, if the defects happen in the future, who will take responsibility to this problem? Do the cloners have to give guarantee for a number of years?

Briefly, with the human cloning there will be no family nucleus[175]. One of the important roots of this confusion is in the relation between the cloned human being and the woman who give him birth. We cannot always call the cloned human being as "child (children)" in relation to the woman who gives birth to him. This is another reason why I do not agree with the term "cloning-to-produce-children" which was proposed by the President's Council on Bioethics[176].

In place of the term "children", we do not yet have a term designated for him. In spite of the confusion regarding the term designated to him, one thing is obvious and that is that he is a human being. That is the reason why in the previous chapter (I.D.5.d) I proposed the term "the cloned human being" instead of the term "children". As a consequence, the logical name which people ordinarily use to refer to "reproductive cloning" or what the President's Council on Bioethics called "cloning-to-produce-children" is "cloning to create human being".

In the affective level, Leon Kass and James Nelson also pointed out some serious problems regarding this cloning to create human

---

[175] Richard Sherlock and John D. Morrey, "Human Cloning and Stem Cell Research", p. 520

[176] Leon R. Kass (chairman), *Human cloning and human dignity: The Report of the President's council on Bioethics*, Public Affairs, New York, 2002, p. 49

being. A female child who was cloned from her "mother" might develop a desire for a relationship with her "father" and might understandably seek out a paternal relationship to the father of her "mother", who is after all also her biological father[177]. On the other hand, a cloned human being who is carried in pregnancy by her surrogate mother may not have an affective relationship with her biological "mother". The experience of pregnancy builds a special bond between the baby and the woman. There are many cases in which the surrogate mother does not want to give the baby to his biological parents and this unfortunate situation ends up in court. In many cases, the court favors the biological parents to raise the baby.

These problems are not simple problems but they are serious problem, especially for the well being of the cloned human being. These problems will have a huge impact on the development of the cloned human being in many aspects of his life such as socially, psychologically, affectively and so forth. In fact, every person has the right to live in dignity apart from unnecessary problems imposed by other people. The distortion of social mother and biological mother and other related problems contradict to the well being of the cloned human being. That is the reason why every person has the right to be born naturally[178].

Each of us has the right to know our genealogy so that we know exactly who our parents are. In the modern time, people demand the minimum condition to life humanly. For the baby, the first condition is the accuracy of parent which guarantees the children's need of intimacy, safety, and love. They are very important for the development of the children. In the case of cloning human being, the accuracy of the parent is not guaranteed. A cloned human being may have 4 'mother' without any father if the somatic nucleus of a woman is inserted to an enucleated ovum of other woman and then it is implanted to another woman (surrogate mother) and finally he is adopted by another woman. A cloned human being who is born from such process will undergo total confusion regarding his genealogy.

---

[177] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, p. 36; Leon R. Kass, "The Wisdom of Repugnance", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, p. 28

[178] Eberhard Schockenhoff, *Etica della Vita: Un Compendio Teologico*, Queriniana, Brescia, 1997, pp. 173 - 174

D. Research on Human Embryos and Its Regulation

In this chapter, we will discuss the responsibility of scientists, researchers, and society in conducting biomedical research and experiments, especially in relation to human cloning. One of the objectives of human cloning is for research. Even the President's Council on Bioethics proposed a new term "Cloning-for-Biomedical-Research"[179]. In this case, "biomedical research" is either for knowing the mechanism of the human embryo better or for testing new drugs. We will see whether human cloning is a valid means of research or whether it is against ethical principles of research using human embryos.

1. Freedom of Research in Biomedical Research and Its Regulation

The fast growing biomedical technology which we now enjoy is the fruit of long time biomedical research and experiment. It is universally accepted that the practical finality of biomedical research is centered on the cure of illness and prevention of sickness so that sick persons can be cured in an effective and timely manner without collateral effects[180]. Certainly, those objectives are not the only ends of biomedical research, since biomedical research is also pursued for other objectives such as the growth of medical knowledge itself.

The development of science in general (also in biomedical science) usually happens in the scientific community which pursues study, investigation, exploration, research, and conduct experiment. In order to bear good fruit, the scientific community needs certain conditions so that it can explore and unveil the secrets of the universe. One of the important conditions is freedom of research in which scientists have the liberty to explore and conduct research on whatever they want.

---

[179] Leon R. Kass (chairman), *Human Cloning and Human Dignity: The Report of the President's Council on Bioethics*, pp. 49 - 52

[180] Adriano Bompiani, "Experimental Research in the Field of Biomedicine: Spheres, Methods, Validity Criteria for Research Projects," in Pontificia Academia pro Vita, *Ethics of Biomedical Research in a Christian Vision*, Libreria Editrice Vaticana, Città del Vaticano, 2004, p. 93

But it has to be underlined that freedom of research does not mean *chaos,* without any regulation. It is a liberty by which they may do that which is fitting and right. From common sense, it is obvious that a research project which produces benefits has a different value from the research that causes damage or grave risk to human beings. The ancient medical aphorism is still valid: first do no harm. Scientists and researchers cannot exclude themselves from the general duties of responsability and prudence in their research.

In their research, scientists and researchers touch the civil community because all the scientists' and researchers' activities will have an impact on the civil community either directly or indirectly. For example, people's opposition to the genetically modified organism (GMO) and to the success of the cloning of Dolly indicates clearly that there is a border which cannot be crossed by researchers or scientists. Scientific activities which cross the boundaries of common ethical sentiment and offend the dignity of human beings alarm the civil community to protect the well being of humankind.

In order to protect the common good and well being of humankind, we need to regulate those scientific activities in form of laws and clear protocol of research[181]. In some cases, the regulated law falls behind these activities so that when scientific research comes up with a result, people are disoriented and legislation must rush to draw up legislation (law). There are many examples: in many countries, there is no regulation (law) about assisted reproduction, the surrogate mother, and cloning. This situation can be understood, though, because scientific research develops rapidly while to make laws needs many considerations and agreement from many political parties which is not easy to reach in a pluralistic society.

The existence of the constitution (laws) guarantees the protection of those involved either directly or indirectly in the research and experimentation and the protocol of research describes the scientific validity of the research.

Unfortunately, not all countries where the experiment and research are conducted have this kind of law. In this case, scientists and researchers certainly are bound by the ethical principles of conducting research which is valid in the scientific community. Even in countries where the law exists, it can be justified that researchers follow the

---

[181] Adriano Bompiani, "Experimental Research in the Field of Biomedicine: Spheres, Methods, Validity Criteria for Research Projects", pp. 96 – 98

ethical principles rather than follow merely the law literally. For example: although in the United Kingdom researchers are allowed to use an embryo for research up to 14 days old, a Catholic researcher in the United Kingdom may refuse to use an embryo for research based on his conviction.

On the contrary, not all of the activities which conform to the legal system of a country are justified morally. The clear example of this situation is the case of the medical doctors who worked for the Nazi regime in Germany. Arguments that these doctors only follow the existing laws did not satisfy the juries in the Nuremberg court. They were sentenced because of their activities.

The justification of this principle is due to the fact that law is a general agreement upon which all the citizens agree. Certainly, in a pluralistic society where there is no single way of life (ethical principles), it is difficult to unite all of these ways of life into a single law. In some cases, the ethical principles are wider than the legal system and these ethical principles bind the adherents personally. That is the reason, why not all things that are valid legally are by that reason also valid morally. In the following chapter, we will investigate these ethical principles which bind scientists and researchers either universally (international agreement on biomedical research) or particularly (Christian teaching on biomedical research).

2. Ethical Principles of Biomedical Research on Human Embryo

Since the last decades, research using the human embryo for many objectives has developed extraordinarily. There is therapeutic research and non-therapeutic research which use the embryo in uterus as subjects or use tissues from the aborted embryo. There is also research on the embryo to study the early stages of embryonic development to improve techniques in assisted reproduction. The newcomer in this field is research on embryonic stem cells and cloning. The fruits of this research on human embryo are remarkable. Our understanding of the human embryo is far more advance than ever before.

Along with this fast development of research, there also emerge, therefore, a growing need for ethical principles that guide the research. Unlike the past centuries, in which the guiding principles lay mainly in the integrity of the researchers to judge the validity of the research; in

the today's world, there is a growing need for common accepted principles that can be applied to and guide research so that the research can be verified objectively and thereby abuses can be avoided[182]. Unfortunately, in this pluralistic society, it is not easy to find a common ground on which these guiding principles should be based. These principles have to be trans-cultural and religious principles are sometimes not always easy to reconcile with each other.

a. International Agreement of Biomedical Research on the Human Embryo

In many countries, the concern about ethical problems of research on the human embryo is growing together with the unending ethical debate on abortion and the revelations about the inappropriate use of the human subject in research. Governments of many nations look for a common policy regarding the ethical guidance for this research in order to prevent further abuse of the research. Baruch A. Brody a professor of Biomedical Ethics and Health Policy at Baylor College of Medicine, Houston, Texas, offered an important observation regarding research on human embryo. He concluded that "*All official policies treat research on fetuses in utero as human subject research governed by the policies for human subject research.*"[183] So we will discuss first of all the principles that guide research on the human subject and then their application on the embryonic subject.

Since the end of the Second World War, the first important code for international medical research is the Nuremberg Code (1949)[184]. The Nuremberg Code emerged as part of the judgment in the Nuremberg trails against some physicians who undertake auspices of the Nazi government, conducted research using human beings as the object of their research in the concentration camps. It contains a series of ten principles on human research and it has played important role in the development of further policies in many countries. The second

---

[182] Trevor Smith, *Ethics in Medical Research: A Handbook of Good Practice*, Cambridge University Press, Cambridge, 1999, p. 1

[183] Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, p. 100

[184] All of the citations of The Nuremberg Code (1947) are taken from Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, p. 213. In this disertation, this code will be called as "Nuremberg Code".

international code of medical research is the Declaration of Helsinki[185] which was adopted by the World Medical Association. The Declaration of Helsinki was adopted in 1964 on the occasion of the 18th World Medical Assembly in Helsinki, Finland and was renewed in 1975, 1983, 1989, and 1996. There are some other significant international and national codes which also regulate research on the human subject, such as the International Ethical Guidelines for Biomedical Research Involving Human Subjects (1993) by the Council for International Organizations of Medical Sciences (CIOMS)[186], Recommendation Concerning Medical Research on Human Beings (1990) by Council of Europe[187]. The Belmont Report: Ethical Principles and Guidelines for the Protection of Human Subjects of Research (1974) by Department of Health, Education, and Welfare, the USA[188].

In the special field of research using the human embryo, there are also some international and national agreements which regulate research on the human embryo, for examples Scientific Research and/or Experimentation on Human Gametes, Embryos, and Fetuses and Donation of such Human Material[189] (1989) by Council of Europe; Protections pertaining to Research, Development, and Related Activities Involving Fetuses, Pregnant Woman, and Human In Vitro

---

[185] All the citation of the Declaration of Helsinki are taken from Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, p. 214 – 216. In this disertation, this declaration will be called "Declaration of Helsinki".

[186] All the citations of these guidelines are taken from Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, p. 233 – 236. In this disertation, this ethical guidelines will be called "CIOMS".

[187] All the citations of this recommendation are taken from Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, pp. 241 – 250. In this disertation, this recommendation will be called "Councill of Europe".

[188] All citations of this Report are taken from Ruth Ellen Bulger, Elizabeth Heitman, and Stanley Joel Reiser, *The Ethical Dimensions of the Biological and Health Sciences*, Cambridge University Press, Cambridge, 2002, pp. 128 – 137. In this dissertation, this report will be called "Belmont".

[189] All the citations of this document are taken from Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, pp. 253 – 255. In this disertation, this document will be called "SRE".

Fertilization (1981)[190] by American Department of Health and Human Services.

In biomedical research using the human subject – also in the case of the human embryo – generally there are conceptual distinctions between therapeutic research and non-therapeutic biomedical research. The clinical therapeutic research is research whose aim is essentially diagnostic and therapeutic for the patient. This research is justified by its benefits for the patient. The patient for whom the research is performed has to benefit from that research. On the contrary, if patient does not receive benefit from the research, that research cannot be justified. The non-therapeutic biomedical research is research which is purely scientific and without direct diagnostic or therapeutic value to the person for whom the research is performed. There are some examples of these researches such as research to know better the nature and development of the embryo, research to know the efficacy of the contraceptive and abortive drugs, research on the genetic manipulation of embryo, and so on. This type of research is justified so long as the interest of society does not take precedence over the well-being of the research subject. In this kind of research, although the research may be a benefit for society, if the research jeopardizes or ruins the well-being of the subject, the research cannot be justified[191].

We will examine more deeply some principles of biomedical research which have implications for human cloning which use the human subject. Those principles are:

- Informed Consent

In some codes, informed consent is placed as the first principle or basic principle because in the past there were many abuses. *"The voluntary consent of the human subject is absolutely essential."* (Nuremberg Code no.1). *"The physicians should then obtain the subject's freely-given informed consent, preferably in writing."* (Declaration of Helsinki no.9). *"For all biomedical research involving human subjects, the investigator must obtain the informed consent of*

---

[190] All the citations of this regulation are taken from Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, pp. 272 – 281. In this disertation, this document will be called "DHHS"

[191] Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, p. 34; Sandro Spinsanti, *Etica Bio-Medica*, Paoline, Torino, 1992, pp. 152 – 153

the prospective subject." (CIOMS no.1). "*No medical research may be carried out without the informed, free, express and specific consent of the person undergoing it.*" (Council of Europe no. 3). "*Except as provided elsewhere in this policy, no investigator may involve a human being as a subject in research covered by this policy unless the investigators has obtained the legally effective informed consent of the subject or the subject's legally authorized.*" (DHHS §46.116). "*Respect for persons requires that subjects, to the degree that they are capable, be given the opportunity to choose what shall or shall not happen to them. This opportunity is provided when adequate standards for informed consent are satisfied.*" (Belmont, part C. no. 1)

It is understandable that the case of consent is placed in the first or basic principle because in the past, there were experiments which were conducted without consent of those who participated in the experiment. Some researchers did not even offer enough information of the nature (the benefits and the risks) of the experiment to those who participated in it. The principle of consent flows from the principle of autonomy. Every person has autonomy over his being to determine or make a decision for himself.

Since medical intervention on the human body affects not only the body of the person but affects the whole being of the person, a holistic approach to the human being must be the center of consideration in determining any research on human subject. Furthermore, the owner of the body is the patient so that all the medical interventions on his body must have the permission from the owner of the body (patient).

Certainly, informed consent only can be given by those who are capable to give it freely, without any form of fraud or pressure and only after receiving enough information. They are parts of the common principle in medical ethics to respect human being as person.

This consent does not mean that the participant has to engage in all the process or all the procedures involved in the experiment. At any time the participant can withdraw his participation if he sees or predicts that there is something wrong regarding his physical and moral integrity. "*During the course of the experiment the human subject should be at liberty to bring the experiment to an end if he has reached the physical or mental state where continuation of the experiment seems to him to be impossible.*" (Nuremberg Code no. 9). "*He or she should be informed that he or she is at liberty to abstain from participation in the study and that he or she is free to withdraw his or*

her consent to participation at any time." (Declaration of Helsinki no.9). The researchers have to honor the decision of the participant to withdraw from the research. The researchers have to respect his decision. "*The right of research subject to safeguard his or her integrity must always be respected*" (Declaration of Helsinki no. 6).

Those who are legally incapacitated (because of being of minor age or being mentally incapable) can participate in the research only if his legal representative gives consent. "*In the case of legal incompetence, informed consent should be obtained from the legal guardian in accordance with national legislation.*" (Declaration of Helsinki no. 11). But in the European countries "*A legally incapacitated person may not undergo medical research unless it is expected to produce a direct and significant benefit to his health*" (Council of Europe no. 5.1).

Since we cannot receive consent from the embryo, the informed consent must be given by the mother and father of the fetus. "*An activity permitted under paragraph (a) of this section (i.e. intervention on human fetus, red.) may be conducted only if the mother and father are legally competent and have given their informed consent.*" (DHHS §46.208.b). This consent has to be regulated in such away that both the interest of the mother and the embryo are protected. It is possible that there is a conflict of interest between the two of them, for example the benefit of the mother in some cases may be harmful for the embryo or vice versa.

- The Purpose of the Research

All of the national and international rules that regulate research on the human embryo offer agreement on this type of research only if it is therapeutic and it is a preventive intervention for the benefit of the embryo itself. "*investigation of viable embryos in vitro shall only be permitted for applied purposes of a diagnostic nature or preventive or therapeutic purposes*" (SRE no. B.4). "*No fetus in utero may be involved as a subject in any activity covered by this subpart unless the purpose of the activity is to meet the health needs of the particular fetus and the fetus will be placed at risk only to the minimum extent necessary to meet such needs.*" (DHHS §46.208.a.1)

In this case, cloning to create therapeutic means cannot be justified, because it is not a therapeutic intervention. The embryo on whom medical intervention is performed does not receive any benefit.

Even a preprogrammed death is performed upon the embryo before receiving any benefit of the intervention.

- Methods of the Research

Research using human beings is permitted only if the fruitful results for the good of the society cannot be obtained by other methods. If there are alternative methods, the other methods must be employed first. Research on the human embryo is to be performed only after research has been performed on animals. If good results emerge from the research on animals, it can be followed up using human (embryo).

"The experiment should be so designed and based on the results of animal experimentation and a knowledge of the natural history of the disease or other problem under study that the anticipated results will justify the performance of the experiment." (Nuremberg Code no. 2 - 3). *"Research on living embryos must be prohibited, particularly if it is possible to use an animal model."* (SRE no. B.5); "*No activity to which this subpart is applicable may be undertaken unless appropriate studies on animals and nonpregnant individuals have been completed.*" (DHHS §46.206.a)

It is true that research using animal has been performed before it is eventually applied to human cloning. But the result of the animal experiment is very low. The highest result is only 3% of life birth and in the most cases are even lower than that. So the appropriate result has not yet been proven. As long as the result on animal experimentation is unsatisfactory, it cannot be applied to human beings. People like Severino Antinori and Michael Panayotis Zavos who want to clone human beings (see chapter I.B.2.c) do not seem to respect this principle. Until now, no kind of human cloning can be justified according to this principle.

- The Risk of Research.

Research using the human embryo can be permitted only if the embryo is exposed to minimum risk. The minimal risk of research is determined by the general obligation of beneficence in medical ethic to improve people's well-being and to do no harm. This Hippocratic principle of do no harm has long been a fundamental principle in medical ethics. This principle underlines the importance of ensuring that the risk of research is minimal in comparison with the potential benefit. "*Biomedical research involving human subjects cannot be legitimately carried out unless the importance of the objective is in*

proportion to the inherent risk to the subject." (Declaration of Helsinki no. 4). *"The experiment should be so conducted as to avoid all unnecessary physical and mental suffering and injury. No experiment should be conducted where there is an a priori reason to believe that death or disabling injury will occur, except, perhaps, in those experiments where the experimental physicians also serve as subjects."*(Nuremberg Code no. 4 - 5) *"No fetus in utero may be involved as a subject in any activity covered by this subpart unless the purpose of the activity is to meet the health needs of the particular fetus and the fetus will be placed at risk only to the minimum extent necessary to meet such needs."* (DHHS §46.208.a.1). *"Person are treated in ethical manner not only by respecting their decisions and protecting them from harm but also by making efforts to secure their well-being."* (Belmont, part B. no. 2)

Human cloning clearly exposes the human embryo to a very dangerous risk. For the present time, the result of cloning mammalians – as we have seen in the previous chapter (I.D.3.b) – is very low. The highest success for cloning mammalians is only 3%[192]. In the previous chapter (I.D.3.b) we have also seen the diseases of the born mammalians. Those which were born live have many defects genetically and as a result were susceptible to many diseases. So, human cloning to create human beings can not be permitted because of the high inefficiency of live births. The frequent occurrence of prenatal deaths and birth defects (abnormalities) indicate that we do not yet fully understand the process of epigenetic reprogramming that goes on in a reconstructed cloned embryo. We cannot assure that the process will be accomplished successfully in human beings who are more complicated than mammalians. If the highest success rate in the animals is only 3%, it can then be assumed with a great degree of certainty that the result of human cloning will be less than that of mammalians[193].

In the case of cloning to create therapeutic means it is even more dramatic because the death of the person is the integral part of the research process. The danger for the fetus is not only very high but it also results in the death of the fetus. There is no way that one can take

---

[192] Tanja Dominko, Calvin Simerly, Crista Martinowich, and Gerald Schatten, "Cloning in Nonhuman Primate", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 422

[193] Ronald M. Green, "Ethical Implications of Cloning", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 480

the embryoblast of the embryo without causing the death of the embryo.

The final conclusion is very clear: every kind of human cloning must be prohibited according to these principles. I hold a deep conviction that behind the birth of terminology "therapeutic cloning" there lies this problem. I have some reasons to think in such away. Firstly, there are some research protocols such as Council of Europe, Convention for the Protection of Human Rights and Dignity of the Human Being with Regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine (1996) which stated clearly "*The creation of human embryos for research purposes is prohibited.*"[194]

Secondly, the only permitted medical intervention on the human embryo is the therapeutic intervention. As we have seen in the previous chapter (I.D.5.b) that what people called "therapeutic cloning" is exactly against these principles: they create human embryo for the research and their intervention on human embryo is not for therapy. Thus, as to camouflage the real process of their research, the term "therapeutic cloning" is used in the hope that people will agree to it. Unfortunately, it seems to me that it is used in wrong way, as we have outlined in the previous chapter (I.D.2.d). That is the reason why I do not agree with the terminology of therapeutic cloning. Therapeutic cloning is an euphemism to soften and to hide the real problem of the human embryo being killed. It is clearly a misleading terminology.

Although international principles on research forbid using the human embryo for research - except for therapeutic purposes – the application from one country may vary to that found another country. The most famous example is the Warnock Committee from England which gave permission to use the human embryo for research before the human embryo was 14 days old because the benefit of the research is greater than the obligation to respect the human embryo. "*... though the human embryo is entitled to some added measure of respect... that respect can not be absolute, and may be weighted against the benefits*

[194] Article 18 § 2. Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, p. 252

arising from research."[195] Certainly, it is a violation of international agreement.

b. The Christian Teaching on Biomedical Research on the Human Embryo

In the instruction on Bioethics, *Donum Vitae*, Pope John Paul II stressed that "*The human being must be respected as a person—from the very first instant of his existence.*"[196] In this instruction, the Church does not take an official position on whether the zygote is a person or not but the central attention is that the zygote as the fruit of the fertilization, must be respected as a person from the very first instant of his/her existence. The respect which inherently belongs to the zygote is not as "the potential person" or "the future person" but as a person although the zygote may not be present as a tangible person. We are fortunate because the recent understanding of embryology illuminates this problem and affirms the zygote as a person. (See previous chapter II.A.2). Certainly, the personhood of the zygote is not like that of you and I who in own stage of development have the capacity and possibility to act as person. These facts have no implications as to the status of the embryo because it is only a question of time until the zygote will be like you and I.

Because of those arguments, *Donum Vitae* emphasized "*Thus the fruit of human generation, from the first moment of its existence, that is to say from the moment the zygote has formed, demands the unconditional respect that is morally due to the human being in his bodily and spiritual totality. The human being is to be respected and treated as a person from the moment of conception; and therefore from that same moment his rights as a person must be recognized, among which in the first place is the inviolable right of every innocent human being to life.*"[197]

The right to life – as we have seen in the previous chapter II.B.5 – is a basic right upon which other rights are built. This right to life belongs to all people regardless of their physical form (embryo or

---

[195] Warnock Report No. 11.15. Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, pp. 6

[196] *Donum Vitae* no. I.1

[197] *Donum Vitae* no. I.1

adult). This right must also be respected in regard to medical intervention or research using the human embryo. This right is restated by *Fontificia Academia pro Vita* in responding to the case of stem cells research. *"From this it follows that as a 'human individual' it has the right to its own life; and therefore every intervention which is not in favour of the embryo is an act which violates that right."*[198]

Donum Vitae actually only restated what the Church has taught in the previous official teaching such as the Pastoral Constitution *Gaudium et Spes*, "*Life, once conceived, must be protected with the utmost care; abortion and infanticide are abominable crimes.*"[199] The Charter of the Rights of the Family, published by the Holy See, confirmed "*Human life must be absolutely respected and protected from the moment of conception.*"[200]

This concern for respecting the human embryo as a person is due to the fact that the life of a human being begins with conception and the life of the human being – regardless of its form – is valuable before God. There are many passages in the Bible that recognize the value of life from its very beginning. For example, "*Before I formed you in the womb I knew you, and before you were born I consecrated you*"[201]. About this passage, *Evangelium Vitae* commented, "*the life of every individual, from its very beginning, is part of God's plan.*"[202]. In the New Testament, the value of the person from the moment of conception is celebrated in the meeting between the Virgin Mary and Elizabeth, and between the two children whom they are carrying in their wombs[203]. It is precisely the embryo who reveals the advent of the Messianic age: in their meeting, the redemptive power of the presence of the Son of God among humanity first becomes operative.[204]

Like the international regulation on research using the human being as the subject, the Church also makes a distinction between therapeutic and non-therapeutic experimentation. But unlike

---

[198] Pontificia Academia pro Vita, *Declaration on the Production and the Scientific and Therapeutic use of human Embryonic Stem cell*, Libreria Editrice Vaticana, Città del Vaticano, 2000, pp. 14 – 15

[199] Pastoral Constitution Gaudium et Spes, no. 51

[200] Holy See, Charter of the Rights of the Family, no. 4: L'Osservatore Romano, November 25, 1983.

[201] Jeremiah 1:5

[202] *Evangelium Vitae* no. 44

[203] Luc 1: 39 - 56

[204] cf *Evangelium Vitae* no. 45

international regulation which give a possibility of non therapeutic experimentation as long as the interest of the society does not take precedence over the well-being of the research subject[205], the Church said clearly that non-therapeutic experimentation is illicit. *"As regards experimentation, and presupposing the general distinction between experimentation for purposes which are not directly therapeutic and experimentation which is clearly therapeutic for the subject himself, in the case in point one must also distinguish between experimentation carried out on embryos which are still alive and experimentation carried out on embryos which are dead. If the embryos are living, whether viable or not, they must be respected just like any other human person; experimentation on embryos which is not directly therapeutic is illicit."*[206]

Since we have to respect a human being as a person from the very first instant of his existence, an embryo which is used for medical research enjoys the treatment like other person.

- Informed Consent

All medical interventions whether on adults or embryos need informed consent. *"The informed consent ordinarily required for clinical experimentation on adults."*[207] In the case of the embryo, consent is given by the parents. *"Medical research must refrain from operations on live embryos, unless there is a moral certainty of not causing harm to the life or integrity of the unborn child and the mother, and on condition that the parents have given their free and informed consent to the procedure."*[208] In the case of prenatal diagnostic, informed consent is needed to perform prenatal diagnostic test. *"Such diagnosis is permissible, with the consent of the parents after they have been adequately informed, if the methods employed safeguard the life and integrity of the embryo and the mother, without subjecting them to disproportionate risks."*[209]

---

[205] Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, p. 34

[206] *Donum Vitae* I,4

[207] *Donum Vitae* I.4

[208] *Donum Vitae* I. 4.

[209] *Donum Vitae* I.2

- The Purpose of the Research

The Church stated clearly that medical intervention (research) on the human embryo is licit if it is therapeutic. *"As with all medical interventions on patients, one must uphold as licit procedures carried out on the human embryo which respect the life and integrity of the embryo and do not involve disproportionate risks for it but are directed towards its healing, the improvement of its condition of health, or its individual survival."*[210]

This therapeutic motive of research or medical intervention is very important. Since we cannot ask informed consent from an embryo, we do not know exactly what embryo wants in this intervention. But we can assume or guess it by what people usually want in the same situation. All people normally want to have a healthy life and improve their health. Based on this presumption we have a reasonable ground for assuming that the embryo will agree to this therapeutic medical intervention. On the contrary, we cannot assume with a reasonable ground that embryo will agree to the medical interventions which do not respect its life and integrity and do not involve disproportionate risks. Since we cannot force other people to take great risks or to sacrifice their lives – even for the benefit of others – we cannot assume that the embryo will agree to that type of medical intervention.

Evangelium Vitae restated another important point. Medical intervention or research which includes the killing of the embryo is illicit. The moral problem of this type of intervention is the same as abortion because the both of them are a form of killing innocent people.

> *This evaluation of the morality of abortion is to be applied also to the recent forms of intervention on human embryos which, although carried out for purposes legitimate in themselves, inevitably involve the killing of those embryos. This is the case with experimentation on embryos, which is becoming increasingly widespread in the field of biomedical research and is legally permitted in some countries*[211].

From this perspective, it is clear that cloning to create therapeutic means is illicit. The illicitness of this type of cloning lies in the fact that the embryo upon which the research is performed, does not receive any benefit or therapy. Even, the embryo is killed in order to harvest its

---

[210] *Donum Vitae* I.4. *Evangelium Vitae* no. 63
[211] *Evangelium Vitae* no. 63

stem cells. As we have seen in the previous chapter (I.D.5.b) the killing of the embryo is an integral part of the research process without which the research cannot be performed. It is a foreseen – planned murder which is worse morally than many cases of abortion in which the murder is not planned before it is created.

Cloning to create human being also cannot be justified based on this principle. The cloned human being is exposed to a very great risk of his personal integrity and health. We have seen in the previous chapter (I.D.3.b) that mortality of the born baby is very high and abnormality in the physical health of the born baby is also very high.

- Risk to the Embryo

The risks in the experiments may come from different causes such the methods of the research or the side effects of the research. As in the international law, the Church also points out the illicitness of research and medical interventions on human embryo which jeopardize the physical integrity and life of the embryo. *"It follows that all research, even when limited to the simple observation of the embryo, would become illicit were it to involve risk to the embryo's physical integrity or life by reason of the methods used or the effects induced."*[212]

From this perspective, all types of cloning cannot be justified since the risks involved with of cloning are very apparent. The high mortality of the cloned human being will not be less than the high mortality of cloned animals and the health risks of the cloned human being would also not be less than that of cloned animals that we have seen in the previous chapter.

The final conclusion regarding ethical principles of biomedical research using human embryos can be deducted clearly. Both from the international legal perspective and from Church's perspective, any type of human cloning cannot be justified. There are serious violations of international principles as well as of Church principles that cannot be disregarded. There is no doubt that there could be some important benefits either from research using embryos in general or especially cloning to create therapeutic means, but the final goal cannot justify the means. A good goal must be procured with good means also.

---

[212] *Donum Vitae* I. 4

E. Technique of Cloning and Its Related Problems

Throughout centuries of the history of science, there have always been debates about the nature and the value of technology. On one side people state that technology has neutral moral value because technology is neither for nor against human value; it depends on how the technology is employed. On the other side, people have held that technology is value-laden; it cannot be neutral value morally because behind the birth of technology, there are always values for which the inventors want to strive.

The last position is more convincing because technology is not born unintentionally but it is the fruit of long-planned studies, research, and experiments. Its validity is checked and rechecked so many times that its accuracy leaves no doubt. Certainly, this research and experiments are directed toward certain directions which hold values, otherwise the works are in vain. Those values that the scientists strive for in their research are not neutral morally as we have discussed in the previous chapter (II.B). Insofar as values are concepts or ideas or notions that we use to explain how and why various realities are important and attractive. These values attract us and draw us to pursue them insofar as they aspire after the good that they articulate. We expect to find our own good in relation to what they offer. The Vatican instruction *Donum Vitae* says rightly "*it would be illusory to claim that scientific research and its applications are morally neutral.*"[213]

The non-neutrality of science and technology is easily demonstrated by the fact that science and technology can promote a better understanding of the universe with all of its contents or it can destroy it. The contributions of science and technology to a better understanding of the universe and of God can be traced throughout the history of human civilization. For example, the recent better understanding of human embryology and genetics (as we have seen in the previous chapter I.C) leads us to affirm the Church's teaching that the life of human beings starts at fertilization.[214] These contributions of

---

[213] *Donum Vitae*, introduction 2

[214] The Church itself confirmed the contribution of genetic science in better understanding of the first days of the life of embryo "*modern genetic science offers clear confirmation. It has demonstrated that from the first instant there is established the program of what this living being will be: a person, this individual*

science and technology has been reaffirmed by Pope John Paul II in his address to the members of the Pontifical Academy of Sciences and other world renown scientists, gathered in the Vatican to celebrated the fourth centenary of the Academy's foundation, on November 10, 2003. On that occasion John Paul II said,

> *I am more and more convinced that scientific truth, which is itself a participation in divine Truth, can help philosophy and theology to understand ever more fully the human person and God's Revelation about man, a Revelation that is completed and perfected in Jesus Christ. For this important mutual enrichment in the search for the truth and the benefit of mankind, I am, with the whole Church, profoundly grateful*[215].

Whatever position one takes, one thing is clear science and technology has to serve the human person and not to destroy human dignity[216]. Otherwise, technology will destroy human beings as the creator of technology as it is illustrated in the famous science fiction story of Frankenstein[217]. So, science and technology must be guided by principles which do not negate or oppose human dignity and the human being as a whole. In different words, *Donum Vitae* present guidance on how to evaluate technology, especially that which is related to the beginning of human life. These criteria are "*the respect, defense and promotion of man, his "primary and fundamental right" to life, his dignity as a person who is endowed with a spiritual soul and with moral responsibility and who is called to beatific communion with God.*"[218]

In this chapter, we will examine carefully the technical problem of human cloning in light of the above propositions and we will analyze what should be done in order to protect humankind at large.

---

person with his characteristic aspects already well determined. Right from fertilization the adventure of a human life begins, and each of its capacities requires time—a rather lengthy time—to find its place and to be in a position to act." Evangelium Vitae no. 60

[215] L'Osservatore Romano, Lunedi – Martedi 10 – 11 Novembre, 2003, page 5

[216] c.f. *Donum Vitae*, introduction 2

[217] See this dissertation chapter I.B.1.

[218] *Donum Vitae*, Introduction 1.

1. Technological Fatalism

There are some people who believe that the major reason for the opposition to human cloning is the malformation of the cloned human being. Hence when the technique of human cloning is perfect and there will be no more malformation or death of the cloned human being, there is no more reason to oppose human cloning[219]. If there is opposition to cloning, it remains from a religious perspective. From this position, when cloning is technologically possible and feasible, there is no problem anymore and people can do it.

On this matter, Renato R. Martino, when he gave remarks to the United Nations on Human Cloning on November 19, 2001. He said, "*This opposition, by the Holy See, and the reason of this discussion, is not derived only from the risks of malformation or the death of the embryo as a result of predictable failures but first and foremost upon anthropological and ethical reason.*"[220]

Deep at the bottom of this discussion there are two opposing positions. On the one hand, many people hold that technology is the expression of human liberty (freedom) in exploring the universe. Since human freedom is very precious and it is one of the most important human characteristics its expression should not be hindered. So, it is a matter of freedom, just like any other freedom of expression such as the freedom to speak, the freedom to worship and so on[221]. If we can have those freedoms why cannot we have the freedom of science, research, and technology?

Actually at the bottom of this attitude there is what the encyclicals *Fides et Ratio* called "scientism"[222]. In this way of thinking, the only reality is the scientific reality which is achieved through science and the only truth is scientific truth which is deducted from empirical science. In other words they hold that the only reality is the one which can be verified empirically or can be verified by techno-

---

[219] Ronald Cole-Turner (ed.), *Human Cloning: Religious Responses*, Westminster John Knox Press, Louisville, 1997, pp. xii – xiii

[220] Renato R. Martino, "Remarks to the United Nations on Human Cloning", in *The National Catholic Bioethics Quarterly* 2(2002) 140

[221] Carmel Shalev, "Human Cloning and Human Rights: A Commentary", in *Health and Human Rights*, 6(2002) 137 - 151

[222] Fides et Ratio no. 88. All citations from this encyclicals are taken from John Paul II, *Faith and Reason: Encyclical Letter Fides et Ratio*, Catholic Truth Society, London, 1998

science. Since this is the only reality that binds them in acting or doing, any technology can be applied after its technical feasibility has been verified. Thus, also in the case of human cloning, after its technological feasibility has been proved, there is no more reason not to apply it.

On the other hand, we hold that it is true that freedom is one of the most important human characteristics. But freedom has an inherent relational dimension that must not be denied[223]. It means that the expression of freedom cannot infringe other people's rights especially when the expression of freedom jeopardizes the physical and psychological integrity of other people and exposes the life of a human being to danger. Thus, freedom cannot be expressed in an individualistic way in which people can do whatever they want but it has to be expressed in such away that it is at the service of the person and of his fulfillment through the gift of self and openness to others. Furthermore, when freedom is made absolute in an individualistic way, its original contents are emptied and its very meaning and dignity are contradicted[224].

That is why, the evaluation of human cloning has to be done in a holistic way in which many human aspects have to be included. It is not only a matter of technique but also its implication in human life as a whole. That is the reason why *Donum Vitae* said, "*what is technically possible is not for that very reason morally admissible.*"[225]

As we have seen in many chapters in this dissertation, up to this time human cloning places human beings in very dangerous situations physical, psychological, and spiritual. Technically speaking, the application of human cloning is not yet appropriate because of the bad result of the previous experiments using animals. But this is not the most important point in this judgment because even if the technical problems will be overcome in the future, it does not mean that human cloning can be done licitly. The global implications to human life have to be taken into consideration as we have seen in previous chapters.

In this case, it has to be remembered that the final objective of medical intervention and other progress in medical technologies is to protect and defend human life and not its destruction or manipulation. These principles have been the inspiring and guiding principle of medical ethics for a long time since the Hippocratic era. So the

---

[223] cf. *Evangelium Vitae* no. 19
[224] cf. *Evangelium Vitae* no. 19
[225] *Donum Vitae* no. 4

medical intervention or medical research which destroys human life is a counter productive effort and contradict to the very aim of medical intervention itself.

Some people may say that human cloning matches perfectly to these criteria because human cloning not only defends the life of the human being but even creates life itself. However, if we see it in the wider perspective we will see clearly that human cloning falls into this contradiction. It is true that human cloning creates human life artificially but it destroys many important human values as we have discussed in many chapters of this reflection. In the case of cloning to produce therapeutic means, it is even worse because the researchers create life only to be destroyed. With the coming of the technology of human cloning the question which was posed in the *Reflexions on Cloning* is very legitimate. "*Once again man is asked to choose: it is his responsibility to decide whether to transform technology into a tool of liberation or to become its slave by introducing new forms of violence and suffering.*"[226]

Now it is clear that science itself is not enough. It needs guiding principles to regulate and to make science and technology more human. It is true what *Donum Vitae* said, "*Science without conscience can only lead to man's ruin.*"[227] On another occasion, Pope John Paul II underlined the necessity to keep technology under human control so that human being remains the master of technology and not the product of technology[228].

2. Embryos as Instrument

The advances in the research on the human embryo in the last couple decades certainly mean the need for more human embryos as raw material. Many researchers have turned to assisted reproduction,

---

[226] Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p 15

[227] *Donum Vitae*, Introduction, no. 2

[228] On the remarks to George W. Bush when he visited Pope John Paul II at Castel Gandolfo on July 23, 2001, John Paul II said, "*In defending the right to life, both in law and through a vibrant culture of life, America can show the world a path to a truly humane future in which man remain the master, not the product, of hi- technology.*" See John Paul II, "Remarks to President Bush on Stem Cell Research", in *The National Catholic Bioethics Quarterly* 1(2001) 618

especially in vitro fertilization (IVF) to obtain them. Usually IVF provide many embryos which are frozen in laboratory in order to be implanted if the first attempt fails to impregnate the woman. In many cases, after the woman has the baby, the frozen embryos are left in the laboratory and no couple is taken of them. Since the frozen embryos cannot be stored for a long period of time, they will be discarded or thrown away after certain time. The researchers use these embryos for their research by arguing that it is better to use them rather than being discarded in vain so that society gets some benefit from them[229].

The Church – maintaining that the human being must be respected from the very beginning of his existence – has affirmed the illicitness of using human embryos in such a way. The origin of the embryos – whether they are conceived naturally or in vitro or by cloning – does not make any different to the dignity of the embryos. They are the same human beings. They deserve the same respect. *"Human embryos obtained in vitro are human beings and subjects with rights: their dignity and right to life must be respected from the first moment of their existence. It is immoral to produce human embryos destined to be exploited as disposable "biological material."*[230]

From this perspective, cloning to create therapeutic means is a form of instrumentalization of the human embryo. People want to create human embryos through cloning and when they succeed in creating these embryos, they will kill them in order to harvest their stem cells and then they will throw them away after being used. There is also another possibility: they will create an embryo through cloning and after the embryo is created, they will use it for research. They will inject some chemical substance to see its reactions to these chemical substance or they will divide it to see its capability to merge together. This means that the researchers treat human embryos like disposable biological materials. Certainly, this process of cloning is not without quality control. Embryo which does not match a certain quality will be thrown away. Jürgen Habermas called it the instrumentalization of human life[231].

---

[229] Andrea L. Bonnicksen, *Crafting a Cloning Policy: From Dolly to Stem Cells*, Georgetown University Presss, Washington, D.C., 2002, p. 72

[230] *Donum Vitae* no. I.5

[231] Jürgen Habermas, *Il Futuro della Natura Umana: I Rischi di Una Genetica Liberale*, Biblioteca Einaudi, Torino, 2002, p. 33

Certainly, it is contrary to the duty of respect for the human embryo. As we have seen in the previous chapter (II.A.2-3) the human embryo is a person although it may not be exactly the same as we are. But it is a normal development of human being. It is only a question of time when his human body will function as ours does. One of the most widely quoted of Kant's categorical imperatives: "*Treat others and oneself, never merely as a means, but always at the same time as an end in himself*"[232]. Thus, treating the human embryo as a disposable biological material can not be justified. As if the human embryo is only a means to obtain something else. In fact human embryos have their own end which cannot be altered to something else other than their own end.

Neither throwing away human embryos nor using them as a means, is justified. Human embryos have human dignity which merit respect and are not to be treated as solely an instrument of research. It may be true that respect for the human embryo is not exactly the same as respect owed to adult people but the human embryo does have some rights that are bound intrinsically to its existence as a human person. People may disagree on how many rights to the embryo has but at least we all must respect its right to live. This is a basic right of all human beings, they do have the right to live (chapter II.B.5).

This point is beautifully stated by the encyclicals *Donum Vitae* which says:

> *Physical life, with which the course of human life in the world begins, certainly does not itself contain the whole of a person's value, nor does it represent the supreme good of man, who is called to eternal life. However, it does constitute in a certain way the "fundamental value of life, precisely because upon this physical life all the other values of the person are based and developed. The inviolability of the innocent human being's right to life "from the moment of conception until death" is a sign and requirement of the very inviolability of the person to whom the Creator has given the gift of life*[233].

---

[232] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, Yale University Press, New Haven, 2002, p. 45

[233] *Donum Vitae* no. 4

3. Women as Instrument

The demand for human ova increases with the increasing of fertility treatments although it does not give satisfying result. Unfortunately, the supply is limited. The economical law of supply and demand shows their efficacy. Andrews reported this fact:

> *When egg donation began in 1984, Richard Seed paid donors just $250. By 1994 the going rate was $1,500. In 1998 St. Barnabas Hospital in Livingston, New Jersey, boosted its rate from $ 2,500 to $ 5,000 during an egg donation bidding war. But the largest fee - $ 35,000 – is being offered by an anonymous couple who specifically want an attractive, intelligent, Princeton woman's egg*[234].

It is not difficult, though, to suspect that some women will take advantages of this scarcity of supply to sell their ova for economical benefit. Even, for some economical benefit, they may agree to endure some medical risks associated with hyperstimulation syndrome as well as the long term risks of ovulation-stimulating drugs. The same thing happens for the researchers or for companies which support a certain research on the human embryo. They will be compelled to obtain ova as raw material for their research by persuading women to sell or to donate their ova.

Certainly, these attitude cannot be justified ethically because it is the same as trading human organs. The European culture is generally oppose to the trading of human organ as expressed in the Convention for the Protection of Human Rights and Dignity of Human Being with Regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine (1996) article 21[235]. Human organ sould be obtained as a donation whether donor is still alive or deadth and it should not be regulated by market[236]. In the Catholic Church,

---

[234] L. B. Andrews, *The Clone Age: Adventures in the new in the New World of Reproductive Technology*, Henry Holt, New York, 1999, p. 95

[235] Article 21: "*Interdiction du profit: Le corps humain et ses parties ne doivent pas être, en tant que tells, source de profit.*" Conseil de l'Europe, "Convention pour la Protection des Droits de l'Home et de la Dignité de l'être Humain a l'égard des Applications de la Biologie et de la Médecine: Convention sur les Droits de l'Homme et la Biomédecine", in *Medicina e Morale* 1(1997) 138

[236] Carlo Hanau, "Il Mercato degli Organi", in Stefano Fagiuoli, *La Questione dei Trapianti: Tra Etica, Diritto, Economia*, Dott. A. Giuffrè Editori, Milano, 1997, p. 151

organs donation is regarded as an act of charity and love that flow from altruism. In his discourse to the participants of a Conggress on Organs Transplantion in Rome (1991), John Paul II said that organs transplantation is a human act of donation. Further he said:

> *It is a decision to offer, without reward, a part one's own body for the health and well-being of another person.... Love, communion, solidarity and absolute respect for the dignity of the human person constitute the only legitimate context of organs transplantation. ... The body cannot be treated as a merely physical or biological entity, nor can its organs and tissues ever be used as items for sale or exchange*[237].

The same point was repeated when John Paul II gave address to the International Congress on Transplants in Rome August 29, 2000. He says, "*The decision to offer without reward a part of one's own body for the health and well-being of another person. Here precisely lies the nobility of the gesture, a gesture which is a genuine act of love.*"[238]

In other countries such as the USA, compensation for organ donation can be justified as long as it is fair and in so far it is not so substantial as to become the primary motivation to give organs. A statement by the Ethics Committee of the American Society for Reproduction Medicine (2000) endorses compensation, especially in egg donation. But this compensation is allowed "*so long as it is fair and not so substantial that it becomes an undue inducement that leads egg donors to discount potential risks.*"[239]

The second danger to the woman in relation to human cloning is that the woman will be regarded as the laboratory in which the experiments are conducted. Until now, although researchers succeed in producing some artificial human organs such as the kidney, heart, liver and so forth, they do not have the capability to produce artificial womb of a woman. The womb of a woman is an irreplaceable human organ. Its biological structures are so complicated that human technology

---

[237] John Paul II's discourse to the Participants of Congress on Organ Transplantation, Rome, June 20, 1991, in *Insegnamenti di Giovanni Paolo II*, vol. XIV, 1, 1991, pp. 1711 – 1712

[238] Pope John Paul II, "Address to the International Congress on Transplant", in *The National Catholic Bioethics Quarterly*, 1(2001)90

[239] Ronald M. Green, "Ethical Implications of Cloning" in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 490

cannot imitate them to create an artificial womb, whereas its functions are very important for the research of reproduction. The structures of the womb of a woman are so special and intricately designed that even there are no such structures among primates or other animals that we can use for experiments. That is why there is no choice except to use a woman's womb for reproductive research. Since there is no choice except to use the body of a woman to conduct research, researchers will try all possible efforts to have women involved in their experiments.

Thus, the real danger is that the dignity of woman will be reduced to a purely biological function who provides ova and a womb which are very essential and irreplaceable tools in reproductive research[240].

There may be some people who says "*we use only her body*" and it is only one part of her existence. It is true that it is the woman's body which is used but it is not true that it is only a part of her existence.

In the past, people separated body and soul because of the influence of Platonism. Accordingly, the human body is only temporarily and had minimal value while the soul is eternal and had the higher value than the human body. In this way of thinking, the human body was viewed to be the servant of the soul.

A new perspective of the relationship between body and soul has replaced the existing Platonic perspective. In the new perspective, it is underlined the union between body and soul. They are not separate in essence but are united in such a way that they cannot be separated. This new perspective is more convincing because it can be justified both from an empirical perspective and from a religious perspective.

From empirical observation on the live and death of the human being, we can see that in the separation of the human soul in the death of people, the human body is not a human body anymore. It is a corpse. The same thing can be said of the human soul. A soul which is not united to the human body is not human soul. It may be the soul of some other created being. Thus the body and the soul of a human being are inseparable. We can make a distinction tentatively but we cannot separate them. Where there is a human body, there is a human soul and vice versa.

From a religious perspective, almost all of major religions teach that God created the body and soul of human beings. The book of

---

[240] cf. Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano 1997, p. 11

Genesis 1 – 2 narrates that God created human beings as male and female in his image and likeness. It is not said that God created only the human soul alone or the human body alone but God created humankind in his image. It means that God created the whole human being: body and soul.

With the incarnation of Christ, God give a new perspective to creation. The incarnation of Christ unveiled that God takes the form of human flesh (body) to save human beings. The nature of the humanness of Christ is inseparable from his nature as God. Christ is fully God and fully human. The Bible is full of narrations on how Christ's redemption not only saves the human soul but also the human body. He cured the sick, opened the eyes of the blind man, give food to the hunger and so on. Briefly, the human body is an integral part of Christ's redemption. Human being obtains the fullness of his existence in Christ's redemption which redeems the total and indivisible human being. A human being is at the same time corporal and spiritual (*corpore et anima unus*)[241]. The encyclical *Donum Vitae* emphatically restates this point, "*For it is only in keeping with his true nature that the human person can achieve self-realization as a "unified totality": and this nature is at the same time corporal and spiritual.*"[242]

Because of this unity, any intervention on the human body will affect not only the human tissue itself but all of the person on any different levels. In other words, the integrity and the well being of the person as a whole is an important point to be considered in all interventions on human body. This point is expressed rightly by encyclical *Donum Vitae:*

> *An intervention on the human body affects not only the tissues the organs and their functions but also involves the person himself on different levels. It involves, therefore, perhaps in an implicit but nonetheless real way, a moral significance and responsibility. ... To respect the dignity of man consequently amounts to safeguarding this identity of the man corpore et anima unus, ... It is on the basis of this anthropological vision that one is to find the fundamental criteria for decision-making in the case of procedures which are not strictly therapeutic, as, for example, those aimed at the improvement of the human biological condition*[243].

---

[241] cf. *Gaudium et spes*, no. 14, par. 1
[242] *Donum Vitae* no. 3
[243] *Donum Vitae*, Introduction, no. 3

That is why, one cannot say that "we only use woman's body which in only a part of her dignity and personality'. We cannot separate the body from the person because the human body is integral part of the personality. It is true that all human bodies together is part of personality and human personality cannot be reduced only to the human body. We cannot 'use' the human body without involving the whole personality.

The inseparable unity of the human body and soul makes the human body different from other types of bodies of creatures because it is a body which is animated by the human soul. In other words, the human soul incarnates in the human body in such a way that both of them are inseparable and thereby making human body different from other body such as animal's bodies. That is the reason why the human body cannot be regarded as merely biological tissues. "*By virtue of its substantial union with a spiritual soul, the human body cannot be considered as a mere complex of tissues, organs and functions, nor can it be evaluated in the same way as the body of animals; rather it is a constitutive part of the person who manifests and expresses himself through it.*"[244]

It is clear that in the cloning of human being, human being are treated inadequately, especially women and the human embryo. Woman is also treated badly. She is regarded as the provider of the ova and her womb is used as the laboratory in which research and experiments are conducted. Human embryo is treated even worse. The human embryo is created, modified, used it for research, killed, and then thrown away as if the human embryo is a disposable research tool which can be disposed of after being used without considering the dignity and personhood of the embryo. This is contrary to the dignity of human beings. Pontificia Academia Pro Vita states this point clearly: "*In any case, such experimentation is immoral because it involves the arbitrary use of the human body (by now decidedly regarded as a machine composed of parts) as a mere research tool. The human body is an integral part of every individual's dignity and personal identity, and it is not permissible to use women as a source of ova for conducting cloning experiments.*"[245]

Unfortunately, there are some researchers who perform such research without guilty feelings because their research is endorsed by

---

[244] *Donum Vitae* 3

[245] Pontificia Academia Pro Vita, *Reflexions on Cloning*, pp. 13 – 14

the government and even has been legalized. For example, the British government legalized the uses of human embryo before 14 days because the benefit of the research is greater than the obligation to respect the human embryo[246]. Even on August 16, 2000 the British government legalized cloning to create therapeutic means[247]. Although there are other possibilities in which to obtain stem cells from other sources, such as from the umbilical cord, placental blood, bone marrow etc, they chose the easier, more efficient, and more practical way to obtain it from human embryo although it means that they have to kill the embryo. This is a blatant abuse in using a human being as a tool for research and the irresponsibie treatment of a human being because a human being is used other for their own end.

Certainly it cannot be justified morally on the basis of human dignity. Human dignity is violated if the specific individual is degraded to the status of "mere object", as an instrument, a substitutable dimension[248]. As we have discussed in the previous chapter about human dignity (chapter II.B.3) human being cannot be treated as a means because a human being exists as an end in itself.

In his prolific writing, Immanuel Kant underlined this point. *"Now I say that the human being, and in general every rational being. Exists as end in itself, not merely as means to the discretionary use of this or that will, but in all its actions, those directed toward itself as well as those directed toward other rational beings, it must always at the same time be considered as an end."*[249]

Again, in the same book he wrote, *"Rational beings, by contrast, are called persons, because their nature already marks them out as ends in themselves, i.e., as something that may not be used merely as oceans, hence to that extent limits all arbitrary choicest."*[250]

In another book, Kant wrote more clearly the obligation of a human being is to treat other human being as an end in himself so that

---

[246] Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization & Embryology*, Basil Blackwell, Oxford, 1985, p. 62

[247] Mario Capanna, *L'Uomo e più dei Suoi Geni: La Verità sulle Biotechnologie*, BUR, Milano, 2001, p. 16

[248] Thomas Petermann, "Human dignity and Genetic Tests", in Kurt Bayertz (ed.), *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996, p. 124

[249] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, Yale University Press, New Haven, 2002, p. 45

[250] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, p. 46

we cannot kill or even corrupt or maim as you will it. *"The human being, however, is not a thing, hence not something that can be used merely as a means, but must in all his actions always be considered as an end in itself. Thus I cannot disposed of the human being in my own person, so as to maim, corrupt, or kill him."*[251]

4. Eugenics and Planned Killing

Eugenics is a theory that deals with the improvement of heredity qualities by means of the principles of genetics[252]. Francis Galton coined the word eugenics in 1883. He was a cousin of Charles Darwin and a pioneer in the mathematical treatment of biological inheritance[253]. This word comes from a Greek word which means wellborn, or good in birth, or noble in heredity. Usually, people differentiate eugenic between positive eugenic and negative eugenic[254]. Negative eugenics or preventive eugenics is a control of copulation which tries to impede the transmission of pathogenic (capable of causing diseases) or harmful genes by banning the carriers of these genes to procreate[255]. Positive eugenics is a human selection to ameliorate the species[256].

There are many ways to ameliorate the quality of the species. For example: only copulating the best male and female animals and preventing the inferior animals to procreate or simply killing the bad

---

[251] Immanuel Kant, *Groundwork for the Metaphysics of Morals*, Yale University Press, New Haven, 2002, p. 47

[252] Elizabeth A. Martin, *Oxford Concise Medical Dictionary*, Oxford University Press, Oxford, 1998, p. 230; Rosalind Fergusson (ed.) *Oxford Dictionary of Nursing*, Oxford University Press, Oxford, 1998, p. 158

[253] Linda Tagliaferro, *Genetic Engineering: Progress or Peril?*, Lerner Publications Company, 1997, p. 70; Ruth Hubbard and Elijah Wald, *Exploding the Gene Myth*, Beacon Press, Boston, 1993, p. 14

[254] Hans Jonas, *Dalla fede antica all'uomo tecnologico: Saggi filosofici*, Il Mulino, Bologna, 1991, pp. 228 – 237; Hans Jonas, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, Einaudi, Torino, 1997, pp. 130 – 136; William E. May, *Human Existence, Medicine and Ethics: Reflection on Human Life*, Franciscan Herald Press, Chicago, 1977, p. 70 – 72

[255] Hans Jonas, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, Einaudi, Torino, 1997, p. 130

[256] Hans Jonas, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, p. 133

offspring. Although the word eugenics was coined only in 1883, the practice of eugenics is not a new practice. It is an old practice that had been recorded in the works of the ancient Greek philosopers. In *Republic*, no. 459 – 462, Plato suggested that the offspring has to come from a good quality of parents. Plato said, "*the best men must have sex with the best women as frequently as possible, while the opposite is true of the most inferior men and woman, and, second, that if our herd is to be of the highest possible quality, the former's offspring must be reared but not the latter's.*"[257]

The control of hereditary qualities was still practiced more recently. For example, the Station for the Experimental Study of Evolution was established in Cold Spring Harbor, New York in 1904. Their mission was to collect data of hereditary traits from New Jersey and New York. They collected 750,000 genetic records ranged from studies of inherited disease and color blindness, to recording the inheritance of shyness and moral control[258]. They paid attention to special hereditary traits such as "shiftlessness" and "feeblemindedness". Those hereditary traits were considered inferior traits. This data led to involuntary sterilization laws and the U. S. Immigration Restriction Act of 1924.[259] *"By 1931 sterilization laws were in effect in about 30 states, and 20,000 Americans had been involuntarily sterilized. In California the law was not repealed until 1979. In 1985, a number of states still had laws that allowed mentally retarded persons to be forcibly sterilized."*[260]

With the coming of human cloning, there will arrives a new form of eugenics. As is usual in the process of the production of goods, there is a strict quality control in order to maintain the good quality of the product. The goods which do not meet a certain degree of quality are destroyed. The same procedure will be applied to human cloning. The cloners will not allow the product of inferior quality to be on stage. The cloned human beings who do not match certain criteria of good genes will be destroyed (killed). In this way, human cloning will

---

[257] Plato, Republic V, 459,d. John M. Cooper, D. S. Hutchinson (eds.), *Plato: Complete Works*, Hacket Publishing Company, Indianapolis, 1997, p. 1087

[258] John Scally, *A Brave New World?*, Veritas Publications, Dublin, 1998, p. 39; Steve Jones, *In the Blood: God, Genes and Destiny*, Harper Collins, London, 1996, p. 9

[259] Linda Tagliaferro, *Genetic Engineering: Progress or Peril?*, Lerner Publications Company, 1997, p. 71; Ruth Hubbard and Elijah Wald, *Exploding the Gene Myth*, Beacon Press, Boston, 1993, p. 19

[260] Linda Tagliaferro, *Genetic Engineering: Progress or Peril?*, p. 71

dehumanize human procreation because it transforms human procreation into a laboratory technique of reproduction. Sooner or later only those children who fulfill our wants will be fully acceptable[261]. It means that people are condemned to die not because of their faults or mistakes or wrong doings but simply because they do not fulfill the criteria of possessing good genes. It is a form of eugenics[262]. It is even more tragic because the state of having "inferior genes" is not because of the mistakes or the faults of the cloned people but because of the mistakes of other people (the cloners). It means that people (cloned human beings) are condemned to die for something which is not their responsibility but which is the responsibility of other people (cloners).

The other difficult questions to resolve are about the criteria themselves: who are they who have the power to decide the criteria, and why those people have the authority to decide the criteria. The variety of the criteria can be imagined to be applied in human cloning such as business criteria in which the profit is the leading element, or scientific pride in which the scientific achievement is the most important thing, or even the individualistic criteria in which like and dislike play the most important role. Regarding the people who decide the criteria, it seems an endless discussion. Do we let only the scientists decide the criteria or should other people be included?

Cloning to create therapeutic means still has further different judgment. As usual in the ethical consideration, the justifications of an act have to be considered from many perspectives An act has to be justified from the object itself, the intention, and the totality of the foreseeable consequences. The Church clearly stated this point in the encyclical *Veritatis Splendor*. It says, "*The morality of the human act depends primarily and fundamentally on the "object" rationally chosen by the deliberate will.*"[263] In another place the same encyclical says *"One must therefore reject the thesis, characteristic of teleological and proportionalist theories, which holds that it is impossible to qualify as morally evil according to its species-its "object"-the deliberate choice of certain kinds of behavior or specific acts, apart from a consideration*

---

[261] Leon R. Kass and James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, p. 9

[262] Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p 10

[263] *Veritatis Splendor*, no. 78

of the intention for which the choice is made or the totality of the foreseeable consequences of that act for all persons concerned."[264]

If we apply this principle in research using human subjects, the researchers have to predict the side effects both long-term and short-term effect to those who are involved in the research. The research cannot be justified if the researchers have foreseen the damaging effect to the subject involving in the research. Not only does the Church forbid this kind of research but also the international law forbids this kind of research as we have seen in the previous chapter (III.D.1.a).

In this perspective, the situation of cloning to produce therapeutic mean is even worse. The cloners deliberately create human beings and plan well how to destroy them deliberately. The killing of the human being is an integral part of their programs without which they can not achieve their goals. As we have seen in the previous chapter (I.D.6.b) that the harvesting of the embryonic stem cells can be performed only by destroying the blastocyst. The embryoblasts which are inside the blastocyst are taken away to provide the stem cells and thus the blastocyst is destroyed. This destruction of the blastocyst is the same as killing. This is a preprogrammed and foreseen killing of an innocent human being. The innocent cloned people are destined to be killed soon after their existence in the world. This type of killing cannot be justified at all neither from a religious viewpoint nor from an ethical one.

Although some people believe that it is justified to kill people in the case of just war, legitimate self-defense, and the death penalty as we have discussed in the previous chapter (II.B.7), the case of embryonic stem cells is different. The case of cloning to create therapeutic means does not match any of the criteria of either just war, legitimate self-defense, or the death penalty. Religiously speaking, the killing of the innocent human being cannot be justified at all. *Evangelium Vitae* affirms this teaching when it says, *"the commandment "You shall not kill" has absolute value when it refers to the innocent person."*[265] In the encyclicals *Donum Vitae*, Pope John Paul II gives a reason for the teaching. He said "*The human being is to be respected and treated as a person from the moment of conception; and therefore from that same moment his rights as a person must be*

[264] *Veritatis Splendor*, no. 79
[265] *Evangelium Vitae* no. 57

recognized, among which in the first place is the inviolable right of every innocent human being to life."[266]

Hence, human cloning cannot be justified for any reason. This is another example of a slippery slope of eugenics. What people have started by making eugenic selection through genetic screening and prenatal diagnosis[267] now it is continued in cloning human beings.

5. Health Dangers of Technically Related Cloning

Although it is not the most important point in an ethical reflection on human cloning the health dangers of human cloning have attracted many people to comment on them and to worry about them. In fact their worry is not without base. As we have seen in a previous chapter (I.D.3.b) the success rate of cloned animals is very low. The highest rate is only 1% - 3%[268].

This poor result of animal cloning is due to many factors. First of all it relates to the fact that the biological structure of one of living being is different from another. Just because one species can be cloned does not mean that another species can be cloned using the same procedure. There must be some differences in the procedure for cloning one species if we are to apply at another species. The cloning procedure of ungulate mammals is different from the cloning protocol of primates and certainly different from the cloning protocol of human beings. The step from cloning other mammals to cloning human beings is a big jump that needs careful anterior studies and experiments[269].

Secondly it relates to the lack of biological knowledge about the process of genetic reprogramming and the epigenetic consequences of transferring a nucleus into an enucleated ovum and reprogramming

---

[266] *Donum Vitae* no. I.1

[267] Leon R. Kass, James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998, p. 33; Leon R. Kass, "The Wisdom of Repugnance", in Gregory E. Pence (ed), *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 32

[268] Tanja Dominko, Calvin Simerly, Crista Martinowich, and Gerald Schatten, "Cloning in Nonhuman Primate", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 422; John B. Gurdon and James A. Byrne, "The History of Cloning" in Council of Europe, *Ethical Eye: Cloning*, Council of Europe Publishing, Strasbourg, 2002, p. 45

[269] Richard Sherlock and John D. Morrey (eds.), *Ethical Issues in Biotechnology*, Rowman & Littlefield, Lamham, 2002, p. 520

specialized cells[270]. Ian Wilmut, although he succeeded in cloning Dolly, still has many unanswered questions regarding reprogramming specialized cells into pluripotent cells. For example why specialized cells such as nerve cells and muscle cells cannot be reprogrammed while breast tissue cells can be reprogrammed? Even he questioned Dolly itself: "*Did Dolly in fact derive from a pluripotent stem cell?*"[271]

Thirdly it relates to the imperfectness of techniques and tools which are used to enucleate an ovum and its transfers[272]. After it was used to clone Dolly, the technique to clone other animals has undergone almost no essential changes. "*The procedure that was used in the Korean experiment was essentially the same as that used to produce Dolly.*"[273] Good tools are essential for the success of cloning. 75% of the success of cloning experiments depends on the good tools the researchers use[274].

Because of many lacks in knowledge of cloning both in technologies and the cellular knowledge, for the time being, cloning to create human beings is impossible[275]. This lack of knowledge is a very serious problem that we cannot ignore. Ignoring this problem will be a violation of the principles of biomedical research (see chapter III.D.1) because it exposes the health of the participant to excessive danger and also the integrity of the person. This is a violation of the principle of medical ethics which is called the Hippocratic canon, to "first do no

---

[270] Roberto Colombo, "La Clonazione Umana: Aspetti Antropologici e Morali", in *L'Osservatore Romano* August 20, 2003, page 5

[271] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, pp. 261 – 262

[272] Roberto Colombo, "La Clonazione Umana: Aspetti Antropologici e Morali", in *L'Osservatore Romano* August 20, 2003, page 5

[273] Editorial, "Human cells from cloned embryos in research and therapy: Current methods of cloning are repeatable but remain inefficient", in *British Medical Journal* 328(2004)415 – 416

[274] Raymond L. Page, "Micromanipulation Techniques for Cloning", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 155

[275] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, pp. 282; Calvin Simerly et all., "Molecular Correlates of Primate Nuclear Transfer Failures", in *Science* 300 (11 April 2003) 297; Susan Mayor, "Human cloning may be impossible" in *British Medical Journal* 326 (19 APRIL 2003) 838

harm"[276]. Furthermore medical interventions have to safe guard and promote the life and the well being of the human being and not to destroy them.

Since up to now there is no viable cloned human being, our analyses in regard to health problems will be based on cloned animals. Certainly the two of them are not the same. Human cloning is more complicated than animal cloning and it has to be remembered that what is applicable to animal is not necessarily applicable on human cloning. So, even if there is no problem in animal cloning, it does not necessarily follow that there will be no problem also in human cloning.

The fact of health problems relating to the unsafe techniques of cloning is obvious. From the report of Dolly, Ian Wilmut and his team said, "*Bill and Keith between them constructed 277 embryos from the Finn-Dorset mammary cells. All were transferred into the oviducts of temporary recipients, and 247 were recovered. Twenty nine of them had successfully developed into morulae or blastocysts. These were transferred into thirteen ewes, of which one become pregnant; and this solitary Scottish Blackface surrogate mother went on to produce a live Finn-Dorset lamb. This was Dolly.*"[277] Briefly, the success rate in the experiments which led to the cloning Dolly was very low. It was only one out of 277 embryos.

The efficiency in the cloning of other animals is not much better than for Dolly. In cattle, it needed 496 cloned embryo transferred to get 30 calves but 6 of them died shortly after birth[278]. In mice, it needed 2468 cloned embryos transferred to get 31 mice but 20 of them died at a young age[279]. In pigs, it needed 110 cloned embryos to get 1 pig[280]. In

---

[276] National Bioethics Advisory Commission, "Cloning Human Beings", in Gregory E. Pence (ed), *Fiesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998, p. 48

[277] Ian Wilmut, Keith Campbell, Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000, pp, 216.

[278] Jose B. Cibelli, Steve L. Stice, Paul J. Golueke, Jeff J. Kane, Joseph Jerry, Cathy Blackwell, F. Abel Ponce de León, and James M. Robl, "Cloned Transgenic Calves Produced from Nonquiescent Fetal Fibroblasts", in *Science* 280(1998) 1256 – 1258

[279] T. Wakayama, A. C. F. Perry, M. Zuccotti, K. R. Johnson, R. Yanagimachi "Full-term development of mice from enucleated oocytes injected with cumulus cell nuclei" in *Nature* 394 (1998) 369 - 374

[280] Akira Onishi, Masaki Iwamoto, Tomiji Akita, Satoshi Mikawa, Kumiko Takeda, Takashi Awata, Hirohumi Hanada, and Anthony C. F. Perry, "Pig Cloning by Microinjection of Fetal Fibroblast Nuclei" in *Science* 289(2000) 1188 – 1190

rabbits, it needed 1852 cloned embryos to get six rabbits[281]. In gaur it needed 692 cloned embryo to get one live gaur[282].

Wilmut noted some problems related with the technical process of cloning. The first problem noted was the abnormality in the development of the cloned animal. In the cloned animals, there are many cases of Large Offspring Syndrome where the newborn animals have an excessive weight compared to the normal new born. When John Gurdon cloned frogs, he discovered that the frog was smaller when the donor cells were taken from animals at a more advanced developmental stage. The results of cloning until now show a similar pattern of defects[283]. The recent observation by Hill and Chavatte-Palmer give a clear overview of some abnormalities of cloned animal:[284]

Body System in which abnormalities have occurred in cloned neonates:

System	Abnormality
Respiratory	Surfactant deficiency, meconium aspiration, pneumonia
Cardiovascular	Pulmonary hypertension, enlarged umbilicus, septicemia
Hematopoietic	Immunodeficiency, anemia
Metabolic	Hypoglycemia, diabetes, obesity, idiopathic hyperthermia
Gastrointestinal	Gastritis/enteritis
Musculoskeletal	Contracted tendons, oversized, joint infection
Reproductive	Placentation: hydroallantois and/or edema, reduced number of placentomes, enlarged placentomes; overweight placenta

[281] David A. Prentice, *Stem Cells and Cloning*, Benjamin Cummings, San Francisco, 2003, p. 23

[282] Robert P. Lanza, Betsy L. Dresser and Philip Damiani, "Cloning Noah's Ark", in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, p. 26

[283] Ian Wilmut, "Cloning for Medicine", in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, pp. 47 – 48

[284] Jonathan R. Hill and Pascale Chavette-Palmer, "Pregnancy and Neonatal Care of Cloned Animals", in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 259

Endocrine	Delayed or absent signs of parturition, low postnatal milk production, elevated leptin
Urinary	Hydronephrosis (lambs)

From the above data, it is very clear that the inefficiency of cloning and the health related problems are very serious problems. Because of these poor results, after success in cloning gaur, Dr. Robert Lanza of Advanced Cell Technologies – one of the leading microbiological companies – said that "*the technology (of cloning) is still as much an art as it is a science.*"[285] Another expert in cloning, Ronald M. Green said, "*There is significant scientific evidence that SCNT cloning as an assisted reproductive procedure is not yet safe enough for clinical implementation.*"[286]

Apart from the inadequate tools and limited knowledge of cloning there are other danger. In the future when cloning technology is better developed and the result is higher than it is now, even if the success rate is 100%, the transferring of a nucleus to an enucleated ovum (SCNT) is still problematic in relation to the health of the cloned being. The problem lies right in the cloning itself as a means of reproduction. The defects of cloning as a means of reproduction can be deduced from the natural reproduction of endangered species. Because of the limited numbers within endangered species, the copulation of those animals only occurs among the close family such as between uncle and niece or between grand father and grand children or even between children. The negative effect of this copulation is obvious. There is lack possibility to improve the quality of the genes of those animals. If the copulation happens between animals unrelated by blood ties, there is a possibility to improve or even to repair the defective genes. If the copulation happens between those closely related by blood, there are high probabilities that they may both be carriers of the same kind of defective genes. When those same carriers copulate, their offspring bear a bigger defect so that they will be vulnerable to even ordinary diseases. That is exactly what happens to endangered species. They are so vulnerable to the diseases that they may die because of an 'ordinary' virus. Robert Lanza reported the gaur – its name was Noah -

---

[285] Robert P. Lanza, Betsy L. Dresser and Philip Damiani, "Cloning Noah's Ark", in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, p. 26

[286] Ronald M. Green, "Ethical Implications of Cloning" in Jose Cibelli (ed.), *Principles of Cloning*, Academic Press, San Diego, 2002, p. 480

which he cloned. He said, "*Noah died from a common bacterial infection.*"[287]

The same is also true among human beings. In noble families centuries ago, marriage often occurred between couples who were closely related. The result of this marriage was that a high percentage of abnormal offspring were born in those noble families.

This phenomenon can be well explained with the science of genetics. In natural fertilization, the new genome of the new being is formed from two different sources of genes (father and mother). If there is a close blood relationship between father and mother, there are bigger possibilities that the two of them are carriers of the same genetic defects. It is possible that those defects give no negative health effect to the father or the mother because those defects are not big enough to create health problem. But the mixture of them creates bigger defects that cannot be supported anymore by the body system so that they cause health problems.

If there is no close blood relationship between father and mother, there is less danger of such a problem. Even the mixture of that kind of genes is proved to be a blessing. The mixture between the mother and father's genes makes the new genome of the offspring even stronger. The mixture of those different genes gives the possibility of repairing the defective genes so that the new being has new repaired genes.

If the natural copulation between persons who are closely related by blood creates such big health problems for the offspring, cloning of human beings would be even worse. There is no possibility at all of repairing the genetic defects. The genome of the donor (master) is inherited totally by the new being, including the genetic defects and diseases. Certainly, this fact will make the new being more vulnerable to diseases. From all the experiments that the researchers have conducted, the health quality of the cloned beings is always worse than that of the master because of many reasons such as insufficient knowledge about the development of cells and reprogramming of cells, and inadequate tools. It is understandable from Robert Lanza's report that his cloned endangered species (gaur) died from a common bacterial infection[288].

---

[287] Robert P. Lanza, Betsy L. Dresser and Philip Damiani, "Cloning Noah's Ark", in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, p. 23

[288] Robert P. Lanza, Betsy L. Dresser and Philip Damiani, "Cloning Noah's Ark", in Sandy Fritz, *Understanding Cloning*, Scientific American, New York, 2002, p. 23

CHAPTER IV

ALTERNATIVE SOLUTIONS

We have seen that human cloning, either cloning to create human beings or cloning to create therapeutic means, has many unresolved and insuperable problems. In the future when the technique is more perfect, we may overcome the technical difficulties that now are still very problematic, I believe that there will remain many unresolved problems, especially the ethical problems. That is why, although technical problems may be superable in the future, human cloning will remain unethical because technical problems are only a small part of the huge problems regarding human cloning.

Although human cloning will remain unethical, I see that there are some other alternative solutions to replace human cloning so that some of the goals of human cloning can be achieved through other means. These alternative means are more secure and more morally acceptable so that it is better to pursue these alternatives than to proceed with human cloning. Ethical principles on research using human subjects obliges us to use the alternative means whenever available[1].

For the time being, I do not see an alternative solution to replace cloning to create human beings which can be morally accepted. It means that couples who can not have children naturally will remain childless. They will not have a child who has their genetic heredity. If they want to have children, they will have to look at adoption as the best solution.

---

[1] The Nuremberg Code (1947) no. 2 stated, "*The experiment should be such as to yield fruitful results for the good of society, unprocurable by other methods or means of study, and not random and unnecessary in nature.*" In Baruch A. Brody, *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1998, p. 213.

For cloning to create therapeutic means, I see some good alternatives to replace some goals of cloning to create therapeutic means (embryonic stem cells). These alternatives are more promising because they have demonstrated the history of success than embryonic stem cells which still have to overcome many difficulties. The newly published *The Scientist* reported the difficulty of embryonic stem cells (ESC). "*But within the ESC research community, realism has overtaken early euphoria as scientists realize the difficulty of harnessing ESCs safely and effectively for clinical applications.*"[2]

As we have seen in the previous chapter (I.D.2.d and I.D.5.b) the final goal of cloning to create therapeutic means is to produce tissues and ultimately organs for replacement therapy or a means of research in order to understand more fully the human cell[3]. Those goals can be achieved by means of adult stem cells and tissues engineering. They are promising solutions that can be morally accepted although it may need extra work to make them usable for human needs.

A. Adult Stem Cells

We have discussed adult stem cells extensively in the previous chapter (I.D.6). The term adult stem cell is rather misleading terminology because it is as if this stem cell is derived from an adult person. In fact, it does not necessary arrive in such a way. An adult stem cell is an unspecialized cell that is found among specialized cells (somatic cells)[4]. Unlike the embryonic stem cells which are harvested among unspecialized cells of embryo in the stage of blastocyst, adult stem cells are harvested among specialized cells. Thus, adult stem cells do not necessary come from adult persons but can also come from babies and teenager. That is the reason why some scientists prefer to use the term somatic stem cells instead of adult stem cells[5].

---

[2] Philip Hunter, "Differentiating Hope from Embryonic Stem Cells" in *The Scientist* vol. 17 no.24 (December 2003) 31

[3] John Ahmann, "Therapeutic cloning and Stem Cell Therapy", in *The National Catholic Bioethics Quarterly* 1(2001)145

[4] National Institutes of Health, *Stem Cells: Scientific Progress and Future Research Directions*, Department of Health and Human Services, 2001, p. 23

[5] Angelo Vescovi, "Cellule Staminali" in, Amedeo Santosuosso, *Le Tecniche della Biologia e Gli Arnesi del Diritto:* , Collegio Ghislieri, Pavia, 2003, p. 70

Adult stem cells reside in many parts of human body. Typically they are localized in specific compartments or niches and are committed naturally to differentiate into the tissues in which they reside, for example in the niches of epidermal (skin), follicular (hair), intestinal (crypts), neural (brain and nerve) and hematopoietic (bone marrow and blood) niches, central nervous system, liver, and skeletal muscle[6]. Adult stem cells also reside in the umbilical cord and placenta of the fetus[7].

The most important ethical point which makes differences between embryonic stem cells and adult stem cells is the consequences of harvesting the stem cells to the person in whom the stem cells are harvested. In the embryonic stem cells, harvesting the embryonic stem cells means killing the embryo because the most important part of the blastocyst, the embryoblast, which eventually becomes a full human being is taken away. The remaining blastocyst is trophoblast and blastocele and they can not continue to live and develop into a full human being. Adult stem cells are different from the embryonic stem cells. Harvesting adult stem cells does not kill the person, even the possible risk of the extraction is very minimal. The adult stem cells are only a very small part of the human body so that taking a way these cells does not disturb the mechanism of the body.

In the case of adult stem cells which are harvested from the umbilical cord and placenta, there is no risk at all for the baby, because the adult stem cells can be harvested when the baby is born so that the baby does not need them anymore. They are superfluous tissue to normal fetal development that are not needed anymore by the embryo but still can be used for other therapeutic purposes.

Adult stem cells can be obtained licitly also from spontaneous abortion (miscarriage). The legitimacy of the uses of this embryo falls under the same criteria as for other human corpses. Certainly it needs

---

[6] Michele Boiani and Hans R. Schöler, "Determinants of Pluripotency in Mammals", in Jose Cibelli, *Principles of Cloning*, Academic Press, San Diego, 2002, p. 129; H. M. Blau, T. R. Brazelton, J. M. Weiman, "The Evolving concept of a stem cell: Entity or Function?" in *Cell* 105(2001)829 - 841

[7] David A. Prentice, *Stem Cell and Cloning*, Benjamin Cummings, San Francisco, 2003, p. 5; S. Mancuso et all, "Prospettive nell'uso di Cellule Staminali da Cordone Ombelicale", in Gianni Astrei and Antonella Bevere, *Vita Prenatale e Sviluppo della Personalità*, Cantagalli, Siena, 2003, pp. 49 - 57

certification of death, consent from the parent and the reasonable and foreseen benefit for humankind[8].

Thus, the source of stem cells out side the embryonic stem cells is abundant. Although there are some technical disadvantages of adult stem cells, there are also technical advantages that can not be obtained through embryonic stem cells (see chapter I.D.6).

From an ethical point of view, adult stem cells do not create any ethical problems like those of embryonic stem cells. Since there is no ethical problem regarding adult stem cells, Pope John Paul II encouraged the use of adult stem cells in place of embryonic stem cells. In his address to the members of the Pontifical Academy of Sciences and Other World Renown Scientists, gathered in the Vatican to celebrate the fourth centenary of the academy's foundation, on November 10, 2003, John Paul II said,

> *The second topic of your meeting concerns Stem Cell Technology and Other Innovative Therapies. Research in this field has understandably grown in importance in recent years because of the hope it offers for the cure of ills affecting many people. I have on other occasions stated that stem cells for purposes of experimentation or treatment cannot come from human embryo tissue. I have instead encouraged research on adult human tissue or tissue superfluous to normal fetal development. Any treatment which claims to save human lives, yet is based upon the destruction of human life in its embryonic state, is logically and morally contradictory, as is any production of human embryos for the direct or indirect purpose of experimentation or eventual destruction*[9].

[8] cf. Elio Sgreccia, "Interventi su Embrioni e Feti Umani", in Pontificio Academia per la Vita, *Commento interdiciplinare alla Evangelium Vitae*, Libreria Editrice Vaticana, Vatican, 1997, p. 624

[9] L'Osservatore Romano, Lunedi – Martedi 10 – 11 Novembre 2003, page 5

B. Tissues Engineering

As we have seen in the previous chapter (I.D.5 – 6) one of the goals of cloning to create therapeutic means is to provide tissue and organs that can be transplanted into patients who have unrecoverable organs. There are many cases that need this kind of therapy such as skin, blood vessel, nerves, and so on. Actually, those goals can be procured also by other means that do not create any significant ethical problems. This alternative means is tissue engineering.

Tissue engineering is a process of reprogramming of pluripotent stem cells or the rejuvenation of specific differentiated cells. The eventual goal is to be able to take a patient's own cells, expand them in a laboratory environment, genetically engineer them to correct a particular defect, and then reintroduce them into the patient in a form that permits the cells to function in a tissue-specific manner[10].

The history of tissue engineering is older than that of stem cells. Tissue engineering has demonstrated its success in some area of therapy. It started in the mid-1960s when artificial skin for burn victims was being pursued as symptomatic therapy. In the early 1970s, there were concerted efforts to treat artificial surfaces to be used in implants in ways that would enable them to avoid causing blood coagulation, by applying special heparin complex coatings, for example. In the late 1970s, researchers experimented with collagen-based artificial skin for use in oral mucosa injuries[11].

The most igniting event in the history of tissues engineering was when Charles Vacanti of the University of Massachusetts and his team injected a polymer scaffold seeded with cartilage cells into the back of the mouse and created an eerie-looking that grow in the back of the mouse[12]. From now on, tissues engineering is developing rapidly and is bearing fruit extraordinarily. In the present time, engineered skin and cartilage substitutes already are available to the patient and a wide

---

[10] Jerry W. Shay and Woodring E. Wright, "The Use of Telomerized Cells for Tissue Engineering", in *Nature Biotechnology* 18(2000)22

[11] "Tissue Engineering" in *Nature Biotechnology* vol. 18 Suplement 2000, page it56

[12] Y. Cao et al., « Transplantation of Chondrocytes utilizing a polymer-cell construct to produce tissue-engineered cartilage in the shape of a human ear" in *Plastic Reconstruction Surgery* 100 (1997) 297 – 302

range of engineered human body parts such as teeth, bladders, and blood vessels are in the works[13].

The examples of reported successes in tissue engineering are varied. For example: the remodeling of blood vessels[14], bone marrow[15], auricular cartilage[16], and so on. Thus, tissue engineering is as emerging an important area in biomedical engineering for creating biological alternatives for harvesting tissues, implants, and prostheses. Tissue engineering has bright prospects in the future because of significant marketing potential and financial investment that continues apace. In 1997 there was a survey of tissue engineering. It was reported in this survey that in that year alone, R & D (research and development) expenditure directly linked to corporate tissue engineering projects was about $ 0.5 billion, with a growth rate about 22% per year[17].

From an ethical point of view, tissue engineering has no significant ethical problem[18]. The raw material that is engineered is human tissue or cells which are only a small part of the body. The extraction of the tissues or cells does not destroy or disturb the mechanism of the body. Certainly, the common ethical standards for using the human body have to be fulfilled, such as consent from the patient, a clear and good protocol of the process, a qualified person who perform the job, and so on. In this case, the most important point is that tissues engineering does not create human life such as in the human cloning.

---

[13] Aileen Constans, "Body by Science: Tissues Engineers advance in bid to build organs in the lab, but significant roadblock remain" in *The Scientist* vol. 17. No. 19 (October 6, 2003) 34

[14] Shayn M. Peirce and Thomas C. Skalak "Microvascular Remodeling: A Complex Continuum Spanning Angiogenesis to Arteriogenesis" in *Microcirculation* 10(2003) 99 – 111

[15] Alexander S. Krupnick, Aimen Shaaban, Antoneta Radu, and Alan W. Flake, "Bone Marrow Tissue Engineering", in *Tissue Engineering* 8(2002) 145 – 155

[16] S. H. Kamil et al., "Tissue-Engineered Human Auricular Cartilage Demonstrates Euploidy by Flow Cytometry", in *Tissue Engineering* 8(2002) 85 – 92

[17] "Tissue Engineering" in *Nature Biotechnology* 17(1999) 508 – 510

[18] Centro di Bioetica dell'Università Cattolica del Sacro Cuore Milano, "La Clonazione Umana può essere terapeutico?" in *L'Osservatore Romano* February 17, 1999, p. 6

GENERAL CONCLUSION

The term cloning is not a new term although it is not as old as is the practice of cloning. The meaning of cloning has also undergone several changes, or more precisely the term cloning has undergone a different accentuation. The oldest recorded meaning of the term is in reference to the way gardeners multiply their plants by cutting branches or new stems (*néous klônas*) in order to get the same quality as the original plant. In the second half of the last century, the term cloning was more associated with biological engineering such as molecular cloning, gene cloning, and cellular cloning. Only in the last decade, especially after the birth of Dolly as the first living mammalian cloning, did the term cloning become associated with somatic cell nuclear transfer.

Cloning as somatic nuclear transfer is a giant step forward in biological science and biological techniques. It reverse the long standing conviction that the specialized cells cannot be "rebooted" to be *totipotens* cells or *multipotens* cells. The promising benefits of this breakthrough in biological science and technology are immense, especially in the realm of the cure of so many incurable genetic and regenerative diseases. Cloning also gave hope to infertile couples to have offspring with their genetic traits. Unfortunately, the realization of all of these promises are still far into the future. What is still needed is hard work, greater scientific knowledge, research, money, and dedication. The difficulty of harvesting embryonic stem cells safely and effectively for clinical application is still the major problem which has been insuperable until the present[1].

Although there is no reported success on human cloning which produce viable human being due to many unresolved technical factors, the aspect of ethical reflection on human cloning is very important in

[1] Philip Hunter, "Differentiating Hope from Embryonic Stem Cells" in *The Scientist* vol.17 no.24 (December 2003) 31

accompanying this development of the research. This dissertation attempts to demonstrate the importance of ethical reflections. Human cloning should not only be regarded in a techno-scientific manner but also from a wider perspective. In this broader approach, ethical questions play an important role in judgment in order to safeguard the true goals of human technology and development which are always at the service of human beings and never the destruction of human beings[2].

Thus, human technology and development must be guided and accompanied by ethical principles in order not to betray human beings. In the case of human cloning, this ethical accompaniment is even more needed because the harm and destruction which are caused by human cloning are clear. Furthermore the dangers can be predicted more precisely. Ethical reflection on human cloning is rather special in relationship to the sequence of time of the reflection. Many ethical reflections on human developments are usually *post factum*: after the fact of something happening and then ethical reflection follows. But this sequence of time does not happen when it comes to ethical reflections on human cloning. Reflections on human cloning occur even before the event happens and while the process is still going on. This fact underlines the importance of guidance and the accompaniment of ethical principles regarding human cloning.

These reflections should not be regarded as obstacles to human freedom for exploring the universe in the field of technology and science but they are signs – much like traffic signs – which indicates the limit which cannot be trespassed in order to maintain the humanness of human beings. The Pontificia Academia Pro Vita gives an inspiring reflection regarding this point. "*The scientist cannot regard the moral rejection of human cloning as a humiliation; on the contrary, this prohibition eliminates the demiurgic degeneration of research by restoring its dignity. The dignity of the scientific research consists in the fact that it is one of the richest resources for humanity's welfare.*"[3]

This dissertation demonstrates that there are many controversies regarding human cloning which are not easily resolved ethically. It further demonstrates that the ultimate problem of human cloning is not

---

[2] cf. *Evangelium Vitae*, no. 81

[3] Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p 17

the technical problem - although this is a very serious matter – but the anthropological and ethical issues. It seems that although, in the future, techno-scientific difficulties may be overcome, some of the anthropological and ethical issues will remain unresolved. It means that what is technically in the realm of possibility is not always for that very reason morally admissible[4]. Certainly, we need to be open to new developments. What is now presumed to be a problem may not be a problem in the future. But we believe that there are many very difficult controversies that must be resolved before human cloning can be accepted morally. It is possible that some of the problems may never be superable ethically. As long as technology is against human dignity, it may never be justified. Technology may develop rapidly in many sectors of life but the principles governing research and technology will remain unchanged[5].

Some people argue that in the future cloning to create human beings may become reasonably safe and, therefore, there may no longer be any lasting objection to human cloning, except on religious grounds. "*If there are lasting objections to cloning, they will be religious.*"[6] From our perspective, this position is not defendable. To understand the objections regarding human cloning one does not need God's revelation (religion). It is enough if one contemplates the aspect of human dignity, the well being of the human person, as well as the anthropological aspects of human beings. Based on the above exposition it is clear that the main ethical problem in human cloning is not only a religious one. Even Ian Wilmut, so far the most important figure in the world of cloning, does not agree with human cloning[7]. The reason for his disagreement is not because of his religious conviction since he declared himself an agnostic, but because of other humanistic concerns[8]. The South Korean scientists who succeeded in cloning a human being in February 2004, Woo Suk Hwang and Shin Yong Moon called for a worldwide ban on human cloning to produce human

---

[4] *Donum Vitae*, Introduction no. 4

[5] Chris MacDonald, "Nanotech is Novel; The Ethical Issues Are Not", in *The Scientist* 18 (2004) 8

[6] Ronald Cole-Turner, "Preface" in Ronald Cole-Turner (ed.), *Human Cloning: Religious Responses*, Westminster John Knox Press, Louisville, 1997, pp. xiii

[7] R. Jaenisch, and I. Wilmut, "Don't clone humans!" in *Science* 292(2001)639

[8] Gina Kolata, *Cloni: Da Dolly all'uomo*, Rafaello Cortina Editore, Milano, 1998, p. 31

beings[9]. Human cloning is a dangerous attack on the biological and anthropological roots of human life[10].

Human cloning is a perfect example of breaking up the natural and essential correlation between love-sexuality-procreation in the begetting of human beings. For the time being, the cloning of a human being is the most radical fracture of the natural and essential correlation between love-sexuality-procreation. It started with contraception which separates sexual relationship from procreation. This fracture became wider with assisted reproduction (IVF). Finally it becomes a radical fracture with human cloning because in this case the creation of a human being needs neither love nor sexuality. This fact creates immense negative implications on human beings, families, and society at large[11].

It cannot be denied that some of the goals of human cloning such as therapy and curing of genetic illness are good. Even Pope John Paul II acknowledges that the therapeutic finality of stem cells is a good step to help overcome suffering[12]. But – as the moral rule says – the end has to be achieved by good means because the end does not justify the means. To keep a person alive should not be achieved by killing another person. That is the reason why Pope John Paul II urges the use of adult stem cells rather than embryonic stem cells[13]. In the same manner of thinking it can be said that in order to keep a person happy – because he has genetical children – should not be achieved by sacrificing the well being of that child because a human person cannot be regarded as a tool but must be an end in himself.

Briefly, human cloning cannot be justified morally because it is against the dignity of a human being that must be respected at every phase of life from its existence until its natural death regardless of the intellectual or physical abilities one possesses or is deprived of. The dignity of a human being demands that man be always and everywhere treated as an end, as a value, and never as a mere means or simple

---

[9] Tim Radford, "Korean Scientists Clone 30 Human Embryos", in *British Medical Journal* 328 (21 February 2004) 421

[10] c.f. Roberto Colombo, "La Clonazione Umana: Aspetti Antropologici e Morali", in *L'Osservatore Romano*, August 20, 2003, page 5

[11] c.f. Roberto Colombo, "La Clonazione Umana: Aspetti Antropologici e Morali", in *L'Osservatore Romano* August 20, 2003, page 5

[12] Pope John Paul II, "Address to the International Congress on Transplant", in *The National Catholic Bioethics Quarterly*, 1(2001)90

[13] L'Osservatore Romano, Lunedì – Martedì 10 – 11 Novembre 2003, page 5

object. Unfortunately, cloning a human being does exactly the opposite of these principles. That is the reason why the Pontificia Academia Pro Vita says that it is a moral duty to halt human cloning and that this moral duty has to be translated into intercultural, social and legislative terms. "*Halting the human cloning project is a moral duty which must also be translated intercultural, social and legislative terms.*"[14]

This position is the continuing effort of the Church in the modern world to combat against the culture of death[15] and degradation of human dignity. This was declared in the Pastoral Constitution on the Church in the Modern World *Gaudium et Spes* no. 27 and has been repeated on many other occasions. In this passage of the Pastoral Constitution, it is stated clearly that the acts which are contrary to the integral good, which are against life itself and the integrity of the person, and which are against the dignity of human being are infamies. These points are repeated also in different words in *Evangelium Vitae*,

> *Every individual, precisely by reason of the mystery of the Word of God who was made flesh (cf. Jn 1:14), is entrusted to the maternal care of the Church. Therefore every threat to human dignity and life must necessarily be felt in the Church's very heart; it cannot but affect her at the core of her faith in the Redemptive Incarnation of the Son of God, and engage her in her mission of proclaiming the Gospel of life in all the world and to every creature (cf. Mk 16:15)*[16].

Cloning a human being is against all of these points and therefore it should be halted. Together with all people of good will we have the obligation to keep the dignity of human beings from being degraded, violated, and destroyed.

---

[14] Pontificia Academia Pro Vita, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997, p 15

[15] cf. *Evangelium Vitae*, no. 95.100

[16] *Evangelium Vitae* no. 3

BIBLIOGRAPHY

I. CLONING, STEM CELLS, AND GENETICS

A. Books on Cloning, Stem Cells, and Genetics

AMEISEN, Jean Claude, *Al Cuore della Vita: Il Suicidio Cellulare e la Morte Creatrice*, Feltrinelli, Milano, 2001

ANDREWS, Lori B., Jane E. Fullarton, *Assessing Genetic Risks: Implications for Health and Social Policy,* National Academy Press, Washington, D.C., 1994

ANTINORI, Severino, *Come avere un figlio e la clonazione terapeutica: Una svolta epocale per la salute dell'uomo*, Carmenta Editore, Bologna, 2002

APPLEYARD, Bryan, *Brave New Worlds: Staying Human in the Genetic Future*, Viking Penguin, New York, 1998

ATKINSON, Gary M. - Albert S. Moraczewski, *Genetic Counseling: The Church and the Law*, Pope John XXII Medical Moral, St. Louis, 1979

ATLAN, Henri – Marc Augé – Mireille Delmas-Marty, *Le Clonage Humain,* Seuil, Paris, 1999

ATTI DEI CONVEGNI LINCEI, *Centenario della Riscoperta delle Leggi di Mendel,* Accademia Nazionale Dei Lincei, Roma, 2001

----, *Le Cellule Staminali: Problematiche e Prospettive Terapeutiche*, Accademia Nazionale Dei Lincei, Roma, 2002

BALISTRERI, Maurizio, *Etica e Clonazione Umana,* Guerini Studio, Milano, 2004

BERZINS, V., *Basic Cloning Procedures,* Springer-Verlag Berlin and Heidelberg GmbH & Co, Berlin, 1998

BIOLATTI, Bartolomeo – Rosagemma Ciliberti – Aldo Fasolo, *L'Eldorado della Nuova Biologia. Clonazione, Animali Transgenici, Cellule Staminali*, Franco Angeli, Milano, 2003

BOMPIANI, Adriano, *Genetica e Medicina Prenatale,* Edizioni Scientifiche Italiane, Napoli, 1999

BOMPIANI, Adriano – Ennio Brovedani – Carlo Cirotto, *Nuova Genetica nuove Responsabilità,* San Paolo, Cinisello Balsamo, 1997

BONCINELLI, Edoardo, *Genoma: Il Grande Libro dell'Uomo*, Arnoldo Mondadori, Milano, 2001

BONNICKSEN, Andrea L., *Crafting a Cloning Policy: From Dolly to Stem Cell*, Georgetown University Press, Washington D.C., 2002

BRANNIGAN, Michael C., *Ethical Issues in Human Cloning: Cross-Disciplinary Perspective*, Seven Bridges Press, New York, 2001

BROWN, T.A, *Gene Cloning and DNA Analysis: An Introduction*, Blackwell Science, Oxford, 2001

BUCHANAN, Allen – Dan W. Brock, Norman Daniels, Daniel Wikler, *From Chance to Choice: Genetic & Justice*, Cambridge University Press, Cambridge, 2001

CAHILL, Lisa Sowle – Maureen Junker, *L'Etica dell'ingegneria Genetica,* Quereniana, Brescia, 1998

CAPANNA, Mario, *L'Uomo è più dei Suoi Geni: La Verità sulle Biotechnologie*, BUR, Milano, 2001

CAPELLA, Vincente Bellver, *Clonare?: Etica e Diritto di Fronte alla Clonazione Umana*, G. Giappichelli Editore, Torino, 2002

CEFREY, Holly, *Cloning and Genetic Engineering*, Childrens Press, Chicago, 2002

CHADWICK, Ruth et all., *The Ethics of Genetic Screening,* Kluwer Academic Publisher, Dordrecht, 1999

CHAPMAN, Audrey R., *Unprecedented Choices: Religious Ethics at the Frontiers of Genetic Science*, Fortress Press, Minneapolis, 1999

CHEN, Bing-Yuan – Harry W. Janes, *Pcr Cloning Protocols*, Humana Press, Totowa, 2002

CIBELLI, Jose – Robert P. Lanza, Keith H.S. Campbell, Michael D. West, *Principles of Cloning,* Academic Press, San Diego, 2002

COLE-TURNER, Ronald, *Beyond Cloning*, Continuum International Publishing Group – Trinity, New York, 2001

-----, *Human Cloning: Religious Responses*, Westminster John Knox Press, Louisville, 1997COMITATO NAZIONALE PER LA BIOETICA, *La Clonazione,* Presidenza del Consiglio dei Ministri, Dipartemento per l'informazione e l'edito, Roma, 1997

CONCETTI, Gino, *La Clonazione Umana: Diritti ed Etica*, Vivere in, Roma, 1998

CORBELINI, Gilberto, *Le Grammatiche del Vivente: Storia della Biologia e della Medicina Moleculare*, Editori Laterza, Roma, 1999

CORREA, Juan de Dios Vial – Elio Sgrecia, *Human Genome, Human Person and the Society of the Future: Proceeding oh 4th assembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Vatican, 1999

COUNCIL OF EUROPE, *Cloning: Ethical Eye*, Council of Europe Publishing, Strasbourg, 2002

CURRAN, Brendan, *A Terrible Beauty Is Born: Genes, Cloning and the Future of Mankind*, Taylor & Francis, London, 2003

DAVIES, Kevin, *Il Codice della Vita: Genoma: Una Storia e il Futuro di una Grande Scoperta*, Mondadori, Milano, 2001

DEMY, Timothy J. - Gary P. Stewart (eds.), *Genetic Engineering: A Christian Response*, Kregel Publications, Grand Rapids, 1999

DEPARTMENT OF HEALTH, *Stem Cell Research: Medical Progress with Responsability*, Department of Health, London, 2000

DI MAURO, Ernesto, *Annuario Genetico: Genomi, Clonazioni, Cellule Staminali, OGM, Terapia Genetica*, Ediesse, Roma, 2002

DONNELLAN, Craig, *The Cloning Issue*, Independence, Cambridge, 2002

DULBECCO, Renato, *La Mappa della Vita: L'Interpretazione del Codice Genetico*, Sperling Kupfer Editori, Milano, 2001

FRITZ, Sandy (ed.), *Understanding Cloning*, Warner Books, New York, 2002

FUKUYAMA, Francis, *Our Posthuman Future: Consequences of the Biotechnology Revolution*, Profile Books, London, 2003

GALLORI, Enzo, *Genetica: Atlanti Universali Giunti*, Giunti, Firenze, 1998

GALZIGNA, Lauro – Mario Galzigna, *Nascita della Biologia Moleculare: Dalla Doppia Elica alle Biotecnologie*, Edizione GB, Padova, 2001

GOODNOUGH, David, *The Debate Over Human Cloning: A Pro/Con Issue*, Enslow Publishing Inc, Berkley Height, 2003

GREEN, Ronald M., *The Human Embryo Research Debates: Bioethics in the Vortex of Controversy*, Oxford University Press, Oxford, 2001

GUTTMAN, Burton – Anthony Griffiths, David Suzuki, Tara Cullis, *Genetics*, Oneworld Publications, Oxford, 2002

HABERMAS, Jürgen, *Il Futuro della Natura Umana: I Rischi di Una Genetica Liberale*, Biblioteca Einaudi, Torino, 2002

HARDI, Charles et al, *Cloning, Gene Expression and Protein Purification: Experimental Procedures and Process Rationale*, Oxford University Press, Oxford, 2001

HARRIS, John, *Clones, Genes, and Immortality: Ethics and the Genetic Revolution*, Oxford University Press, Oxford, 1998

HO, Mae-Wan, *Ingegneria Genetica: Le Biotechnologie tra Scienza e Business*, Derive Aproditi, Roma, 2001

HOLLAND, Suzanne, *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy*, MIT Press, Cambridge, 2001

HUMBER, James M. - Robert F. Almeder, *Human Cloning*, Humana Press, Totowa, 1998

----, *Biomedical Ethics Reviews Cloning*, Humana Press, Totowa, 1998

HUXLEY, Aldous, *Il Mondo Nuovo Ritorno al Mondo Nuovo*, Arnoldo Mondadori, Milano, 1998

IBEGBU, Jude, *Ricerca sulle Cellule Staminale e sulla Clonazione Terapeutica*, Cantagalli, Siena, 2002

JONES, Steve, *In the Blood: God, Genes and Destiny*, Harper Collins, London, 1996

JORDAN, Bertrand, *Gli Impostatori della Genetica*, Einaudi, Torino, 2002

KAPLAN, Jonathan Michael, *The Limits and Lies of Human Genetic Research: Dangers for Social Policy*, Routledge, London, 2000

KASS, Leon R. - James Q. Wilson, *The Ethics of Human Cloning*, AEI Press, Washington D.C, 1998

KASS, Leon R (ed.), *Human Cloning and Human Dignity: The Report of the President's Councill on Bioethics*, Oublic Affairs, New York, 2002

KEANE, Eamonn, *The Brave New World of Therapeutic Cloning*, HLI, , 2001

KLOTZKO, Arlene Judith, *The Cloning Sourcebook*, Oxford University Press, Oxford, 2001

----, *A Clone of Your Own?: The Science and Ethics of Cloning*, Oxford University Press, Oxford, 2002

KOLATA, Gina, *Cloni: Da Dolly all'uomo*, Rafaello Cortina Editore, Milano, 1998

KRISTOL, William – Eric Cohen, *The Future is Now: America Confronts the New Genetics*, Rowman & Littlefield Oublisher, Lanham, 2002

KUNICH, John Charles, *The Naked Clone: How Cloning Bans Threaten Our Personal Rights*, Praeger Publishers, New York, 2003

KUSMARYANTO, Carolus B., *Problem Etis Kloning Manusia* (2nd), Grasindo, Jakarta, 2003

LACADENA, Juan-Ramón, *Genética y Bioética*, Desclée De Brouwer, Bilbao, 2002

LAURITZEN, Paul (ed.), *Cloning and the Future of Human Embryo Research*, Oxford University Press, Oxford, 2000

LE DOUARIN, Nicole, *Chimere, Cloni e Geni*, Bollati Boringhieri, Torino, 2002

LESTER, Lane – James Hefley, *Human Cloning: When Science Fiction becomes Reality*, Marshall Pickering, London, 1999

LEVICK, Stephen, *Clones on the Couch: Exploring Psychological and Social Realities*, Rowman & Littlefield Publishers, Lanham, 2004

LEVIN, Ira, *The Boys from Brazil*, Bloomsbury, London, 1998

LEWONTIN, Richard, *Il Sogno del Genoma Umano: E Altre Illusioni della Scienza*, Editorti La Terza, Roma, 2002

MACKINNON, Barbara, *Human Cloning: Science, Ethics and Public Policy*, University of Illinois Press, Chicago, 2002

MAIENSCHEIN, Jane, *Whose View of Life?: Embryos, Cloning and Stem Cells*, Harvard University Press, Harvard, 2003

MATTEI, Jean-François, *Il Genoma Umano: Uno Sguardo Etico*, Sapere 2000 Edizioni Multimediali, Roma, 2002

MCGEE, Glenn, *The Human Cloning Debate*, Berkeley Hills Books, Berkeley, 2002

----, *The Perfect Baby: Parethood in the New World of Cloning and Genetics*, Rowman & Littlefield, Lanham, 2000

MCLAREN, Anne, *La Clonazione: Uno Sguardo Etico*, Sapere 2000, Roma, 2002

MELE, Vincenza, *Organismi Geneticamente Modificati e Bioetica*, Cantagalli, Siena, 2002

MIETH, Dietmar, *Che Cosa Vogliamo Potere?: Etica nell'Epoca della Biotecnica*, Queriniana, Brescia, 2003

MIETH, Dietmar, *La Dittatura dei Geni: La Bioetica tra Fattibilità e Dignità Umana*, Queriniana, Brescia, 2003

MINCHIN, Steve – Julia Lodge, *Gene Cloning*, BIOS Scientific Publishers, Oxford, 2003

NARDO, Don, *Cloning*, KidHaven Press, San Diego, 2002

NATIONAL ACADEMY OF SCIENCES, *Scientific and Medical Aspects of Human Reproductive Cloning*, National Academy Press, Washington, D. C., 2002

NATIONAL BIOETHICS ADVISORY COMMISSION, *Cloning Human Beings: Report and Recommendations of the NBAC*, National Bioethics Advisory Commission, Rockville, 1997

-----, *Cloning Human Beings: Commissioned Papers*, National Bioethics Advisory Commission, Rockville, 1997

-----, *Ethical Issues in Human Stem Cell Research: Report and Recommendations*, National Bioethics Advisory Commission, Rockville, 1999

-----, *Ethical Issues in Human Stem Cell Research: Commissioned Papers*, National Bioethics Advisory Commission, Rockville, 2000

-----, *Ethical Issues in Human Stem Cell Research: Religious Perspectives*, National Bioethics Advisory Commission, Rockville, 2000

NATIONAL INSTITUTES OF HEALTH, *Stem Cells: Scientific Progress and Future Research Directions*, National Institutes of Health, London, 2001

NATIONAL RESEARCH COUNCIL BOARD ON LIFE SCIENCES, *Scientific and Medical Aspects of Human Reproductive Cloning*, National Academy Press, Washington D.C., 2002

NERI, Demetrio, *La Bioetica in Laboratorio*, Edizioni Laterza, 2001

NUSSBAUM, Martha C. – Cass R. Sunstein, *Clones and Clones: Facts and Fantasies About Human Cloning*, W.W. Norton, New York, 1999

OVEJERO, Arsenio Fraile, *Fisiologia Umana: Atlanti Universali Giunti*, Giunti, Firenze, 1999

PALLADINO, Michael A., *Stem Cells and Cloning Booklet*, Addison Wesley, Boston, 2002

PASSARGE, Eberhard, *Atlante a Colori di Genetica*, Arti Grafiche Editoriali, Roma, 1999

PENCE, Gregory E., *Who's Afraid of Human Cloning?*, Rowman & Littlefield Publishers, Inc., Lanham, 1998

----, *Flesh of my Flesh: The Ethics of Cloning Humans*, Rowman & Littlefield Publishers, Lanham, 1998

PETERS, Ted (ed.), *Genetics: Issues of Social Justice*, The Pilgrim Press, Cleveland, 1998

PETERSON, James C., *Genetic Turning Points: The Ethics of Human Genetic Intervention*, William B. Eerdman, Grand Rapids, 2001

POLLO, Simone, *Scegliere chi Nasce. L'Etica della Riproduzione Umana fra Libertà e Responsabilità*, Guerini e Associati, Milano, 2003

PRENTICE, David A., *Stem Cell and Cloning*, Benjamin Cummings, San Francisco, 2003

RAËL, *Yes to Human Cloning: Immortality Thanks to Science!*, The Tagman Press, Norwich, 2001

RANTALA, M.L. – Arthur J. Milgram, *Cloning: For and Against*, Open Court Publishing Company, Chicago, 1998

REDI, Carlo Alberto – Silvia Garagna, Maurizio Zuccoti, *Biologia delle Cellule Staminali: Opportunità e Limiti di Impegno*, Collegio Ghislieri, Pavia, 2000

RICCI, Mariella Lombardi, *Fabricare Bambini?: La Questione dell'Embrione tra Nuova Medicina e Genetica*, Vita e Pensiero, Milano, 1996

RUSE, Michael – Aryne Sheppard (eds.), *Cloning: Responsible Science or Technomadness*, Prometheus Books, Anherst, 2001

RUSSEL, Robert John – William R. Stoeger, FranciscoJ. Ayala (eds.), *Evolutionary and Molecular Biology: Scientific Perspective on Divine Action*, Libreria Editrice Vaticana, Vatican, 1998

RUSSO, Giovanni, *La Clonazione di Sogietti Umani*, Coop. S. Tom, Messina, 1997

SABATO, Giovanni, *L'Officina della Vita: Cellula Staminale, Medicina Rigenerativa, Trapianti: Come si Ripara il Corpo Umano*, Garzanti Libri, Cernusco, 2002

SAMBROOK, Joe – David Russell, *Molecular Cloning: A Laboratory Manual*, Cold Spring Harbor Laboratory Press, Woodbury, 2000

SANTOSUOSSO, Amedeo – Silvia Garagna – Carlo Alberto Redi – Maurizio Zuccoti, *Le Tecniche della Biologia e Gli Arnesi del Diritto*, Collegio Ghislieri, Pavia, 2003

SCALLY, John, *A Brave New World?*, Veritas Publication, Dublin, 1998

SHANNON, Thomas A., *What are They Saying about Genetic Engineering*, Paulist Press, New York, 1985

SHOSTAK, Stanley, *Becoming Immortal: Combining Cloning and Stem-Cell Therapy*, State University of New York Press, New York, 2002

SILVER, Lee M., *Remaking Eden: Cloning and Beyond in a Brave New World*, Weidenfeld & Nicolson, London, 1998

SMITH, John Maynard – Eörs Szathmáry, *Le Origine della Vita: Dalle Molecole Organiche alla Nascita del Linguagio*, Einaudi, Torino, 2001

TAGLIAFERRO, Linda, *Genetic Engineering: Progress or Peril?*, Lerner Publications Company, 1997

TAMINO, Gianni – Fabrizia Pratesi, *Ladri di Geni: Dalle Manipolazioni Genetiche ai Brevetti sul Vivente*, Editori Riuniti, Roma, 2001

TAMINO, Gianni, *Il Bivio Genetico: Salute e Biotecnologie tra Ricerca e Mercato*, Edizioni Ambienti, Milano, 2001

VARDY, Peter, *Being Human: Fulfilling Genetic and Spiritual Potential*, Darton Longman & Todd, London, 2003

VEZZONI, Paolo, *Si Può Clonare un Essere Umano?*, Editori Laterza, Bari, 2003

WAHRMAN, Miryam, *Brave New Judaism: When Science and Scripture Collide*, Brandeis University Press, New England, 2002

WATERS, Brent – Ronald Cole-Turner (eds.), *God and the Embryo: Religious Voices on Stem Cells and Cloning*, Georgetown University Press, Washington, D.C, 2003

WATSON, James D., *Geni Buoni Geni Cattivi: Storia di ura Passione per il DNA*, Utet Libreria, Torino, 2002

WEST, Michael D., *The Immortal Cell: One Scientist's Quest to Solve the Mystery of Human Aging*, Doubleday, New York, 2003

WILKIE, Tom, *Perilous Knowledge: The Human Genome Project and its implications*, University of California Press, Los Angeles, 1993

WILLER, Roger A. (Ed.), *Genetic Testing and Screening: Critical Engagement at the Intersection of Faith and Science*, Kirk House Publishers, Minneapolis, 1998

WILMUT, Ian – Keith Campbell – Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control*, Harvard University Press, Cambridge, 2000

WINTERS, Paul A., *Cloning*, Greenhaven, San Diego, 1998

ZANINELLI, Sergio, *Scienza, Tecnica e Rispetto dell'uomo: Il Caso delle Cellule Staminali*, Vita e Pensiero, Milano, 2001

B. Articles on Cloning, Stem Cells, and Genetics

ADVISERS TO THE PRESIDENT OF THE EUROPEAN COMMISSION ON THE ETHICAL IMPLICATIONS OF BIOTECHNOLOGY, "Ethical Aspects of Cloning Techniques" in *Journal of Medical Ethics* 23 (1997) 349 – 352

AGAR, Nicholas, "Cloning and Identity" in *Journal of Medicine and Philosophy* 28 (2003) 9 – 26

AGRES, Ted, "Cloning Capsized?" in *The Scientist* 15(2001) 1

-----, "A pending government decision keeps stem cell investigators in limbo", in *The Scientist* 15(2001) 11

AHMANN, John, "Therapeutic Cloning and Stem Cell Therapy", in *The National Catholic Bioethics Quarterly* 1(2001) 145 – 150

ASHLEY, Benedict and Albert Moraczeski, "Cloning, Aquinas, and the Embryonic Person" in *The National Catholic Bioethics Quarterly* 1(2001) 189 – 201

AUSTRIACO, Nicanor Pier Giorgo, "On Static Eggs and Dynamic Embryos: A Systems Perspective", in *The National Catholic Bioethics Quarterly* Winter (2002) 659 – 683

AVILA, Daniel, "The Present Standing of the Human Embryo in United States Law" in *The National Catholic Bioethics Quarterly* 1(2001) 203 – 226

BALISTRERI, M., "Lo Statuto dell'Embrione dopo la Clonazione" in *Bioetica Rivista Interdisciplinare* 9(2001)247 - 333

BAYLIS, Françoise, "Human Cloning: Three Mistakes and Alternatives", in *Journal of Medicine and Philosophy* 27(2002) 319 – 337

BEDDINGSTON, R.S. - E.J. Robertson. "An Assessment of the Developmental Potential of Embryonic Stem Cells in the Midgestation Mouse Embryo." In *Development* 105 (1989) 733–737

BELVER CAPELLA, Vincente, "Luci e Ombre nella Ricerca con Cellule Staminali", in *Medicina e Morale* 50(2000) 851-867

BJORNSON, C.R., R.L. Rietze, B.A. Reynolds, M.C. Magli, and A.L. Vescovi, "Turning Brain into Blood: A Hematopoietic Fate Adopted by Adult Neural Stem Cells In Vivo" in *Science* 283 (1999) 534–537

BLAU, H. M., T. R. Brazelton, J. M. Weiman, "The Evolving Concept of a Stem Cell: Entity or Function?" in *Cell* 105(2001) 829 - 841

BLERKOM, Jan Van, "Extragenomic Regulation and Autonomous Expression of a Developmental Program in the Early Mammalian Embryo", in *Annals of the New York Academy of Sciences* 442(1985) 61

BOCCACCIO, Carla, "Il Cancro: Una Malattia delle Cellule Staminali?" in *Bioetica Rivista Interdisciplinare* 11 (2003) 40 – 49

BOMPIANI, Adriano, "Le Cellule Staminali e la Clonazione Terpeutica" in *Rivista di Teologia Morale* 128 (2000) 543 – 563

-----, "I Lavori della Commissione Ministeriale per lo Studio della Utilizzazione delle Cellule Staminali", in *Medicina e Morale* 51(2001)101 - 125

-----, "La Clonazione: Considerazioni sulla Normative Internazionali" in *Medicina e Morale* 48 (1998) 581 – 600

BONÉ. E., "Perplexité Éthique devant le Clonage", in *Revue Théologique de Louvain* 30(1999), 437 – 455

BONGSO, A. - C.Y. Fong, S.C. Ng - S. Ratnam, "Isolation and Culture of Inner Cell Mass Cells from Human Blastocysts." *Human Reproduction* 9 (1994) 2110 – 2117

BREITOWITZ, Yitzchok, "What's So Bad About Human Cloning?" in *Kennedy Institute of Ethics Journal* 12 (2002) 325 – 341

BRESCIANI, C., "Famiglia e Clonazione Umana", in *La Famiglia* 34(2000)204, 8-21

BRIGGS, Robert – Thomas J. King, "Transplantation of Living Nuclei from Blastula Cells into Enucleated Frog's Eggs", in *Proceeding National Academy of Science USA*, 38(1952) 455 – 463

BROMHALL, J. D., "Nuclear Transplantation in the Rabbit Egg", in *Nature* 258(1975) 719 – 722

BRUSTLE, O. - K.N. Jones - R.D. Learish - K. Karram - K. Choudhary - O.D. Weistler - I.D. Duncan - R.D. McKay, "Embryonic Stem Cell-Derived Glial Precursors: A Source of Myelinating Transplants." *Science* 285(1999) 754 – 756

BURLEY, Justine - John Harris, "Human Cloning and Child Welfare" in *Journal of Medical Ethics* 25 (1999) 108 – 113

BUSH, George W., "Address on Public Funding of Stem Cell Research" in *The National Catholic Bioethics Quarterly* 4(2001) 619 – 622

CAHILL, Lisa Sowle, "Symposium Human Primordial Stem Cell: The New Biotech World Order" in *Hasting Center Report* 29(1999) 45 – 48

-----, "Religion-Based Perspectives on Cloning of Humans", in *Ethics & Medicine* 14 (1998) 8 – 10

CALLAHAN, Daniel, "Cloning: The Work not Done", in *Hastings Center Report* 27 (1997) 18 – 20

CAMPBELL, K.H.S. - J. McWhir - W.A. Richie - I. Wilmut, "Sheep cloned by Nuclear transfer from a cultured cell line", in *Nature* 380(1996) 64 – 66

CAPELLA, Vincente Belver, "Luci e Ombre nella Ricerca con Cellule Staminali" in *Medicina e Morale* 50(2000) 851 – 867

CARINCI, Paolo - Gianpaolo Bagnara, "Cellule Staminali e Rinovamento Tissutale" in *Bioetica Rivista Interdisciplinare* 11 (2003) 27 – 31

CARLOTTI, P., « La Clonazione tra Scienza, Terapia ed Etica », in *Bioetica e Cultura* 11(2001)141 - 166

CARRON, "Le Clonage", in *Cahiers de Meylan* 2(2002) 24 - 29

CARRASCO DE PAULA, Ignacio. "Etica della Ricerca Biomedica: la Virtù oltre l'Utile. Riflessioni Intorno alla Clonazione Terapeutica", in *Medicina e Morale 50(2000)5*, 869 – 878

CASALONE, C., "Clonazione e Cellule Staminali – In Margine al Rapporto Donaldson" in *Aggiornamenti Sociali* 51 (2000) 716 – 730

-----, "Cellule Staminali: la Decisione del Presidente Bush", in *Aggiornamenti Sociali* 52(2001)705 – 710

CATALDO, Peter J., "A Cooperation Analysis of Embryonic Stem Cell Research" in *The National Catholic Bioethics Quarterly* Spring (2002) 35 – 41

CATTANEO, E. - R. McKay, "Identifying and Manipulating Neuronal Stem Cells." in *Trends in Neurosciences* 14(1991) 338 – 340

CAUSARANO, Renzo, "Le Cellule Staminali e il Neurologo Clinico" in *Bioetica Rivista Interdisciplinare* 11 (2003) 828 – 830

CHAPELLE, A., "Le Clonage d'êtres Humains », in *Nouvelle Revue Théologique* 123(2001) 27 – 45

CHILDRESS, James F., "The Challenger of Public Ethics: Reflections on NBAC's Report", in *Hastings Center Report* 27 (1997) 9 – 11

CIBELLI, Jose B. - S. L. Stice - P. J. Golueke - J. J. Kane - J. Jerry - C. Blackwell - F. A. Ponce de Leon - J. M. Robl, "Cloned Transgenic Calves Produced from Nonquiescent Fetal Fibroblast", in *Science* 280(1998) 1256 – 1258

CIBELLI, Jose B. - Robert P. Lanza - Michael D. West, "The First Human Cloned Embryo" in *Scientific American* (2001)1 – 7

CIBELLI, Jose B., et all., "Somatic Cell Nuclear Transfer in Humans: Pronuclear and Early Embryonic Development" in *The Journal of Regenerative Medicine* 2(2001) 25 – 31

CLEAVER, Cathleen A., "Stem Cell Policy and the Culture of Death" in *The National Catholic Bioethics Quarterly* Spring (2002) 27 – 33

COLLAS Philippe - Anne-Mari Hakelien, "Reprogramming Somatic Cells for Therapeutic Applications" in *The Journal of Regenerative Medicine* 4 (2003) 7 – 13

COLOMBO, Roberto, "Discoveries of Life Sciences Support Prohibition of Killing Human Embryo" in *L'Osservatore Romano* (English) 18 October 1995, page 10 - 11

-----, "La Clonazione Umana: 1. Aspetti Scientifici e Clinici" in *L'Osservatore Romano,* 13 Agosto 2003, page 4

-----, "La Clonazione Umana: 2. Aspetti Antropologici e Morali" in *L'Osservatore Romano,* 20 Agosto 2003, page 5

-----, "La Clonazione Umana: 3.Clonazione e Terapia Cellulare" in *L'Osservatore Romano,* 23 Agosto 2003, page 4

-----, "La Clonazione Umana: 4. Aspetti di Diritto Internazionale" in *L'Osservatore Romano,* 27 Agosto 2003, page 5

CONDIC, Maureen L, "The Basic about Stem Cells" in *The Human Life Review* 28 (2002) 119 – 126

CONNER, Paul, "The Indignity of Human Cloning" in *The National Catholic Bioethics Quarterly* winter (2002) 635 – 658

COORS, Mariiyn E., "Therapeutic Cloning: From Consequences to Contradiction", in *Journal of Medicine and Philosophy* 27(2002)297 – 317

CORN, B. - M. Reed - S. Dishong - L. Yunsheng, - T. Wagner, "Culture and Successful Transplantation of Embryonic Yolk-Sac Cells." in *Clinical Biotechnology* 3 (1991) 15

COTÉ, G. B. - J. Gybtodinou, "Twinning and Mitotic Crossing-over: Some Possibilities and Their Implications", in *American Journal of Human Genetics* 49 (1991) 120 – 130

CUMMINS, J., "Mitochondrial DNA in Mammalian Reproduction" in *Review of Reproduction* 3(1998)172 – 182

DAVIS, Dena S., "Genetic Dilemmas and the Child's Right to an Open Future" in *Hastings Center Report* 27(1997) 7 – 15

DAVIDSON, Jo Ann L., "A Successful Embryo Adoption" in *The National Catholic Bioethics Quarterly* 1(2001) 229 – 233

DEACON, T. - J. Dinsmore - L.C. Costantini - J. Ratliff, - O. Isacson, "Blastula-Stage Stem Cells Can Differentiate into Dopaminergic and Serotenergic Neurons After Transplantation."in *Experimental Neurology* 149 (1998) 28–41.

DE PAULA, Ignazio Carrasco, "Etica della Ricerca Biomedica: la Virtù oltre l'Utile, Riflessioni intorno alla Clonazione Terapeutica", in *Medicina e Morale* 50(2000) 869 – 867

DI PIETRO, Maria Luisa, "La Produzione e la Ricerca sulle Cellule Staminali nel Dibattito Bioetico", in *Camillianum* 1(2001)299 – 320

-----, "Dalla Clonazione dell'Animale alla Clonazione dell'Uomo?" in *Medicina e Morale* 47(1997) 1099 – 1118

DI PIETRO, Maria Luisa - R. Minacori, "Cellule Staminali: Una Questione Apperta", in *Vita e Pensiero* 84(2001)56 – 67

DEACON, T., J. Schumacher - J. Dinimore, "Histological Evidence of Fetal Pig Neural Cell Survival after Transplantation into a Patient with a Parkinson's Disease", in *Nat. Med* 3(2997) 350 – 353

DIUKMAN, R. - M.S. Golbus, "*In Utero* Stem Cell Therapy." *Journal of Reproductive Medicine* 37 (1992) 515–520.

DOERFLINGER, Richard, "The Policy and Politics of Embryonic Stem Cell Research", in *The National Catholic Bioethics Quarterly* 1(2001) 135 – 143

DOETSCHMAN, T., P. Williams, - N. Maeda, "Establishment of Hamster Blastocyst-Derived Embryonic Stem (ES) Cells." in *Developmental Biology* 127 (1988) 224 – 227

DONOVAN, P. J., "Growth Factor Regulation of Mouse Primordial Germ Cell Development." in *Current Topics in Developmental Biology* 29 (1994) 189–225

-----, "The Germ Cell: The Mother of All Stem Cells." in *International Journal of Developmental Biology* 42(1998) 1043 – 1050

DOYLE, John P., "Reflection on Persons in Petri Dishes" in *The Linacre Quarterly* 64 (1997) 62 – 76

EDWARDS, R. G. - P. C. Steptoe, - J. M. Purdy, "Human Blastocysts Grown in Culture", in *Nature* 229(1971)133

EVANS, M.J. - M.H. Kaufman, "Establishment in Culture of Pluripotential Cells from Mouse Embryos." In *Nature* 292(1981)154–156

EVANS, M.J. - E. Notarianni - S. Laurie - R.M. Moor, "Derivation and Preliminary Characterization of Pluripotent Cell Lines from Porcine and Bovine Blastocysts." In *Theriogenology* 33(1990)125–128

EGLITIS, M. A. - E. Mezey, "Hematopoietic Cells Differentiate into both Microglia and Macroglia in the Brains of Adult Mice", in *Proceeding National Academy of Science U.S.A* 94(1997) 4080 – 4085

ELIZARI, Francesco Javier, "La Clonación Humana Reproductiva Atentado a la Singularidad?", in *Moralia* 23(2000) 4, 425-446

ERMINI, Massimo, "Riproduzione e Procreazione", in *Rivista Teologia Morale* 140 (2003) 527 – 533

EVERS, K. "L'Identità dei Cloni" in *Biblioteca della Libertà* 33 (1998) 25 – 33

FAGAN, Amy, "Panel Approves Ban on Cloning", in *The Washington Times*, February 13, 2003

FAGGIONI, Maurizio Pietro, "Lavorare con le Cellule Staminali" in *Studia Morale* 40(2002) 85 – 114

FAGIOLI, Franca - Eleonora Biasin, - Enrico Madon, "Il Trapianto di Cellule Staminali Emopoietiche in Onco-ematologia Pedriatrica" in *Bioetica Rivista Interdisciplinare* 11 (2003) 32 – 39

FORABOSCO, Antonio, "Pre-Embrio e Ricerca sulle Cellule Staminali" in *Bioetica Rivista Interdisciplinare* 11 (2003) 795 – 810

FREED, C. R. - P. E. Greene - R. E Breeze, "Transplantation of Embryonic Dopamine Neurons for Severe Parkinson's Disease", in *New England Journal of Medicine* 344(2001)710 – 719

GAMBINO, G., "Per Una Lettura Bioetica della Clonazione Umana" in *Camillianum* 9 (1998) 77 – 85

GERMAN, L. G., "The Beginning of Individual Human Life" in *The Linacre Quarterly* 64 (1997) 94 – 95

GERON ETHICS ADVISORY BOARD, "Research with Human Embryonic Stem Cells: Ethical Considerations", in *Hasting Center Report* 29(1999) 31 – 36

GRABOWSKI, John S., "Made Not Begotten: A Theological Analyses of Human Cloning", in *Ethics & Medicine* 14 (1998) 69 – 71

GEARHART, J.D. "New Potential for Human Embryonic Stem Cells." in *Science* 282(1998)1061–1062

GRAVES, K.H. - R.W. Moreadith, "Derivation and Characterization of Putative Pluripotential Embryonic Stem Cells from Pre-implantation Rabbit Embryos." in *Molecular Reproduction and Development* 36 (1993) 424 – 433

GREEN, Ronald et all., "Overseeing Research on Therapeutic Cloning: A Private Ethics Board Responds to Its Critics" in *Hasting Center Report* 32(2002) 27 – 33

GREENBERG, Paul, "The Case for Cloning", in *The Human Life Review* 28 (2002) 142 – 144

GURDON, John B., "The Developmental Capacity of Nuclei Taken from Intestinal Epithelium Cells of Feeding Tadpoles", in *Journal of Embryology Experimental Morphology* 10(1962) 622 – 640

GURDON, John B., R.A. Laskey, O.R. Reeves, "The Developmental Capacity of Nuclei Transplanted from Keratinized Skin Cells of Adult Frogs", in *Journal of Embryology Experimental Morphology*, 34(1975)93 – 112

GURDON, John B. - R.A. Laskey, "The Trasplantation of Nuclei from Single Cultured Cells into Enucleated Frog's Eggs", in *Journal of Embryology Experimental Morphology*, 24(1970) 227 – 248

HALL, Jerry - Robert Stillman, "Human Embryo Cloning Reported", in *Science* 262(1993)652 – 653

HALL, Jerry L. - Robert J. Stilmann, et al., "Experimental Cloning of Human Polyploid Embryos Using an Artificial Zona Pellucida" in THE AMERICAN FERTILITY SOCIETY, *Abstracts: Scientific paper to be presented at the conjoint meeting of the American Fertility Society and the Canadian Fertility and Andrology Society, October 11 – 14, 1993, Montreal,* Supplement "Fertility and Sterility" (1993)S1 – S225

HALL, P. A. - F.M. Watt "Stem Cells: The Generation and Maintenance of Cellular Diversity" in *elopment* 106(1989)619–633

HANDYSIDE, A. - M.L. Hooper - M.H. Kaufman - I. Wilmut, "Towards the Isolation of Embryonal Stem Cell Lines from the Sheep." In *Roux's Archives of Developmental Biology* 196(1987)185–190

HANSEN, Bart - Paul Schotsmans, "Cloning: The Human as Created Co-Creator" in *Ethical Perspectives* 8 (2001) 75 – 87

HARRIS, John, "Cloning and Human Dignity" in *Cambridge Quarterly of Healthcare Ethics* 7(1998) 163 – 167

-----, "Goodbye Dolly: The Ethics of Human Cloning", in *Journal of Medical Ethics* 23 (1997) 353 – 360

-----, "Is Gene Therapy a Form of Eugenics?" in *Bioethics* 7(1993) 178 – 187

----- "Is Cloning an Attack on Human Dignity?" in *Nature* 387 (1997) 754

HENNINGER, Daniel, "The Cloning Issues Deserves Better Than 'Why Not'" in *The Human Life Review* 28 (2002) 145 – 147

HOLLANDS, P. "Embryonic Stem Cell Grafting: The Therapy of the Future?" in *Human Reproduction* 6(1991)79–84

IANNACCONE, P.M. - G.U. Taborn - R.L. Garton - M.D. Caplice - D.R. Brenin "Pluripotent Embryonic Stem Cells from the Rat are Capable of Producing Chimeras." *Developmental Biology* 163(1994)288–292.

IOZZIO, Mary Jo, "Science, Ethics, and Cloning Technologies", in *The Linacre Quarterly* 64 (1997) 46 – 52

ISCOVE, N. "Haematopoiesis. Searching for Stem Cells." in *Nature* 347(1990)126–127

IRVING, Dianne, "Testimony Before the NIH Human Embryo Research Panel", in *The Linacre Quarterly* 61 (1994) 82 – 89

ISCOVE, Norman, "Searching for Stem Cell" in *Nature* 347 (1990) 126 - 127

JACKSON, K. A. - M. A. Goodel, "Hematopoietic potential of stem cells isolated from murine skeletal muscle", in *Proceeding National Academy of Science U.S.A* 96(1999) 14482 – 14486

JAENISCH, R., I. Wilmut, "Don't clone humans!" in *Science* 292(2001)639

JAKI, Stanley, "Cloning and Arguing" in *The Linacre Quarterly* 65(1998) 5 – 18

KAISER, Jocelyn " Xenotransplantation: Cloned Pigs May Help Overcome Rejection" in *Science* 295(2002) 25 – 27

KASS, Leon R., "The Moral Meaning of Genetic Technology" in *The Human Life Review* 26 (2000) 76 – 87

KAVENY, M. Cathleen, "Jurisprudence and Genetics" in *Theological Studies* 60 (1999) 135 – 150

KIDDLER, G. M., "The genetic Program for Preimplantation Development", in *Developmental Genetics*, 13(1992) 320

KISCHER, C. Ward, "Cloning, Stem Cell Research and Some Historic Parallels", in *Linacre Quarterly*, 69(2002) 340

-----, "A Contemporary on the Beginning of Life: A View from Human Embryology" in *The Linacre Quarterly* 63 (1996) 73 – 77

-----, "The Big Lie in Human Embryology: The Case of the Preembryo", in *Linacre Quarterly*, vol. 64. No. 4 (1997) 53 – 61

KOLATA, Gina, "First Mammal Clone Dies; Dolly Made Science History" in *The New York Times* February 15, 2003

KRAJ, Thomasz, "The Magisterium and Modern Genetics" in *The National Catholic Bioethics Quarterly* Winter (2002) 617 – 634

KRAUTHAMMER, Charles, "Research Cloning? No." in *The Human Life Review* 28 (2002) 127 – 128

LEDERBERG, Joshua, "Experimental Genetics and Human Evolution" in *The American Naturalist* 100(1966)519 – 531

LEE, S. H. - N. Lumelsky - L. Studer - J. M. Auerbach, - R. D. McKay, "Efficient Generation of Midbrain and Hindbrain Neurons from Mouse Embryonic Stem Cells", in *National Biotechnology 18*, (2000) 675 – 679

LOMBARDI RICCI, Mariella, "La Clonazione: il Fatto e il Significato" in *Rivista di Teologia Morale* 29(1997) 221 – 232

LUCAS-LUCAS, Ramón, "Si alla Vita Bene Inviolabile" in *L'Osservatore Romano* 22 February 1999

LUMELSKY, N. - O. Blondel - P. Laeng - I. Velasco - R. Ravin - R. McKay "Differentiation of Embryonic Stem Cells to Insulin-Secreting Structures Similar to Pancreatic Islets" in *Science 292*(2001)1389 – 1394

MALBY, Steven, "Human Dignity and Human Reproductive Cloning", in *Health and Human Rights*, 6(2002) 103 – 134

MARKS, Stephen P., "Human Rights Assumptions of Restrictive and Permissive Approaches to Human Reproductive Cloning", in *Health and Human Rights* 6 (2002) 81 – 100

MARTIN, G., "Isolation of a Pluripotent Cell Line from Early Mouse Embryos Cultured in Medium Conditioned by Teratocarcinoma Stem Cells", in *Proceeding of the National Academy of Sciences of the USA* 78(1981)7634 – 7638

MARTINO, Renato R., "Remarks to the United Nations on Human Cloning" in *The National Catholic Bioethics Quarterly* Spring (2002) 139 – 141

MEYER, John, "Cloning Human Embryos: Why Artificial Human Procreation is Immoral", in *The Linacre Quarterly* 61(1995) 22 – 29

MAYOR, Susan, "Ban on Human Reproductive Cloning Demanded", in *British Medical Journal* 1566(2001) 322

MCDONALD, J. W., X. Z. Liu, Y Qu, "Transplanted Embryonic Stem Cells Survive, Differentiate and Promote Recovery in Injured Rat Spinal Cord", in *Nature Medicine* 5(1999)1410 – 1412

MICHEJDA, Maria, "Spontaneous Miscarriages as Source of Fetal Stem Cells" in *The National Catholic Bioethics Quarterly* Autumn (2002) 401 – 411

MIETH, Dietmar, "Cellule Staminali. I Problemi Etici Concernenti l'utilizzazione ei Embrio a Scopi di Ricerca" in *Bioetica Rivista Interdisciplinare* 11 (2003) 811 – 822

MIRKES, Renée, "NBAC and Embryo Ethics" in *The National Catholic Bioethics Quarterly* 1(2001) 163 – 187

MOERIMER, David P., "The Posthumous Application of Negative Eugenics" in *The Human Life Review* 28 (2002) 13 – 22

MORDACCI, Roberto, "La Clonazione: Aspetti Scientifici e Problemi Etici", in *Aggiornamenti Sociali* 48(1997)2, 127 – 138

MOREADITH, R.W., dan K.H. Graves "Derivation of Pluripotential Embryonic Stem Cells from the Rabbit" in *Transactions of the Association of American Physicians* 105(1992) 197–203

MORI, Mauritzio - Dimetrio Neri, "La Decisione di George Bush Sulle Cellule Staminali e la Svolta di Civiltà sui Temi Bioetici", in *Bioetica Rivista Interdisciplinare* 9(2001) 427 - 434

MUTHUCHAMY, M. - L. Pajak - P. Howles - T. Doetschman - D.F. Wieczorek "Developmental Analysis of Tropomyosin Gene Expression in Embryonic Stem Cells and Mouse Embryos." in *Molecular Cell Biology* 13(1993) 3311 – 3323

NAGY, A. - J. Rossant - R. Nagy - W. Abramow-Newerly - J.C. Roder, "Derivation of Completely Cell Culture-Derived Mice from Early-Passage Embryonic Stem Cells." in *Proceedings of the National Academy of Sciences USA* 90(1993) 8424 – 8428

NERI, Demetrio, "La Ricerca sulle Cellule Staminali tra Etica e Politica" in *Bioetica Rivista Interdisciplinare* 11 (2003) 50 – 66

NISHIMURA, Fumihiro, et all., "Potential Use of Embryonic Stem Cell for the Treatment of Mouse Parkinsonian Model: Improved Behavior by

Transplantation of In Vitro Differentiated Dopaminergic Neurons from Embryonic Stem Cell", in *Stem Cell* 21(2003)171 – 180

NOVELLI, Giuseppe, "Le Cellule Staminali Quali Vettori di Terapia Genica", in *Bioetica Rivista Interdisciplinare* 11 (2003) 19 – 26

OFFICE OF THE PRESS SECRETARY THE WHITE HOUSE, "Fact Sheet: Embryonic Stem Cell Research" in *The National Catholic Bioethics Quarterly* Spring (2002) 145 – 147

ONISHI, Akira, et all., "Pig Cloning by Microinjection of Fetal Fibroblast Nuclei", in *Science* 289(2000) 1188-1190

OUTKA, Gene, "The Ethics of Human Stem Cell Research" in *Kennedy Institute of Ethics Journal* 12 (2002) 175 – 213

PALAZZANI, Laura, "La Clonazione sull'Uomo: Una Recente Questione Bioetica e Biogiuridica", in *Rivista internazionale di filosofia del diritto*, 74 (1997) 461 – 467

-----, "L'uomo e le Frontiere della Genetica: la Questione della Clonazione", in *La Famiglia* 31 (1997)5 – 16

PANICOLA, Michael R., "Three Views on the Preimplantation Embryo" in *The National Catholic Bioethics Quarterly* Spring (2002) 69 – 97

PARDO, A. "La Clonazione Umana" in *Dolentium Hominum* 12 (1997)3, 28 – 31

PEARSON, Helen, "Your Destiny, From Day One", in *Nature* 418 (2002) 14 – 15

PESSINA, Adriano, "Il Controllo Eugenetico. La Clonazione Umana Tra Desiderio e Sperimentazione", in *Vita e Pensiero* 81 (1998) 163 – 175

PIAZZA, Alberto, "La Clonazione Umana a Fini Riprodutivi: Perche la Mozione dei Comitato Nazionale per la Bioetica Suscita Qualche Perplessitá?" in *Bioetica Rivista Interdisciplinare* 11 (2003) 113 – 118

PIOTROWSKA, K. et al., « Blastomeres Arising from the First Cleavage Division Have Distinguishable Fates in Normal Mouse Development", in *Journal in Science and Medicine* 128(2001)19

PONNURU, Ramesh, "Cloning and Eugenics", in *The Human Life Review* 28 (2002) 109 – 118

POTTER, Van Rensselaer, "Bioethics: The Science of Survival" in *Perspective in Biology and Medicine* 14 (1970) 120 – 153

RENNE, John, "Una Conversazione con James D. Watson", in *Le Scienze* (Dossier) 15(2003)5 – 7

RICCI, Mariella Lombardi, "La Clonazione: il Fatto e il Significato" in *Rivista di Teologia Morale* 114 (1999) 221 – 232

ROBERTSON, John A. - Jeffrey P. Khan - John E. Wagner, "Conception to Obtain Hematopoietic Stem Cells" in *Hastings Center Report* 32 (2002) 34 – 40

ROGGERS, J. G., S. M. Voullaire - H. Gold, « Monozygotic Twins Discordant for Trisomy 21", in *American Journal of Human Genetics* 11(1982) 143 – 146

RUBENSTEIN, Donald S. - David C. Thomasma - Eric A. Schon - Michael J. Zinaman, "Germ-Line Therapy to cure Mitochondrial Disease: Protocol and Ethics of In Vitro Ovum Nuclear Transplantation" in *Cambridge Quarterly of Healthcare Ethics* 4 (1995) 316 – 339

SANTOSUOSSO, Amedeo, "Individui, Diritti, Cellule nella Ricerca sulle Cellule Staminali Embrionali" in *Bioetica. Rivista Interdisciplinare* 8(2000) 685 - 693

SCHNIEKE, A. E. et al., "Human Factor IX Transgenic Sheep Produced by Transfer of Nuclei from Transfected Foetal Fibroblast", in *Science* 278(1997)2038 – 2039

SCHWARTZ, C. E. - S. M. Sauer, "Detection of DNA Fingerprint Differences in Monozygotic Twins Discordant fro the Proteus Syndrome" in *Cytogenetics and Cell Genetics* 51(1989) 1075

SERRA, Angelo, "La Clonazione Umana in Prospettiva Sapienziale" in *La Civiltà Cattolica* 149 (1998) 329 – 339

-----, "L'Embrione Umano 'Cumulo di Cellule ' o 'Individuo Umano '? in La Civiltà Cattolica 3616(2001)348 - 362

-----, "La Sperimentazione sull'Embrione Umano: Un Dibattito fra Scienza ed Etica", in *La Civiltà Cattolica* 2(1988) 435 – 449

-----, "L'Embrione Umano <<Cumulo di Cellule>> o <<Individuo Umano>>", in *La Civiltà Cattolica* 152(2001) 348 – 362

-----, "Verso Clonazione dell'Uomo?", in *La Civiltà Cattolica* 3543 (1998) 224 – 234

-----, "La Rivoluzione Gnomica: Conquista, Attese e Rischi", in *La Civiltà Cattolica* 2 (2001) 439 – 453

-----, "L'embrione Umano: Prezioso Strumento Tecnologico?", in *La Civiltà Cattolica* 3636(2001)552 – 565

SCHNIEKE A. E., "Human Factor IX Transgenic Sheep Produced by Transfer of Nuclei from Transfected Foetal Fibroblasts" in *Science* 278(1997) 2038 – 2039

SGRECCIA, Elio - Angelo Fiori, "La Clonazione" in *Medicina e Morale* 47(1997) 229 - 239

SHALEV, Carmel, "Human Cloning and Human Rights: A Comentary" in *Health and Human Rights* 6(2002) 137 - 151

SHAMBLOTT, M.J., et all., "Derivation of Pluripotent Stem Cells from Cultured Human Primordial Germ Cells." *Proceedings of the National Academy of Sciences USA* 95(1998) 13726–13731

SHANNON, Thomas A., "Ethical Issues in Genetics" in *Theological Studies* 60 (1999) 111 – 134

SHATOS, M. A. et all, "Multipotent Stem Cells from the Brain and Retina of Green Mice", in *The Journal of Regenerative Medicine* 2(2001) 13 – 14

SHIELS, Paul G. - Alexander J. Kind - Keith H. S. Campbell - David Waddington - Ian Wilmut - Alan Colman - Angelika E. Schnieke "Analysis of Telomere Lengths in cloned Sheep" in *Nature* 399(1999)316 – 317

SINISCALCHI. Giovanni, "La Doppia Elica", in *Newton* 4 (April 2003) 62 – 66

SMITH, Wesley J., "Close Door on Cloning" in *The Human Life Review* 28 (2002) 132 – 141

SORIA, B., E. Roche, G. Berna, T. Leon-Quinto, J. A. Reig, F.Martin, "Insulin Secreting Cells Derived from Embryonic Stem Cells Normalize Glicemia in Streptozotocin-induced Diabetic Mice," in *Diabetes* 49(2000) 157 – 162

STEPTOE, P. C. - R. G. Edwards, "Birth After the Reimplantation of a Human Embryo" in *Lancet* 2(1978)366

STEPTOE, P. C., R. G. Edwards, J. M. Purdy, "Human Blastocysts Grown in Culture", in *Nature* 229(1971) 132 – 133

SUADEAU, J., "A Propos de la Recénte Discussion sur le Clonage. Faits et Perspectives" in *Revue d'éthique et de théologie Moral* 205(1998) 25 – 64

TARELLA, Corrado - Irene Ricca, "Cellule Staminali Multipotenti e Progenitori Commissionati del Sistema Emopoietico: Funzioni, Capacitá di Automantenimento e Possibili Impieghi Terapeutici" in in *Bioetica Rivista Interdisciplinare* 11 (2003) 772 – 794

TAUER, Carol A., "Symposium Human Primordial Stem Cell: Private Ethics Boards and Public Debate", in Hastings Center Report 29(1999) 43 – 45

THE VATICAN PRESS OFFICE THE HOLY SEE, "Condemnation of the First Human Cloning" in *The National Catholic Bioethics Quarterly* Spring (2002) 143 – 144

THOMSON, J. A., et all., "Embryonic Stem Cell Lines Derived from Human Blastocysts" in *Science* 282(1998)1145–1147

THOMSON, James. A. - J. Kalishman - T.G. Golos - M. Durning - C.P. Harris - R.A. Becker - J.P. Hearn "Isolation of a Primate Embryonic Stem Cell Line" in *Proceedings of the National Academy of Sciences USA* 92(1995) 7844 – 7848

THOMSON, James A. - J. Kalishman - T.G. Golos - M. Durning - C.P. Harris - J.P. Hearn "Pluripotent Cell Lines Derived from Common Marmoset (*Callithrix jacchus*) Blastocysts" in *Biology and Reproduction* 55 (1996) 254 – 259

THOMSON, J.A. - V.S. MARSHALL "Primate Embryonic Stem Cells." *Current Topics in Developmental Biology* 38(1998)133–165.

TRUJILLO, Alfonso López, "Clonazione: Scomparsa della Genitorialità e Negazione della Famiglia" in *L'Osservatore Romano* 9 Agosto 2003, page 6 – 7

UNHCHR'S EXPERT GROUP ON HUMAN RIGHTS AND BIOTECHNOLOGY, "Expert Group on Human Rights and Biotechnology Convened by the UN High Commissioner for Human Rights: Conclusion on Human Reproductive Cloning", in *Health and Human Rights* 6(2002) 153 - 159

VAAS, Alex, "US Scientists Clone First Human Embryo", in *British Medical Journal* 323(2001) 1267

VAN GEND, David, "Keep Stem Cells Adult-only" in *The Human Life Review* 28 (2002) 129 – 131

VELEZ, Juan R., "Why Respect for the Human Embryo?" in *Linacre Quarterly* 69 (2002) 316 – 337

VARSPIEREN, Patrick, "La Clonazione Umana e i Suoi Problemi", in *La Civiltà Cattolica* 150(1999) 453 - 465

VÁSQUEZ, R., "Si Può Giustificare Eticamente la Clonazione Umana?", in *Bioetica. Rivista Interdisciplinare* 8(2000) 712 – 722

WAKAYAMA, T., A. C. F. Perry, M. Zuccotti, K. R. Johnson, R. Yanagimachi "Full-Term Development of Mice from Enucleated Oocytes Injected with Cumulus Cell Nuclei" in *Nature* 394 (1998) 369 – 374

WAKAYAMA, T. - R. Yanagimachi, "Cloning of Male Mice from Adult Tail-tip Cells", in *Nature Genetics* 22(1999) 127 - 128

WAKAYAMA, Teruhiko et. Al, "Cloning of Mice to Six Generations", in *Nature* 407(2000) 318 – 319

WATT, Helen, "A Brief Defense of Frozen Embryo Adoption" in *The National Catholic Bioethics Quarterly* 1(2001) 151 – 154

WHEELER, M.B. "Development and Validation of Swine Embryonic Stem Cells: A Review" in *Reproduction, Fertility, and Development* 6(1994) 563 – 568

WHITE, Gladys B., "Symposium Human Primordial Stem Cell: Foresight, Insight, Oversight" in Hastings Center Report 29(1999) 41 - 42

WILMUT, Ian - A.E. Schnieke - J. McWhir - Keith H. Campbell, "Viable Offspring Derived from Fetal and Adult Mammalian Cells", in *Nature* 385(1997) 810 – 813

WHITTINGHAM, D.G., "Fertilization of Mouse Eggs in Vitro", in *Nature* 220 (1968) 592 – 593

WILLADSEN, Steen M., "A Method for Culture of Micromanipulated Sheep Embryos and its Use to Produce Monozygotic twins", in *Nature* 277(1979) 165 – 172

-----, "Nuclear Transplantation in Sheep Embryos", in *Nature* 320(1986) 63 - 65

WOLF, Susan M., "Ban Cloning? Why NBAC is Wrong" in *Hastings Center Report* 27 (1997) 12 – 15

YAMASHITA, J., et all., "Flk1-positive Cells Derived from Embryonic Stem Cells Serve as Vascular Progenitors", in *Nature 408* (2000)92 – 96

II. EMBRYOLOGY AND REPRODUCTION

A. Books on Embryology and Reproduction

ANGELA, Piero - Alberto Angela, *La Staordinaria Avventura di Una Vita che Nasce: Nove Mesi nel Venire Materno*, Oscar Mondadori, Milano, 1996

ARAMINI, Michele, *La Fecondazione Artificiale: Che Cosa Dice la Legge e Che Cosa Insegna la Chiesa,* Portalupi, Casale Monferrato, 2004

ARAMINI, Michele, *La Procreazione Assistita: Scoprire il Senso di un Nuovo Modo di Nascere*, Paoline, Milano, 1999

ASTREI, Gianni - Antonella Bevere, *Via Prenatale e Sviluppo della Personalità*, Cantagalli, Siena, 2003

AZZONE, Giovanni Felice, *Biologia e Medicina: Tra Molecule, Informazione e Storia*, Laterza, Bari, 1991

BAGGALEY, Ann, *Human Body: An Illustrated Guide :o Every Part of the Human Body and How It Works*, Dorling Kindersley Limited, London, 2001

BENTLEY, Gillian R. - C.G. Nicholas Mascie-Taylor, *Infertility in the Modern World: Present and Future Prospects*, Cambridge University Press, Cambridge, 2000

BLÁZQUEZ, Niceto, *Bioética: La Nueva Ciencia de la Vida*, Biblioteca de Autores Cristianos, Madrid, 2000

BOCCIA, Maria Luisa - Grazia Zuffa, *L'Eclissi della Madre: Fecondazione Artificiale Tecniche, Fantasie e Norme*, Pratiche Editrice, Milano, 1998

BONCINELLI, Edoardo, *Io sono, tu sei. L'identità e la differenza negli uomini e in natura*, Mondadori, Milano, 2002

BONDESON, William B. - H. Tritram Engelhardt, *Abortion and the Status of the Fetus*, Kluwer Academic Publisher, Dordrecht, 1983

BOSS, Judith A., *The Birth Lottery: Prenatal Diagnosis and Selective Abortion*, Loyola University Press, Chicago, 1993

BOURGUET, Vincent, *L'Être en Gestation: Réflexions Bioétiques sur l'embryon Humain*, Presses de la Renaissance, Paris, 1999

BRODY, Baruch, *Abortion and the Sanctity of Human Life: A Philosophical View*, MIT Press, Massachusetts, 1975

BROWN, Hugh, - Kristine Gibbs, *Pre-Conceived Ideas: A Christian Perspective of IVF and Embryology*, The Church of Scotland, Edinburg, 1996

CAPRILE, Giovanni, *Non Ucidere: Il Magistero della Chiesa sull'Aborto*, La Civilta Cattolica, Roma, 1973

CARREL, Alexis, *Riflessioni sulla Condotta della Vita*, Cantagalli, Siena, 2004

CASCONE, Mario, *Maschio e Femmina Li Creò*, Edizioni Rinnovamento nello Spirito Santo, Roma, 2001

CATTORINI, Paolo, Emilio D'Orazio, Valerio Pocar, *Bioetiche in Dialogo: La Dignità della Vita Umana, l'autonomia degli individui*, Zadig, Milano, 1999

CENTRO DI BIOETICA E DIRITTI UMANI, *I Diritti del Nascituro e la Procreazione Artificiale*, Libreria Editrice Vaticana, Vaticano, 1995

CHANNER, John Hugh (ed), *Abortion and the Sanctity of Human Life*, Paternoster Press, Devon, 1985

CICCONE, Lino, *La Vita Umana: Euthanasia, Aborto, legge civille*, Ares, Milano, 2000

COLONNELLO, Pio, - Roberto Gallinaro - Pasquale Giustiniani, *L'Albero della Vita: Bioetecnologie tra Fede e Scienza*, Campania Notizie, Napoli, 2002

CONCETTI, Gino, *La Fecondazione Medicalmente Assitita*, Vivere In, Roma, 1999

----, *Le Gemelline Siamesi: Separarle o Non Separarle*, Vivere In, Roma, 2001

----, *L'embrione uno di noi: Riflessione Etico-Giuridica*, Vivere in, Roma, 1997

CORREA, Juan de Dios Vial - Elio Sgreccia, *Identity and Statute of Human Embryo: Proceedings of Third Assembly of the Pontifical Academy for Life*, Libreria Editrice Vaticana, Vatican, 1998

DAVIS, Dena S., *Genetic Dilemmas: Reproductive Technology, Parental Choices, and Children's Future*, Routledge, New York, 2001

DI PIETRO, Maria Luisa - Elio Sgreccia, *Bioetica ed Educazione: Fondamenti ed Eticadella Vita Nascente*, Editrice La Scuola, Brescia, 1997

-----, *Interogativi per la Bioetica: Nuova Genetica, Identità Sessuale, AIDS*, Editrice la Scuola, Brescia, 1998

-----, *La Trasmissione della Vita nell'Insegnamento di Giovanni Paolo II*, Vita e Pensiero, Milano, 1989

-----, *Procreazione Assistita e Fecondazione Artificiale: Tra Scienza, Bioetica e Diritto*, La Scuola, Brescia, 1999

DUFFY, Regis - Angelus Gambatese, *Made in God's Immage: The Catholic Vision of Human Dignity*, Paulist Press, Mahwah, 1999

DWORKIN, Ronald, *Life's Dominion: An Argument about Abortion and Euthanasia*, Harper Collins Publisher, London, 1995

DWYER, John C., *Son of Man and Son of God: A New Language for Faith*, Paulist Press, New York, 1983

DYSON, Anthony, *The Ethics of IVF*. Mowbay, London, 1995

DYSON, Anthony - John Harris, *Experiments on Embryos*, Routledge, London, 1990

FINZI, Silvia Vegetti, *Volere un Viglio: La Nuova Maternità fra Natura e Scienza*, Arnoldo Mondadori, Milano, 1999

FLAMIGNI, Carlo, *Avere un Bambino: Come Inizia una vita: dal concepimento al Parto*, Mondadori, Milano, 2001

FLAMIGNI, Carlo, *La Procreazione Assistita: Fertilità e Sterilità tra Scienza Medica e Considerazioni Bioetiche*, Il Mulino, Bologna, 2002

FORD, Norman M., *The Prenatal Person: Ethics from Conception to Birth*, Blackwell Publishing, Oxford, 2002

-----, *When did I Begin?: Conception of the Human Individual in History, Philosophy and Science*, Cambridge University Press, Cambridge, 1991

FRYDMAN, René, *Dieu, La Médecine et L'embryon*, Editions Odile Jacob, Paris, 1997

FURTON, Edward J. (ed.), *What is Man, O Lord?: The Human Person in a Biotech Age*, The National Catholic Bioethics Center, Boston, 2002

FURTON, Edward J., *Respect for the Human Embryo*, The National Catholic Bioethics Quarterly, Boston, 2001

GARRONE, Giuseppe, *Ma questo è un figlio?: Testimoanze di Donne Vittime del'aborto*, Gribaudi, Milano, 1998

-----, *Fecondazione Extra Corporea: Pro o Contra L'Uomo*, Grabaudi, Milano, 2001

GIANNONI, Paolo, *La Creazione: Oltre l'antropocentrismo?*, Edizione Messaggero Padova, Padova, 1993

GIBELINI, Rosino, *Il Dibattito sulla Dignità Umana*, Queriniana, Brescia, 2003

GOGLIA, Gennaro, *Embriologia Umana*, Piccin, Padova, 1997

GOSDEN, Roger, *Designing Babies: The Brave New World of Reproductive Technology*, W.H. Freeman and Company, New York, 1999

GRECO, Ermanno, *Genitori in Provetta: Le Certezze, i Confini e Limiti Normativi della Fecondazione in Vitro in Italia e nel Mond*, L'Airone Editrice, Roma, 2003

HARRIS, John, - SØren Holm, *The Future of Human reproduction: Ethics, Choice, and Regulation*, Clarendon Press, Oxford, 1998

HATCHER, Robert A. - Ward Rinehart, *The Essentials of Contraceptive Technology: A Handbook for Clinic Staff*, John Hopkins Population Information Program, Baltimore, 1997

HEANEY, Stephen J. (ed), *Abortion: A New Generation of Catholic Responses*, The Pope John Cenier, Braintree, 1992

INNOCENTI, Tony Andrés, *La Contraccezione: Per un Amore Libero e Responsabile*, Loggia de Lanzi, Firenze, 1998

KEARNEY, Brian, *High-tech Conception: A Comprehensive Hand Book for Consumers*, Bantam Book, New York, 1998

KILNER, John F. - Paige C. Cunningham - W. David Hager, *The Reproduction Revolution: A Christian Appraisal of Sexuality, Reproductive Technologies, and the Family*, William B. Eerdmans, Grand Rapids, 2000

KUSMARYANTO, Carolus B., *Kontroversi Aborsi*, Grasindo, Jakarta, 2002

LARCHET, Jean-Claude, *Pour Une éthique de la Procréation: Éléments d'Anthropologie Patristique*, Cerf, Paris, 1998

LAURICELLA, Emmanuelle, *La Riproduzione della Specie Umana: Sessualità, controllo delle Nascite, Fecondazione Artifialle*, Editori Riuniti, Roma, 1986

LEE, Patrick, *Abortion and Unborn Human Life*, The Catholic University of America Press, Washington DC, 1996

LEE, Robert - Derek Morgan, *Birth right: Law and Ethics at the Beginning of Life*, Routledge, London, 1995

LEJEUNE, Jérôme, *The Concentration can: When does Human Life Begin? An Eminent Geneticist Testifies*, Ignatius Press, San Frabcisco, 1992

LEJEUNE, Jérôme, *L'Embrione Segno di Contraddizione: Dai Verbali del Processo di Maryville*, Edizione Orizzonte Medico, Roma, 1992

LONG, Franca, *Procreazione Medicalmente Assistita*, Claudiana, Torino, 1999

MATTHEEUWS. Alain, *Les Origines de la Vie: Quelques Repères Bioéthiques*, éditions Mame, Paris, 1997

MAZZONI (ED), Aldo, *A Sua Immagine e Somiglianza?: Il Volto dell'uomo alle soglie del 2000. Un Approccio Bioetico*, Città Nuova, Roma, 1997

MCCARTHY, Donald G. (ed), *Reproductive Technologies, Marriage and the Church*, The Pope John Center, Braintree, 1988

MCCARTNEY, James J., *Unborn Persons: Pope John Pauls II and the Abortion Debate*, Peter Lang, New York, 1987

MCCULLAGH, Peter, *The Foetus as Transplant Donor: Scientific, Social and Ethical Perspectives*, John Wiley & Sons, Chichester, 1987

MELANÇON, Louise, *L'Avortement dans une Société Pluraliste*, éditiones Paulines, Montréal, 1993

MONTEBELLI, Antonio, *Procreazione Responsabile: Guida ai metodi naturali*, Città Nuova, Roma, 1992

MOORE, Keith L. - T.V.N. Persaud, *The Developing Human: Clinically Oriented Embryology* (7th), Saunders, Philadelphia, 2003

MORI, Maurizio, *La Fecondazione Artificiale: Una Nuova Forma di Riproduzione Umana*, Laterza, Bari, 1995

MOROWITZ, Harold J. - James S. Trefil, *The Facts of Life: Science and the Abortion Controversy*, Oxford University Press, New York, 1992

NICHOLSON, Susan T., *Abortion and the Roman Catholic Church*, Religious Ethics Inc., Knoxwille, 1978

NILSON, Lennart - Lars Hamberger, *Diventare Genitori*, San Paolo, Cinisello Balsamo, 2000

NOBLE, Denis - Jean-Didier Vincent, *The Ethics of Life*, Unesco Publishing, Paris, 1997

NOONAN, John T., *Contraception: A History of its treatment by the Catholic theologian and Canonist*, Harvard University Press, Cambidge, 1986

O'MAHONY, Patrick, *A Question of Life: Its Beginning and Transmission*, Sheed & Ward, London, 1990

ORLANDI, Alfredo, *Una Bioetica per l'uomo: Aborto, manipulazioni genetiche, euthanasia, donaz*, Elle Di Ci, Leumann, 1995

PALMARO, Mario, *Ma Questo è un Uomo: Indagine Storica, Politica, Etica, Giuridica sul Concepito*, San Paolo, Ciniselo Balsamo, 1996

PELLEGRINO, Edmund D. - John Collins Harvey (eds), *Gift of Life: Catholic Scholars Response to the Vatican Instruct*, Georgetown University Press, Washington D.C., 1990

PETRINOVICH, Lewis, *Human Evolution, Reproduction, and Morality*, MIT Press, Massachusetts, 1998

POLJMAN, Louis P. - Francis J. Beckwith, *The Abortion Controversy: A Reader*, Jones and Barlett, Boston, 1994

REIMAN, Jeffrey, *Abortion and the Ways We Value Human Life*, Rowman & Littlefield Publishers, Inc., Lanham, 1999

RHONHEIMER, Martin, *Etica della Procreazione: Contraccezione, Fecondazione Artificiale, Aborto*, Pontificia Università Lateranense, Roma, 2000

RIGUTI, Adriana, *Gravidanza: Atlanti Scientifici Giunti*, Giunti, Firenze, 1994

-----, *Puericultura: Atlanti Scientifici Giunti*, Giunti, Firenze, 1996

ROBERTS, Melinda A., *Child Vs Childmaker: Future Persons and Present Duties in Ethics and the Law*, Rowman & Littlefield Publishers, Lanham, 1998

ROBERTSON, John A., *Children of Choice: Freedom and the New Reproductive Technologies*, Princeton University Press, Princeton, 1994

ROSENBLATT, Roger, *Life Itself: Abortion in the American Mind*, Vintage Books, New York, 1992

RUSSO, Giovanni, *Bioetica della Sessualità, della Vita Nascente e Pediatrica*, Elledici, Leumann, 1999

SADLER, T. W., *Medical Embryology*, Wiiliams & Wilkins, Baltimore, 1995

SANDRI, Luigi, *Humanae Vitae e Magistero Episcopale*, EDB, Bologna, 1969

SARDI, Paolo, *L'Aborto Ierie Oggi*, Paideia Editrice, Brescia, 1975

SARTI, Paolo - Giuseppe Sparnacci, *Gravidanza e Puericultura: Guida Completa dan Concepimento ai Sei Anni*, Giunti, Firenze, 2003

SCHLOSSBERG, Terry - Elizabeth Achtemier, *Not My Own: Abortion & the Mark of the Church*, William B. Eerdmans, Grand Rapids, 1995

SCHOOYANS, Michel, *Aborto e Politica,* Libreria Editrice Vaticana, Città del Vaticano, 1991

SCHWARZ, Stephen D., *The Moral Question of Abortion,* Loyola University Press, Chicago, 1990

SCHWEITZER, Albert, *Rispetto per la Vita,* Fabri Editori, Milano, 1997

SCOLA, Angelo (ed), *Quale Vita?: La Bioetica in Questione*, Mondadori, Milano, 1998

SERRA, Angelo, *L'Uomo-Embrione: Il Grande Misconosciuto*, Cantagalli, Siena, 2003

SGRECCIA, Elio, *Il Dono della Vita,* Vita e Pensiero, Milano, 1987

SMITH, Janet E., *Why Humanae Vitae was Right: A Reader*, Ignatius, San Francisco, 1993

SMITH, Janet E., *Humanae Vitae: A Generation later*, Catholic University of America, Washington DC, 1991

SOLDINI, Maurizio, *Bioetica della Vita Nascente: In Puero Homo*, CIC Edizioni Internazionali, Roma, 2001

STRONG, Carson, *Ethics in Reproductive and Perinatal Medicine: A New Framework*, Yale University, London, 1997

SWEENEY, Lauren J., *Basic Concepts in Embryology: A Student's Survival Guide*, McGraw Hill, Inc, New York, 1998

SYMONDS, Malcom - Marion B. Macpherson, *Obstetrics and Gynecology,* Mosby - Wolfe, London, 1997

WARNOCK, Mary, *Making Babies: Is There a Right to Have Children*, Oxford University Press, Oxford, 2002

WILDES, Kevin WM. - Francesc Abel, *Birth, Suffering, and Death: Catholic Perspective at the Edges of Life*, Kluwer Academic Publisher, Dordrecht, 1992

WILLKE, Jack, and Barbara Willke, *Che ne sai dell'Aborto,* CIC Edizioni Internazionali, Roma, 1995

WINIKOFF, Beverly- Suzanne Wymelenberg, *Contraception: A Guide to Safe and Effective Choices*, Joseph Henry Press, Washington, 1997

WISTON, Robert, *Il Futuro della Riproduzione Assistita,* Garzanti Libri, Cernusco, 1999

B. Articles on Embryology and Reproduction

ALBERTACCI G. — Vetrugno G. — Dario Sacchini, "La maternità surrogata: Riflessioni medico - legali intema di tutela dell'embrione, del nascituro, delle due madri e della dignità della persona umana", in *Medicina e Morale* 50(2000) 261 – 318

ADORNO, Roberto, "The paradoxical notion of human dignity", in *Rivista Internazionale di Filosofia del diritto* 79(2001) 151 - 168

ANGELINI, G. "Rispetto della vita e idea della vita tra bioetica e teologia", in *Filosofia e Teologia*, 10(1996) 232 – 244

BARRAL-BARON, André, "Quel statut pour l'embryon?" in *Cahiers de Meylan* 2(2002) 51 – 53

BARRATT, Helen - Trevor Jackson, "Scions made simple", in *British Medical Journal* 323(2001) 406

BERTONE, Tarcisio, "I cattolici e la società pluralista, le leggi imperfette e la responsabilità dei legislatori", in *Medicina e Morale* 51(2001)431 – 455

BOMPIANI, Adriano et all., "La cosidetta riduzione embrionale sotto il profilo assitenziale ed etico", in *Medicina e Morale* 45(1995) 223 – 258

BOZZATO, G., "Quando inizia ad esistere l'essere umano?", in *Medicina e Morale* 49(1999) 77 - 93

CALABRÒ, Gian Pietro, "Diritto alla vita, principi costituzionali e interpretazioni per valori" in *Medicina e Morale* 47 (1997) 727 – 737

CALORIO Gian Pietro, "Riduzionismo e sperimentazione", in *Bioetica e Cultura* 9(2000) 91 – 100

CAMPBELL, Courtney S., "Prophecy and Policy" in *Hastings Center Report* 27(1997) 15 – 17

CANANZI, Raffaelle, "L'identità genetica" in *Studi Cattolici,* 42(1998) 606 - 607

CARRASCO DE PAULA, Ignacio, "Dignita e vita umana: due concetti fondamentali dell'etica medica", in *Medicina e morale* 45(1995) 433 – 444

CARRON, Pierre, "L'Aventure de la vie: de l'oeuf au foetus", in *Cahiers de Meylan* 2(2002) 9 – 11

CASAVOLA F.P. "Vita: Diritto alla vita & ricomposizione civile", in *Studi Cattolici* 45(2001) 772 – 775

CASCONE, Mario, "L'Inizio, la Fine e il Fine della Vita Umana" in *Synaxis* 16 (1998) 115 – 128

CASINI, Carlo, "Il diritto alla vita", in *Dolentium Hominum* 9(1994) 51 – 56

CASINI, Marina, "I Diritti dell'Uomo, la Bioetica, e l'Embrione Umano", in *Medicina e Morale* 53(2003) 67 – 109

COTTIER, Georges, "Distorted concept of Subjectivity contradicts Dignity of the Person", in *L'Osservatore Romano* (English) 25 October 1995, page 10

CATTORINI, Paolo, Massimo Reichlin, "L'idea di vita in bioetica", in *Filosofia e Teologia* 10(1996) 301 – 317

CATTORINI, Paolo, "Etica del morire: Dominio, amministrazione, speranza di vita. Un'ipotesi di studio", in *Rivista di Teologia Morale* 135(2002)413 - 425

CIOFFI, Alfred, "Early human embryonis development: individuation before implantation", in *The Linacre Quarterly* 62(1995) 70 - 73

CIPRESSA, Salvatore, "Procreazione artificiale e rispetto dell'embrione umano," in *Rivista di Teologia Morale*, 109(1996), 111 - 116

COLOMBO, Roberto, "La natura e lo statuto dell'embrione umano" in *Anime e corpi* 35(1997) 785 – 792

-----, "La natura e lo statuto dell'embrione umano" in *Medicina e morale* 47(1997)4, 761 – 767

-----, "Statuto biologico e statuto ontologico dell'embrione e del feto umano", in *Anthropotes* 12(1996) 133 - 162

COMPAGNONI, Francesco, "Uno come noi: l'embrione umano", in *Anime e corpi* 34(1996) 395 – 398

COZZOLI, Mauro, "La verità della vita. Il valore uno e unico della vita umana", in *Rivista di Teologia Morale* 134(2002) 231 – 242

CULTRERA, F., "La Bioetica, anuncio del Vangelo", in *La Civiltà Cattolica* 152(2001)254 - 262

D'AGOSTINO, Francesco, "Il diritto e la salvezza della vita", in *Rivista Internazionale di Filosofia del diritto* 77(2000) 153 –160

DE GUIDI, Serio, "La vita si fa conoscere, perciò dobbiamo ri-conoscerla: Precisazioni lessicografiche sul termine "vita" e la vita si è fatta visibile", in *Rivista di Teologia Morale* 135(2002)403 - 411

DE PAULA, Ignazio Carrasco, "Dignità e vita umana: due concetti fondamentali dell'etica medica" in *Medicina e Morale* 45(1995) 213 – 222

DONCEEL, Joseph F., "Immediate Animation and Delayed Hominization", in *Theological Studies* 31 (1970) 76 – 100

DOYLE, John, "Reflections on persons in petri dishes" in *The Linacre Quarterly* 64(1997)62 - 76

DUMAINE, Pierre - Gerald D. Coleman, "Reproductive technologies: ethical implications", in *The Linacre Quarterly* 63(1996)25 – 43

EDITORIALE, "La Donazione di embrione" in *Medicina e Morale* 46(1996) 1053 – 1056

-----, "Galileo Galilei, l'embrione e la bioetica", in *Medicina e Morale* 50(2000) 845 – 850

EDWARD, R. G. - B. D. Bavister, "Early Stages of Fertilization in Vitro of Human Oocytes Matured in Vitro", in *Nature* 221(1969) 632 - 635

EDWARDS, R. G. - P. C. Steptoe - J. M. Purdy, "Fertilization and cleavage in vitro of preovulation human oocytes", in *Nature* 227(1970)307 – 309

EIJK, Willem J., "Some Remarks Concerning the Embryos Bill of the Dutch Government" in *Medicina e Morale* 6(2001) 1059 – 796

ERMINI, Massimo, "La vita e la qualità di vità" in *Rivista di Teologia Morale* 129(2001) 87 – 96

FAGGIONI, Maurizio, "Embrioni congelati" in *Studia Moralia* 34(1996) 351 – 387

FAVRAUX, P., "L'Embryon, personne humaine dès la conception. À propos d'undébat éthique", in *Nouvelle Revue Théologique* 126(1994) 201 – 217

FIGUEIREDO, Fernando A., "Human Beings are Merely Stewardess and not Lords Who Can Dispose of Life at Will" in *L'Osservatore Romano* (English) 15 November 1995, page 10

FLETCHER, Joseph, "Ethical Aspects of Genetic Controls" in *New England Journal of Medicine* 285(1971)776 – 783

FOLSCHEID, Dominique, "The Status of the Embryo from a Christian Perspective" in *Studies in Christian Ethics* 9(1996) 16 – 21

FORD, Norman, "L'embrione umano come persona nel magistero cattolico", in *Rivista di Teologia Morale* 133(2002) 77 – 85

FORD, Norman, "The Human Embryo as Person in Catholic Teaching", in *The National Catholic Bioethics Quarterly* 1(2001) 155 – 160

FRANKEL, Marks S., "Inheritable Genetic Modification and a Brave New World: Did Huxley Have It Wrong?" in *Hastings Center Report* 33 (2003) 31 – 36

GERMAN, L G., "The beginning of individual human life", in *The Linacre Quarterly* 64(1997) 94 – 95

GHIDELLI, C., "Padri e madri, secondo natura e grazia", in *La Famiglia* 35(2001)7 – 14. 71 - 79

GIUNCHEDI, Franco, "Considerazioni sullo statuto embrionario" in *Rassegna di Teologia* 34(1993) 62 – 76

HASELTINE, William A., "Regenerative Medicine 2003: An Overview", in *The Journal of Regenerative Medicine* 4(February 28, 2003) 15

HELLEGERS, Andre, "Fetal development", in *Theological Studies* 31(1970) 3 – 9

IACOBELLI, P., "L'inizio della vita umana", in *Bioetica e Cultura* 11(2001)61 – 90

IOZZIO, Mary Jo, "It is Time to Support Embryo Adoption" in *The National Catholic Bioethics Quarterly* 2(2002) 585 – 593

IRVING, Dianne N., "New Age Embryology Text Books: Implications for Fetal Research", in *The Linacre Quarterly* 61 (1994) 42 – 62

-----, "Testimony before the NIH human embryo research panel", in *The Linacre Quarterly* 61(1994) 82 – 89

JONES, Howard W., "And Just What is a Preembryo?" in *Fertility and Sterility* 52(1991)189 – 191

KISCHER, C Ward, "A contemporary on the beginning of life: A View from human embryology", in *The Linacre Quarterly* 63(1996) 73 – 77

-----, "The big lie in human embryology: the case of the preembryo", in *The Linacre quarterly* 64/1997) 53 - 61

KOWALSKI, E., "Bioetica e tutela della persona" in *Studia Moralia* 37(1999), 215 – 228

LAURENT, Philippe, "L'Unesco e la dichiarazione internazionale sul genoma umano", in *La Civiltà Cattolica* 1(1996) 49 – 58

LAURENT, Philippe, "L'Unesco e la dichiarazione internazionale sul genoma umano", in *La Civiltà Cattolica* 1(1997) 30 – 40

LEHMAN, Karl, "Il diritto di essere uomo", in *Il Regno/Attualita* 46(2001) 771 - 780

LEONE, Salvino, "La concezione della famiglia e le tecnologie riproduttive", in *Rivista di Teologia Morale* 132(2001) 535 – 547

LEONE, Salvino, "Alcune osservazioni a Norman Ford", in *Rivista di Teologia Morale* 133(2002)87 - 90

LOMBARDI RICCI, Mariella, "La vita umana: Evidenza e inevidenza di un concetto", in *Rivista di Teologia Morale* 25(1993) 109 - 114

-----, "Procreazione medicalmente assistita e genetica. Quale raporto?", in *Rivista di Teologia Morale* 126(2000), 223 - 244

LOSAPPIO, G., "La tuttela dell'embrione", in *Prospettiva Persona* 5(1996) 10 – 17

-----, "Tutela dell'identità genetica", in *Prospettiva Persona* 8(1999), 7 – 11

MANNO, Ambrogio Giaccomo, "Essere umano dal concepimento", in *Revista di Teologis Morale* 25(1993) 89 - 95

MARINELLI, M., Etica della biotecnologie. Clonando e clonando: note a margine degli eventi spettacolari della genetica", in *Anime e Corpi* 36(1999), 43 – 92

MARZANO PARISOLI M.M., "Corpo e diritto. Il concetto di dominium", in *Filosofia e Teologia* 4(2000) 603-616

MATTAI, Giuseppe, "Cultura della vita, Pace, Mediterraneo", in *Bioetica e Cultura* 5(1996) 89 – 94

MCCORMICK, Richard A., "Who or What is the Pre-embryo?" in *Kennedy Institute of Ethics* 1(1996) 1 – 15

MCGEE, Glenn - Arthur L. Caplan, "What's in the Dish?" in *Hastings Center Report* 29 (1999) 36 – 38

MCLAREN, Anne, "Embryo Research" in *Nature* 320(1986) 570

MELENSO GRANADOST, T., "Bioetica & dignità umana", in *Studi Cattolici* 44(2000) 473 - 474, 484-497

MIGLIETA, Guido, "Donum Vitae ten years later", in *Medicina e Morale* 48(1998) 909 - 934

MORDACCI, Roberto, "La Nozione di vita umana in bioetica", in *Rivista di Teologia Morale*, 111(1996) 391 – 402

MORI, Maurizio, "L'insolubile questione dell'identità dell'embrione", in *Rivista di Teologia Morale* 112(1996) 493 - 499

MORI, Maurizio - Mariella Lombardi Ricci, "Embrioni: A proposito di un intervento di M. Lombardi Ricci", in *Rivista di Teologia Morale* 117 (1998) 95 – 102

MURRAY, Thomas H., "What Are Families For? Getting to an Ethics of Reproductive Technology", in *Hastings Center Report* 32 (2002) 41 – 45

NERI, Giovanni, "Il genoma umano", in *Vita e Pensiero* 84(2001)263 - 271

PALAZZANI, Laura, "La legittimità di una legislazione bioetica" in *Rivista Internazionale di Filosofia del Diritto* 79(2001) 236 – 245

PARENS, Erik, "Tools from and for Democratic Deliberations" in Hastings Center Report 27 (1997) 20 – 22

PELLEGRINO, Edmund, "The human person, the physician, and the physician's ethics", in *The Linacre Quarterly* 62(1995)74 - 81

PERICO, G., "Lo statuto dell'embrione umano tra legge, scienza e bioetica", in *Aggiornamenti Sociali* 47(1996)3, 191 – 199

PESSINA, Adriano, "Bioetica e antropologia: Il problema dello statuto ontologico dell'embrione umano", in *Vita e Pensiero* 79(1996)6, 402 – 424

PETAGINE, A., "Vita/2. L'animazione ritardata secondo Tomasso", in *Studi Cattolici* 46(1999) 680 - 682

PIAZZA, Giovanni, "L'embrione è uno di noi?", in *Bioetica. Rivista interdisciplinare* 4(1996)3, 461 – 469

PINET, Janine, "Le premiers mois de la vie: Conférance du 31 Mars 1998 à la faculté", *Cahiers de la faculté libre de philosophie comparée*, 58(1998)1 - 42

PORTERS, Jean, "Delayed hominization" in *Theological Studies* 56(1995)743 – 770

PUCA, Antonio, "Ten Years on from the Warnock report: is the human embyo a person?", in *The Linacre Quarterly* 62(1995)75 – 87

REDI, Carlo Alberto - S. Garagna, "Come, da biologi, vediamo il problema dell'embrione?" in *Bioetica Rivista Interdisciplinare* 9(2001)357 - 360

REICHLIN, Massimo, "Lo statuto del'embrione: La prospettiva etica e il concetto di potenzialità" in *Rivista di Teologia Morale* 24(1992) 343 – 358

RICCI, Mariella Lombardi, "Procreazione Medicalmente Assistita e Genetica" in *Rivista di Teologia Morale* 126 (2000) 223 – 244

ROCCHI, Mario Paolo, "Il diritto del concepito" in *Studi Cattolici* 42(1998) 613 - 614

ROSSI, P., "Vita/2. Quando e fino a quando l'uomo è sostanza?", in *Studi Cattolici* 43(1999) 676 - 680

SALA, Roberta, "La Nozione di dignita della vita umana", in *Rivista di Teologia Morale*, 117(1998), 113 - 119

SALVI, M. "Paradossi biotecnologici: identità personale e genetica applicata", in *Bioetica. Rivista interdisciplinare* 5(1997)2, 171 – 192

SALVINI, G., "Una testimonianza su J. Maritain el il problema dell'embrione", in *Bioetica Rivista Interdisciplinare* 9(2001)366 – 367

-----, "L'embrione umano cumulo di cellule o individuo umano?" in *La Civiltà Cattolica* 152(2001) 348 - 362

SANTOSUOSSO, A., "Individui, diritti, cellule nella ricerca sulle cellule staminali embrionali", in *Bioetica. Rivista Interdisciplinare* 8(2000)4, 685 – 693

SCILIRONI, Carlo, "Il vivere umano: Riflessioni esistenziali", in *Rivista di Teologia Morale* 28(1996) 221 – 234

SERRA, Angelo, "La Riproduzione Medicalmente Assistita", in *La Civiltà Cattolica* III(1999)229

-----, "La Rivoluzione gnomica: conquista, attese e rischi", in *La Civiltà Cattolica* 2 (2001) 439 – 453

-----, "La Sperimentazione sull'embrione umano: Un dibattito fra scienza ed etica", in *La Civiltà Cattolica* 2(1988) 435 – 449

-----, "Le Biotecnologie e le attese dell'uomo", in *La Civiltà Cattolica* 2(199)16 – 30

-----, "L'Embrione umano <<cumulo di cellule>> o <<individuo umano>>", in *La Civiltà Cattolica* 152(2001) 348 – 362

-----, "Le Origine biologiche dell'uomo" in *La Civiltà Cattolica* 4(1998)16 - 30

-----, "Procreazione umana: la sfida tecnologica", in *Vita e Pensiero* 83(2000)6, 566 – 585

-----, "Riflessioni sulle Tecnologie di Riproduzione Assistita : a 21 Anni dalla Nascita della Prima Bambina Concepito in Vitro" in *Medicina e Morale* 49(1999) 861 – 883

SGARAMELLA, Vittorio, "Origine della Vita e Controllo dell'Evoluzione" in *Le Scienze, Dossier* 15 (2003)18

SGRECCIA, Elio, "I Limiti della scienza e l'educazione alla vita: l'apporto della bioetica", in *Vita e Pensiero* 79 (1996)10, 642 – 652

SIMONDS, Thomas Andrew, "Aquinas and Early Term Abortion", in *The Linacre Quarterly* 61(1994) 10 – 17

SPAGNOLO, Antonio - Maria Luisa di Pietro, "Bioetica clinica: Quale decicione per l'embrione in una gravidanza tubarica", in *Medicina e Morale* 45(1995)2, 285 – 310

TESTI, C: C., "Lo statuto dell'embrione umano in una prospettiva tomista", in *Bioetica. Rivista Interdisciplinare* 8(2000)3, 417 – 433

THOMSON, Judith Jarvis, "A Defense of Abortion", in *Philosophy and Public Affairs* 1(1971) 47 – 66

TOOLEY, Michael, "Abortion and Infanticide" in *Philosophy and Public Affairs* 2(1971) 37 – 65

VIANO, C. A. "L'embrione: Statuto e regole", in *Bioetica. Rivista interdisciplinare* 4(1997)3, 469 – 489

WADE, Nicholas, "Was She, or Wasn't She?" in *The Scientist* vol.17 No. 7 (2003) 72

WALKER, Vern R. "Presumptive personhood" in *The Linacre Quarterly* 45(1978)179 – 197

WATT, Helen, "The origin of humans", in *The Linacre Quarterly* 62(1995)36 - 46

WHELTON, Beverly, "On the beginning of human life", in *The Linacre Quarterly* 65(1998) 51 - 65

ZUCCARO, Cataldo, "La gravidanza: aspetti etici fondamentali", in *Rivista di Teologis Morale* 117(1998), 77 – 92

ZUCCARO, Cataldo, "La Vita Umana è Indisponibile?" in *Rassegna di Teologia* 39 (1998) 35 – 60

III. LITERATURE ON BIOETHICS IN GENERAL

A. Bible, Magisterium and Tradition

New Revised Standard Version: Catholic Edition, Geoffrey Chapman, London, 1993

CDF, *Instruction on Bioethics Respect for Human life, Donum Vitae*, St. Paul Books & Media, Boston, 1990

CDF, *Dichiarazione sull'aborto Procurato: Testo della Dichiarazione e Documenti degli Episcopati*, Libreria Editrice Vaticana, Vaticana, 1998

JOHN PAUL II, *The Theology of the Body: Human Love in the Divine Plan*, Paoline Books and Media, Boston, 1997

JOHN PAUL II, "Address to the International Congress on Transplants" in *The National Catholic Bioethics Quarterly* 1(2001) 89 – 92

JOHN PAUL II, "Remarks to President Bush on Stem Cell Research" in The National Catholic Bioethics Quarterly 4 (2001) 617 – 618

JOHN PAUL II, "Research Must Respect Human Dignity: Address of Pope John Paul II to Members of the Pontifical Academy for Life, November 20, 1995" in *The Pope Speaks* 41 (1995) 159 – 162

JOHN PAUL II, *The Gospel of Life, Evangelium Vitae*, St. Paul Books & Media, Boston, 1995 (Vatican Translation)

PIO XII, *Discorsi ai Medici*, Orizzonte Medico, Roma, 1959

PONTIFICIA ACADEMIA PRO VITA, *Declaration on the Production and the Scientific and Therapeutic use of human Embryonic Stem cell*, Libreria Editrice Vaticana, Città del Vaticano, 2000

PONTIFICIA ACADEMIA PRO VITA, *La Causa della Vita: Atti della Seconda Assemblea della Pontificia Accademia per la Vita sulla Enciclica "Evangelium Vitae*, Libreria Editrice Vaticana, Vatican, 1996

PONTIFICIA ACADEMIA PRO VITA, *Il Divieto della Clonazione nel Dibattito Internazionale: Aspetti Scientifici, Etici e Giuridici*, LEV, Città del Vaticano, 2003

PONTIFICIA ACADEMIA PRO VITÀ, *Identità e Statuto dell'Embrione Umano*, Libreria Editrice Vaticana, Vatican, 1995

PONTIFICIA ACCADEMIA PRO VITA, *Reflexions on Cloning*, Libreria Editrice Vaticana, Città del Vaticano, 1997

VERSPIEREN, Patrick (ed), *Biologia, Medicina ed Etica: Testi del Magistero Cattolico*, Queriniana, Brescia, 1990

THE CATHOLIC BISHOPS' JOINT COMMITTEE ON BIOETHICAL ISSUES, *Genetic Intervention on Human Subjects: The Report of a Working Party of the Catholic Bishops' Joint Committee on Bioethical Issue*, The Catholic Bisops' Joint Committee on Bioethical Issues, London, 1996

THE CATHOLIC HEALTH ASSOCIATION OF THE UNITED STATES, *Care of the Dying: A Catholic Perspective*, The Catholic Health Association of the United States, St. Louis, 1993

B. Dictionaries and Encyclopedias

-----, *Dizionario Medico*, La Biblioteca di Repubblica, Roma, 2004

-----, *Ramdom House Webster's College Dictionary: Electronic Dictionary and Thesaurus*, Reference Software International, 1992

----, *The American Heritage Dictionary* (3rd), Info Soft International, 1994

DUNCAN, A. S. - G.R. Dustan, *Dictionary of Medical Ethics*, Crossroad, New York, 1981

FERGUSSON, Rosalind - Elizabeth A. Martin (eds.), *Oxford Dictionary of Nursing*, Oxford, Oxford, 1998

HOTTOIS, Gilbert - Marie-Hélène Parizeau, *Les Mots de la Bioéthique: Un Vocabulaire Encyclopédique*, De Boeck Université, Bruxelles, 1993

LECALDANO, Eugenio, *Dizionario di Bioetica*, Editori Laterza, Roma, 2002

LEONE, Salvino - Salvatore Privitera, *Nuovo Dizionario di Bioetica*, Edizione ISB, Acireale, 2004

MANIERI, Massimo - Emanuele Giacon, *Nuova Enciclopedia della Salute*, Gruppo Editoriale L'Espresso, Roma, 2002

MARTIN, Elizabeth A. (ed.), *Oxford Concise Medical Dictionary*, Oxford, Oxford, 1998

MELDI, Diego, *Dizionario Medico*, Gulliver, San Casciano, 1999

PONTIFICIO CONSIGLIO PER LA FAMIGLIA, *Lexicon: Termini Ambigui e Discussi su Famiglia, Vita, e Questioni Etiche*, EDB, Bologna, 2003

REICH, Waren Thomas, *Encyclopedia of Bioethics*, Simon & Schuster and Prentice Hall International, New York, 1995

STERPELLONE, Luciano, *Dizionario dei Termini Medici più Comuni*, Tascabili Economici Newton, Roma, 1997

STERPELLONE, Luciano, *Dizionario Medico*, Newton & Compton Editori, Roma, 1999

TETTAMANZI, Dionigi - Marco Doldi, *Dizionario di Bioetica*, Piemme, Casale Monferrato, 2002

C. Bioethics

AGIUS, Emanuel et all, *The Sanctity of Life: Physical, Cultural and Religious Problems*, Armando Editore, Roma, 1994

-----, *The Quality of Life in the Mediterranean Countries*, Armando Editore, Roma, 1994

ANDORNO, Roberto, *La Bioéthique et la dignité de la personne*, Presses Universitaires de France, Paris, 1997

AQUINO, Maria Pilar - Dietmar Mieth, *Ritorno della Guerra Giusta?*, Queriniana, Brescia, 2001

ASHLEY, Benedict, *Theologies of the Body: Humanist and Christian*, The Pope John Center, Braintree, 1995

ASHLEY, Benedict M. - Kevin D. O'Rourker, *Healthcare Ethics: A Theological Analysis*, The Catholic Health Association of the US, St. Louis, 1989

ATTI DEI CONVEGNI LINCEI, *Bioetica e Tutela della Persona*, Accademia Nazionale Dei Lincei, Roma, 2000

AUBERT, Jean-Marie, *Compendio della Morale Cattolica*, Edizione Paoline, Cinisello Balsamo, 1991

----, *La Morale*, Editrice Queriniana, Brescia, 1993

AUTIERO, Antonio, *Temi di Bioetica: Nascere, Vivere, Morire*, Edizioni Dehoniane, Roma, 1990

BAINS, William, *Biotechnology from A to Z*, Oxford University Press, London, 1998

BAIXAULI, Vincente Muedra, *Anatomia Umana: Atlanti Universali Giunti*, Giunti, Firenze, 1999

BALDINI, Massimo, *Ippocrate: Aforismi e Giuramento*, Tascabili Economici Newton, Roma, 1994

BARNES, Jonathan, *The Complete Works of Aristotle: The Revised Oxford Translation* (Vol. 1 and 2), Princeton University Press, Princeton, 1995

BARRAGÁN, Javier Lozano, *Teologia e Medicina*, Edizione Dehoniane Bologna, Bologna, 2001

BASADONNA, Giorgio, *Alle Sorgenti della Morale*, Edizioni San Paolo, Cinisello Balsamo, 1998

BASTERA, Francisco Javier Elizari, *Bioethics*, St. Pauls, Middlegreen, 1994

BAYERTZ, Kurt, *Sanctity of Life and Human Dignity*, Kluwer Academic Publisher, Dordrecht, 1996

BEAUCHAMP, Tom L. - LeRoy Walters, *Contemporary Issues in Bioethics*, Wadsworth Publishing Company, Inc., Belmont, 1978

BEAUCHAMP, Tom L. - James F. Childress, *Principles of Biomedical Ethics*, Oxford University Press, Oxford, 1994

BELLINO, Francesco, *Bioetica e Qualità della Vita: Fondamenti*, Besa Editrice, Nardo, 1999

----, *La Storia della Bioetica e la Svolta Biopedagogica*, Cacucci Editori, Bari, 2001

-----,*Trattato di Bioetica*, Levante Editori, Bari, 1992

BERLINGUER, Giovanni, *Etica della Salute*, EST, Milano, 1997

BIAGI, Lorenzo - Renzo Pegoraro, *Religioni e Bioetica: Un confronto sugli inizi della vita*, Gregoriana Libreria Editrice, Padova, 1997

BLOCH, Ernst, *Natural Law and Human Dignity*, The MIT Press, Cambridge, 1996

BÖKLE, Franz, *Morale Fondamentale*, Queriniana, Brescia, 1985

BOMPIANI, Adriano, *Bioetica dalla parte dei Deboli*, EDB, Bologna, 1994

BOPP, James, *Human Life and Health Care Ethics*, University Publications of America, Frederick, 1985

BOURGOIS, Elisabeth, *La Bioéthique pour Tous*, Le Sarment, Saint-Amand-Montrond, 2001

BRODY, Baruch A., *The Ethics of Biomedical Research: An International Perspective*, Oxford University Press, Oxford, 1993

BROWN, Robert, *Bioethics Online: A Guide to Bioethical Resources on the Internet*, Writers Clup Press, San Jose, 2002

BRUSCO, Angelo - Sergio Pintor, *Sulle Orme di Cristo Medico: Manuale di Teologia Pastorale Sanitaria*, Edizione Dehoniane Bologna, Bologna, 1999

BULGER, Ruth Ellen - Elizabeth Heitman - Stanley Joel Reiser, *The Ethical Dimentions of the Biological and Health Sciences*, Cambridge University Press, Cambridge, 2002

BUSNELLI, Francesco Donato, *Bietica e Diritto Privato: Framenti di un Dizionario*, G. Giappichelli Editore, Torino, 2001

BYK, Christian, et all., *Le Mythe Bioéthique*, Editions Bassano, Paris, 1999

CAFFARA, Carlo, *Living in Christ: Fundamental Principles of Catholic Moral Teaching*, Ignatius Press, San Francisco, 1987

CAGLIANO, Stefano, *Viaggio Intorno alla Medicina: Progressi e Illusioni verso il Duemila*, Laterza, Bari, 1993

CAHILL, Lisa Sowle, *Love your Enemies: Discipleship, Pacifism, and Just War Theory*, Fortress Press, Minneapolis, 1994

-----, *Sesso, Genere, e Etica Cristiana*, Queriniana, Brescia, 2003

CAHILL, Lisa Sowle - Margaret A. Farley, *Embodiment, Morality, and Medicine*, Kluwer Academic Publishers, Dordrecht, 1995

CAHILL, Lisa Sowle - James F. Childress (eds.), *Christian Ethics: Problems and Prospects*, The Pilgrim Press, Cleveland, 1996

CALLAHAN, Daniel, *What Kind of Life: The Limits of Medical Progress*, Georgetown University, Washington DC, 1994

-----, *La Medicina Impossibile: Le Utopia e gli Errori della Medicina Moderna*, Baldini & Castoldi, Milano, 2000

CAMBARERI, Reginaldo G., *Scritti di Bioetica*, Edizioni Settecolori, Vibo Valentia 1992

CAMERON, Nigel M. De S., *The New Medicine: Life and Death After Hippocrates*, The Bioethics Press, Chicago, 2001

CAPLAN, Arthur L., *Am I My Brother's Keepers?: The Ethical Frontiers of Biomedicine*, Indiana University Press, Bloomington, 1997

-----, *If I were a Rich Man Could I Buy a Pancreas?: and Other Essays on the Ethics of Health Care*, Indiana University Press, Bloomington, 1992

CATALDO, Peter J. - Albert S. Moraczewski, *Catholic Health Care Ethics: A Manual for Ethics Committees*, The National Catholic Bioethics Center, Boston, 2002

CATTORINI, Paolo, *La Morte Offesa: Espropriazione del Morire ed Etica della Resistenza al Male*, Edizione Dehoniane Bologna, Bologna, 1996

CHAPMAN, Gretchen B. - Frank A. Sonnenberg, *Decision Making in Health Care: Theory, Psychology, and Applications*, Cambridge University Press, Cambridge, 2000

CHERRY, Mark J. (ed.), *Persons and Their Bodies: Rights, Responsibilities, Relationships*, Kluwer Academic Publishers, Dordrecht, 1999

CHILDRESS, James F., *Practical Rasoning in Bioethics*, Indiana University Press, Indianapolis, 1997

CHIODI, Maurizio, *Tra Cielo e Terra: Il Sensi della Vita a Partire dal Dibatito Bioetico*, Cittadella Editrice, Assisi, 2002

CICCONE, Lino, *Bioetica: Storia, Principi, Questioni*, Edizione Ares, Milano, 2003

CIMOSA, Mario, *Il Vangelo della Vita: Riflessioni su Evangelium Vitae*, Edizioni Dehoniane, Roma, 1996

CLOWES, Brian, *The Facts of Life: An Authoritative Guide to Life and Family Issues*, Human Life International, Front Royal, 1997

COMMISSION NATIONALE SUISSE JUSTICE ET PAIX, *Éthique Chrétienne et Médecine Moderne: Points de repères sur des Problèmes Actuels*, Labor et Fides, Berne, 1999

COMPAGNONI, Francesco - Francesco D'Agostino (eds.), *Bioetica Diritti Umani e Multietnicitá: Immigrazione e Sistema Sanitario Nazionale*, San Paolo, Cinisello Balsamo, 2001

COOPER, John M. - D. S. Hutchinson, *Plato: Complete Works*, Hacket Publishing Company, Indianapolis, 1997

CORREA, Juan de Dios Vial - Elio Sgreccia, *Evangelium Vitae: Five Years of Confrontation With the Society*, Libreria Editrice Vaticana. Vatican, 2001

-----, *The Culture of Life: Foundations and Dimentions*, Libreria Editrice Vaticana, Città del Vaticano, 2002

-----, *The Nature and Dignity of the Human Person as the Foundation of the Right to Life: The Challenges of the Contemporary Cultural Context*, Libreria Editrice Vaticana, Città del Vaticano, 2003

COTTIER, Georges, *Défis Éthiques*, Editions Saint-Agustin, Saint-Maurice, 1996

CRIGGER, Bette-Jane, *Cases in Bioethics: Selections from the Hastings Center Report*, St. Martin's Press, New York, 1998

CROIX, J. M. De la, *Piccolo Manuale di Bioetica*, Mimep-Docete, Pessano, 2000

CURRAN, Charles E., *Medicine and Morals*, Corpus Book, Washington, 1970

D'AGOSTINO, Francesco, *Bioetica*, G. Giappichelli, Torino, 1998

DE DINECHIN, Olivier - Yves de Gentil-Baichis, *L'homme de la bioéthique: Entretiens avec Yves de Gentil-Baichis*, Desclée de Brouwer, Paris, 1999

DEANE-DRUMMOND, Celia E., *Creation Through Wisdom: Theology and the New Biology*, T & T Clark, Edinburg, 2000

DEN EXTER, André - Herbert Hermans (eds), *The Right to Health Care in Several European Countries*, Kluwer Law International, The Hague, 1999

DESCLOS, Jean, *Values for Life: The Sources of Morality and Ethical Criteria*, St. Paul, Middlegreen, 1992

DI PILLA, Francesco, *Consenco Informato e Diritto alla Salute: Atti del Convegno Perugia 26 Novembre 1999*, Edizioni Scientifiche Italiane, Napoli, 2001

DINOIA, J.A. - Romanus Cessario, *Veritatis Splendor and the Renewal of Moral Theology: Studies by Ten Outstanding Scholars*, Our Sunday Visitor, Huntington, 1999

DOLDI, Marco - Mario Picozzi, *Introduzione alla Bioetica*, Elledici, Leumann, 2000

DONARD, Véronique, *Que Ferons-Nous de l'home?: Biologie, Médecine et Société*, Bayard Editions, Paris, 2002

DRANE, James F., *Clinical Bioethics: Theory and Practice in Medical Ethical Decision-Making*, Sheed & Ward, Kansas City, 1994

DUNN, Patrick, *Ethics for Doctors, Nurses and Patients*, Alba House, New York, 1994

-----, *The Doctor and Christian Marriage*, Alba House, New York, 1992

DURAND, Guy, *Introduction Générale à la Bioéthique: Histoire, Concepts et Outils*, Fides - Cerf, Montréal, 1999

ENGELHARDT, H. Tristram, *Bioethics and Secular Humanis: The Search for a Common Morality*, SCM Press, London, 1991

-----, *The Foundations of Bioethics*, Oxford University Press, Oxford, 1996

-----, *The Foundations of Christian Bioethics*, Swets & Zeitlinger, Lisse, 2000

EYER, Richard C., *Holy People Holy Lives: Law and Gospel in Bioethics*, CPH, Saints Louis, 2000

FECHER, Vincent, *Man, Woman and God*, Alba House, New York, 1993

FINNIS, John, *Natural Law and Natural Rights*, Oxford University Press, Oxford, 1999

FLECHA, Jose-Roman, *La Fuente de la Vida: Manual de Bioetica*, Ediciones Sigueme, S.A., Salamanca, 1999

FLETCHER, Joseph, *Homanhood: Essays in Biomedical Ethics*, Prometheus Books, Buffalo, 1979

FREYNE, Seán, *Ethics and the Christian*, The Columba Press, Dublin, 1991

FULFORD, K.W.M - Donna L. Dickenson - Thomas H. Murray, *Healthcare Ethics and Human Values: An Introductory Text with Readings and Case Studies*, Blackwell Publisher, Oxford, 2002

GALSTON, Arthur W. - Emily G. Shurr, *New Dimensions in Bioethics: Science, Ethics and the Formulation of Public Policy*, Kluwer Academic Publishers, Dordrecht, 2001

GISMONDI, Gualberto, *Cultura Tecnologica e Speranza Cristiana*, Editrice Ancora, Milano, 1995

GOLD, E. Richard, *Body Parts: Property Right and Ownership of Human Biological Materials*, Georgetown University Press, Washington D.C, 1996

GORMALLY, Luke, *Catholic Bioethical Issues*, Linacre, London, 2001

-----, *Culture of Life - Culture of Death*, The Linacre Centre, London, 2002

GREEN, Ronald M., *Religion and Moral Reason: A New Method for Comparative Study*, Oxford University Press, Oxford, 1988

GRIESE, Orville N., *Catholic Identity in Health Care: Principles and Practice*, The Pope John Center, Braintree, 1987

GUARDI, Jolanda, *La Medicina Araba*, Xenia, Sam Vittore Olana, 1999

GULA, Richard M., *Reason Informed by Faith: Foundations of Catholic Morality*, Paulist Press, New York, 1989

HANFORD, Jack, *Bioethics From A Faith Perspective: Ethics in Health Care For The Twenty-First Century*, The Haworth Pastoral Press, New York, 2002

HÄRING, Bernard, *Medical Ethics*, St. Pauls, Middlegreen, 1991

-----, *Ethics of Manipulation: Issues in Medicine, behavior Control and genetic*, The Seabury Press, New York, 1975

HARRIS, John, *Bioethics*, Oxford University Press, Oxford, 2001

-----, *The Value of Life*, Routledge & Keegan Paul, London, 1985

HESCH, John, *Clinical Pastoral Care for Hospitalized Children: and their Families*, Paulist Press, New York, 1987

HIRSCH, Emmanuel, *Médicine et éthique: Le Devoir d'Humanité*, Cerf, Paris, 1990

HOLLAND, Stephen, *Bioethics: A Philosophical Introduction*, Polity Press, Cambridge, 2003

HOWELL, Joseph H - William Frederick Sale, *Life Choices: A Hastings Center Introduction to Bioethics*, Georgetown University Press, Washington D. C., 2000

HUTTER, Reinhard - Theodor Dieter, *Ecumenical Ventures in Ethics: Protestants Engage Pope John Paul II's Moral Encyclical Evangelum Vitae*, William B. Eerdmans, Grand Rapids, 1998

IPPOCRATE, *Antica Medicina: Giuramento del Medico*, Rusconi, Milano, 1998

JECKER, Nancy S. - Albert R. Jonsen, Robert A. Pearlman, *Bioethics: An Introduction to the History, Methods, and Practice*, Jones and Bartlett Publishers, Sudbury, 1997

JONAS, Hans - Lawrence Vogel (ed), *Mortality and Morality: A Search for the Good after Auschwitz*, Northwestern University Press, Evaston, 1996

JONAS, Hans, *Dalla fede antica all'uomo tecnologico: Saggi filosofici*, Il Mulino, Bologna, 1991

----, *Tecnica, Medicina ed Etica: Prassi del principio responsabilità*, Einaudi, Torino, 1997

----, *The Imperative of Responsibility: In Search of an Ethics for the Technological Age*, University of Chicago, Chicago, 1984

----, *The Phenomenon of Life: Toward Philosophical Biology*, University of Chicago, Chicago, 1982

----, *Pour une éthique du futur*, Editions Payot & Rivages, Paris, 1998

JONSEN, Albert R., *The Birth of Bioethics*, Oxford University Press, Oxford, 1998

JOUANNA, Jacques, *Ippocrate*, Società Editrice Internazionale, Torino, 1994

JUNG, Patricia Beattie - Thomas A. Shannon, *Abortion and Catholicism: The American Debate*, Crossroad, New York, 1988

KANT, Immanuel, *Fondazione della Metafisica dei Costumi*, Edizione Bompiani, Milano, 2003

----, *Lectures on Ethics*, Cambridge University Press, Cambridge, 2001

----, *Critique of Pure Reason*, Cambridge University Press, Cambridge, 2000

----, *The Metaphysics of Morals*, Cambridge University Press, Cambridge, 2003

----, *Groundwork for the Metaphysics of Morals*, Yale University Press, New Haven, 2002

KASS, Leon R., *Toward a More Natural Science: Biology and Human Affairs*, The Free Press, New York, 1985

----., *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics*, Encounter Book, San Francisco. 2002

KEARON, Kenneth, *Medical Ethics: An Introduction*, Twenty-Third Publications, Mystic, 1995

KEARON, Kenneth - Fergus O'Ferral, *Medical Ethics and the Future of Healthcare,* The Columba Press, Dublin, 2000

KELLERT, Stephen R., *The Value of Life: Biological Diversity and Human Society*, Island Press, Washington DC, 1996

KLEINIG, John, *Valuing Life*, Princeton University Press, Princeton, 1991

KRAYNAK, Robert P. - Glenn Tinder, *In Defense of Human Dignity: Essays for Our Times*, University of Notre Dame Press, Notre Dame, 2003

KUCZEWSKI, Mark G. - Ronald Polansky, *Bioethics: Ancient Themes in Contemporary Issues*, The MIT Press, Cambridge, 2000

KUSHE, Helga - Peter Singer (eds), *Bioethics: An Anthology*, Blackwell, Oxford, 1999

KUSHE, Helga, *Sanctity-of-Life Doctrine in Medicine: A Critique*, Clarendon Press, New York, 1987

LAMMERS, Stephen E. - Allen Verhey (eds), *On Moral Medicine: Theological Perspectives in Medical Ethics*, William B. Eerdmans, Grand Rapids, 1998

LAWTON, Vincent, *Clinical Futures*, MSD Ltd, London, 2000

LENOIR, Noëlle - Bertrand Mathieu, *Les Normes Internationales de la Bioéthique*, Presses Universitaires de France, Paris, 1998

LEONE, Salvino, *La Prospettiva Teologica in Bioetica*, Instituto Siciliano di Bioetica, Acireale, 2002

----, *Manuale di Bioetica*, Istituto Siciliano di Bioetica, Acireale, 2003

LEVINE, Carol, *Taking Sides: Clashing Views on Controversial Bioethical Issues*, Dushkin/McGraw-Hill, Guilford, 1999

LOBATO, Abelardo, *Etica dell'atto Medico*, ESD, Bologna, 1991

LORENZETTI, Luigi, *Teologia e Bioetica Laica: Dialogo Convergenze Divergenze*, EDB, Bologna, 1994

LUCAS LUCAS, Ramón, *L'Uomo Spirito Incarnato: Compendio di Filosofia dell'Uomo*, Edizioni san Paolo, Cinisello Balsamo, 1993

----, *Antropologia e Problemi Bioetici*, San Paolo, Cinisello Balsamo, 2001

----, *Bioetica per Tutti*, San Paolo, Cinisello Balsamo, 2002

LUNGAGNANI, Vincenzo, *Biotecnologie: Norme e Regolamenti*, Utet Libreria, Torino, 2002

MAGNONI, Filippo, *Ippocrate e Vangelo nella Sanità che Cambia*, EDB, Bologna, 2002

MAPPES, Thomas A. - David DeGrazia, *Biomedical Ethics*, McGraw-Hill, Inc, New York, 1996

MARIANI, Andrea, *Bioetica e Teologia Morale: Fondamenti per un'etica della Vita*, Libreria Editrice Vaticana, Città del Vaticano, 2003

MARTINI, Carlo Maria, *Sul Corpo*, Centro Ambrosiano, Milano, 2000

MASSUÉ, Jean-Pierre - Guido Gerin, *Diritti Umani e Bioetica: Rapporto Medico-Paziente in 120 Casi Pratici*, Sapere 2000, Roma, 2000

MAY, William E., *An Introduction to Moral Theology*, Our Sunday Visitor, Huntington, 1994

----, *Catholic Bioethics and the gift of Human Life*, Our Sunday Visitor, Huntington, 2000

----, *Human Existence, Medicine and Ethics: Reflection on Human Life*, Franciscan Herald Press, Chicago, 1977

MAZZONI, Cosimo Marco, *Un Quadro Europeo per la Bioetica?* Leo S. Olschki, Cittá di Castello, 1998

MCCARTHY, Donald G. - Edward J. Bayers, *Handbook on Critical Life Issues*, Pope John Center, Braintree, 1988

MCCORMICK, Richard A., *Health and Medicine in the Catholic Tradition: Tradition in Transition*, Crossroad, New York, 1985

----, *How Brave A New World: Dilemas in Bioethics*, Georgetown University Press, Washington D.C, 1981

MCKEON, Richard, *The Basic Works of Aristotle*, The Modern Library, New York, 2001

MEILAENDER, Gilbert C., *Body, Soul, and Bioethics*, University of Notre Dame, Notre Dame, 1995

MELINA, Livio, *Corso di Bioetica: Il Vangelo della vita*, Piemme, Casale Monferrato, 1996

MESSER, Neil, *Theological Issues in Bioethics: An Introduction with Readings*, Darton Longman and Todd, London, 2002

MEULDERS-KLEIN, Marie-Thérèse - Ruth Deech - Paul Vlaardingerbroek, *Biomedicine, the Family and Human Rights*, Kluwer Academic Publishers, Dordrecht, 2002

MIGLIETTA, Guido, *Respect for Human Life in its Origin*, Arti Grafiche, Asti, 1998

MILANO, Gianna, *Bioetica: Dalla A alla Z*, Feltrinelli, Milano, 1997

MILANO, Andrea, *Persona in Teologia: Alle Origini del Significativo di Persona nel Cristianesimo Antico*, Edizione Dehoniane Roma, Roma, 1996

MINOGUE, Brendan, *Bioethics: A Commitee Approach*, Jones and Bartlett Publisher, Boston, 1996

MOJETTA, Angelo, *Biologia: Sintesi*, Avallardi, Milano, 2000

MONAGLE, John F. - David C. Thomasma, *Health Care Ethics: Critical Issues for the 21st Century*, Aspen Publishers, Inc, Gaithersburg, 1998

MORICONI, Bruno (ed.), *Antropologia Cristiana: Bibbia, Teologia, Cultura*, Città Nuova, Roma, 2001

MORTENSEN (ED), Viggo, *Life and Death: Moral Implications of Biotechnology*, WCC Publications, Geneva, 1995

MUSSO, Paolo, *Convivere con la Bomba: Dalla Bioetica alla Biopolitica*, ESI, Roma, 2002

NERI, Demetrio, *La Bioetica in Laboratorio*, Editori Laterza, Roma, 2001

----, *Euthanasia: Valori, Scelte Morali, Dignità delle Persone*, Editori Laterza, Roma, 1995

O'DONNELL, Thomas J., *Medicine and Christian Morality*, Alba House, New York, 1996

O'ROURKE, Kevin, *A Primer for Health Care Ethics: Essays for A Pluralistic Society*, Georgetown University Press, Washington DC, 2000

PALAZZANI, Laura, *Introduzione alla Biogiuridica*, G. Giappichelli Editore, Torino, 2002

----, *Il Concetto di Persona tra Bioetica e Diritto*, G. Giappichelli Editore, Torino, 1996

PARIZEAU, Marie-Hélène, *Les Fondaments de la Bioéthique*, De Boeck Université, Bruxelles, 1992

PAUL, Ellen Frankel - Fred D. Miller - Jeffrey Paul, *Bioethics*, Cambridge University Press, Cambridge, 2002

PELLEGRINO, Edmund D. - David C. Thomasma, *The Christian Virtues in Medical Practice*, Georgetown University Press, Washington DC, 1996

----, *Helping and Healing: Religious Commitment in Health Care*, Georgetown University Press, Washington DC, 1997

----, *For the Patient's Good: The Restoration of Beneficence in Health Care*, Oxford University Press, Oxford, 1988

----, *The Virtues in Medical Practice*, Oxford University Press, Oxford, 1993

----, *A Philosophical Basis of Medical Practice: Toward a Philosophy and Ethic of the Healing Prof.*, Oxford University Press, Oxford, 1981

PELLEGRINO, Edmund D. - John P. Langan - John Collins Harvey, *Catholic Perspective on Medical Morals: Foundational Issues*, Kluwer Academic Publishers, Dordrecht, 1989

PELLEGRINO, Edmun D. - Alan I. Faden, *Jewish and Catholic Bioethics: An Ecumenical Dialogue*, Kluwer Academic Publisher, Dordrecht, 1999

PERICO, Giacomo, *Problemi di Etica Sanitaria*, Ancora, Milano, 1992

PERRENX, Jean-Pascal, *L'Évangile de la Vie I: A la Lumière de la Raison*, Beauchesne, Paris, 1999

---- *L'Évangile de la Vie II: A la Lumière de la Foi*, Beauchesne, Paris, 1999

PESSINA, Adriano, *Percorsi di Bioetica*, Vita e Pensiero, Milano, 2002

PESSINA, Adriano - Mario Picozzi, *Percorsi di Bioetica*, Vita e Pensiero, Milano, 2002

PIANA, Giannino, *Bioetica. Alla Ricerca di Nuovi Modelli*, Edizione Camiliane, Torino, 2002

PICO DELLA MIRANDOLA, Giovanni, *Oration on the Dignity of Man*, Regnery Publishing, Inc., Washington, D.C., 1999

PICOZZI, Mario, *Nodi e Prospettive in Bioetica: La Vita Interpella Ogni Essere Umano*, In Dialogo, Milano, 2002

PIÑERO, José María López, *Breve Historia de la Medicina*, Alianza Editorial, S. A., Madrid, 2000

PONS, Giovanna, *Progresso scientifico e bioetica*, Claudiana, Torino, 1999

PONTIFICIA ACADEMIA PRO VITA, *Ethics of Biomedical Research in a Christian Vision*, Libreria Editrice Vaticana, Città del Vaticano, 2004

POPE, Catherine - Nicholas Mays, *Qualitative Research in Health Care*, BMJ, London, 2000

POTTER, Van Rensselaer, *Bioethics: Bridge to the Future*, Prentice-Hall, Inc, Englewood Cliffs, 1971

PRIVITERA, Salvatore, *La Questione bioetica nella città oggi*, Centro Studi Cammarata, San Cataldo, 1998

RABKIN, Judith G. - Robert H. Remien, *Good Doctors, Good Patients: Partners in HIV Treatment*, NCM Publishers, Inc, New York, 1994

RATZINGER, Joseph Cardinal, *Creazione e Peccato*, Edizione Paoline, Cinisello Balsamo, 1986

RIFKIN, Jeremy, *Il Secolo Biotech: Il Commercio Genetico e L'Inizio di una Nuova Era*, Baldini & Castoldi, Milano, 2000

RODOTÀ, Stefano (ed.), *Questioni di Bioetica*, Editori Laterza, Bari, 1993

ROMANO, Carlo - Goffredo Grassani, *Bioetica*, UTET, Torino, 1995

RUSSO, Giovanni, *Fondamenti di Metabioetica Cattolica*, ED, Roma, 1993

----, *Bioetica Fondamentale e Generale,* Società Editrice Internazionale, Torino, 1995

----, *Fondamenti di Metabioetica Cattolica,* Edizioni Dehoniane, Roma, 1993

----, *Bilancio di Venticinque anni di bioetica: Un rapporto dai pionieri*, Elle Di Ci, Leumann, 1997

----, *Evangelium Vitae: Commento all'enciclica sulla bioetica*, Elle Di Ci, Leumann, 1995

SANTOSUOSSO, Amedeo, *Il Consenso Informato: Tra Giustificazione per il Medico e Diritto del Paziente*, Raffaello Cortina Editore, Milano, 1996

SARTORIO, Ugo, *Bioetica,* Edizioni Messagero Padova, Padova, 1997

SCHOCKENHOFF, Eberhard, *Etica della Vita: Un Compendio Teologico*, Queriniana, Brescia, 1997

----, *Natural Law & Human Dignity: Universal Ethics in an Historical World*, The Catholic University of America Press, Washington D. C., 2003

SCHÖNBORN, Christoph, *Scegli la Vita: La Morale Cristiana Secondo Il Catechismo della Chiesa Cattolica*, Jaca Book, Milano, 2000

SCOLA, Angelo, *L'Hospitale: La Medicina tra Arte Terapeutica ed Atto Clinico*, Cantagalli, Siena, 2001

SEIFERT, Josef, *Essere e Persona: Verso Una Fondazione Fenomenologica di Una Metafisica Classica e Personalistica*, Newton & Compton Editori, Vita e Pensiero, 1989

SEIFERT, William N. - William F. Urbine, Michael P. Orsi, *Proclaiming the Gospel of Life: A Summary & Commentary on Proclaiming the Gospel of Life*, Pauline Books and Media, Boston, 1996

SGRECCIA, Elio, Vincenza Mele - Dario Sacchini, *Le Radici della Bioetica,* Vita e Pensiero, Milano, 1998

SGRECCIA, Elio - Maria Luisa di Pietro, *Bioetica e Formazione,* Vita e Pensiero, Milano, 2000

SGRECCIA, Elio, *Storia della Medicina e Storia dell'etica Medica Verso il Terzo Millennio: Atti del Convegno, 29-30 Maggio 1999*, Rubbettino Editore, Catanzaro, 2000

----, *Manuale di Bioetica: Fondamenti ed Etica Biomedica*, Vita e Pensiero, Milano, 2003

----, *Manuale di Bioetica,* Vita e Pensiero, Milano, 2002

SGRECCIA, Elio - Maria Luisa Di Pietro, *Bioetica e Formazione,* Vita E Pensiero, Milano, 2000

SGRECCIA, Elio - Gian Pietro Calabrò, *I Diritti della Persona nella Prospettiva Bioetica e Giuridica,* Marco Editore, Cosenza, 2002

SGRECCIA, Elio - Ramon Lucas Lucas, *Commento interdiciplinare alla Evangelium Vitae,* Libreria Editrice Vaticana, Vatican, 1997

SGRECCIA, Elio - Dario Sacchini, *Evengelium Vitae e Bioetica: Un Approcio interdisciplinare*, Vita e Pensiero, Milano, 1996

SHANNON, Thomas A., *Bioethics: Basic Writing on Key Ethical Questions...*, Paulist Press, Mahwah, 1993

SHELP, Earls E., *Theology and Bioethics: Exploring the Foundations and Frontieres,* D. Reidel Publishing Company, Dordrecht, 1985

----, *Secular Bioethics in Theological Perspective,* Kluwer Academic Publishers, Dordrecht, 1996

SHERLOCK, Richard - John D. Morrey, *Ethical Issues in Biotechnology,* Rowman & Littlefield, Lanham, 2002

SHIVA, Vandana, *Il Mondo Sotto Brevetto,* Feltrinelli, Milano, 2002

SHUMAN, Joel James, *The Body of Compassion: Ethics, Medicine and the Church*, Westview Press, Boulder, 1999

SINGER, Peter, *Practical Ethics,* Cambridge University Press, Cambridge, 1999

----, *Liberazione Animale: Il Manifesto di un Movimento Diffuso in Tutto il Mondo*, Il Saggiatore, Minalo, 2003

----, *Rethinking Life and Death: The Collapse of Our Traditional Ethics*, Oxford University Press, Oxford, 1995

SLOYAN, Gerard S., *Catholic Morality Revisited: Origins and Contemporary Challenges*, Twenty-Third Publications, Mystic, 1990

SMITH, Wesley J., *Forced Exit: The Slippery Slope from Assited Suicide to Legalized Murder,* Times Book, New York, 1997

SMITH, Russell, *The Gospel of Life and the Vision of Health Care,* The Pope John Center, Braintree, 1996

SMITH, Wesley J., *Culture of Death: The Assault on Medical Ethics in America*, Encounter Books, San Francisco, 2000

SMITH, David, *Life and Morality: Contemporary Medico-Moral Issues*, Gill & Macmillan, Dublin, 1996

SMITH, Russel E. (ed), *The Interaction of Catholics Bioethics and Secular: Proceeding of the 11 Bishops' Workshop*, The Pope John Center, Braintree, 1992

SMITH, Trevor, *Ethics in Medical Research: A Handbook of Good Practice*, Cambridge University Press, Cambridge, 1999

SOETJE, Elena, *La Responsabilità della Vita: Introduzione alla Bioetica*, Paravia, Torino, 1997

SOLDINI, Maurizio, *Argomenti di Bioetica,* Armando Editore, Roma, 1999

SORICELLI, Elisabetta - Rosangela Barcaro, *Bioetica e Antroposentrismo Etico,* Franco Angeli, Milano, 1998

SORONDO, Marcello Sánchez, *La Vita: Storia e Teoresi*, Pontificia Università Lateranense, Roma, 1998

SPAGNOLO, Antonio G. - Elio Sgreccia, *Lineamenti di Etica della Sperimentazione Clinica,* Vita e Pensiero, Milano, 1994

SPAGNOLO, Antonio G., *Bioetica nella Ricerca e nella Prassi Medica,* Camilliane, Torino, 1997

SPICKER (ED.), Stuart F., *Organism, Medicine, and Metaphysics: Essays in Honor of Hans Jonas*, D. Reidel Publishing Company, Dordrecht, 1978

SPINSANTI, Sandro, *Le Ragioni della Bioetica,* Edizioni Cidas, Roma, 1998

----, *Etica Bio-Medica,* Paoline, Torino, 1992

----, *Documenti di Deontologia e Etica Medica,* Edizioni Paoline, Cinisello Balsamo, 1985

STERPELLONE, Luciano, *Storia della Medicina del XX secolo,* Tascabili Economici Newton, Roma, 1996

SUMNER, L.w. - Joseph Boyle, *Philosophical Perspectives on Bioethics,* University of Toronto Press, Toronto, 1996

SZASZ, Thomas, *The Theology of Medicine: The Political-Philosophical Foundations of Medical Ethics*, Syracuse University Press, Syracuse, 1988

TARANTINO, Antonio, *Diritti Umani e Questioni di Bioetica Naturale,* Giuffrè Editore, Milano, 2003

TETTAMANZI, Dionigi (ed.), *Chiesa e Bioetica: Giovanni Paolo II ai medici e agli Operatori Sanitari,* Massimo,Milano, 1988

TETTAMANZI, Dionigi, *Nuova Bioetica Cristiana,* Piemme, Casale Monferato, 2000

THEVENOT, Xavier, *Compter sur Dieu: Études de Théologie Morale*, Les Éditionsdu Cerf, Paris, 1993

THOMAS, Jean-Paul, *Nel Labirinto della Bioetica,* Società Editrice Internazionale, Torino, 1992

THOMASMA, David C - David N. Weisstub - Christian Hervé (eds.), *Personhood and Health Care,* Kluwer Academic Publishers, Dordrecht, 2001

THOMASMA, David C., *Human Life in the Balance,* Westminster, Louisville, 1990

----, *An Apology for the Value of Human Life*, The Catholic Health Ass., St. Louis, 1983

THOMASMA, David C. - Thomasine Kushner, *Birth to Death: Science and Bioethics*, Cambridge University Press, Cambridge, 1996

UBEL, Peter A., *Pricing Life: Why it's Time for Health Care Rationing*, The MIT Press, Cambridge, 2001

VEATCH, Robert M., *Medical Ethics*, Jones and Bartlett, Sudbury, 1997

----, *The Basics of Bioethics*, Prentice Hall, Upper Saddle River, 2003

VELLA, Charles - Pietro Quattrocchi, *Dalla Bioetica ai Comitati Etici: Prospettive e compiti. Manuale Operativo*, Ancora, Milano, 1988

VENDEMIATI, Aldo, *La Specificità Bio-etica*, Rubbettino, Soveria Mannelli, 2002

VERHEY, Allen (ed.), *Religion & Medical Ethics: Looking Back, Looking Forward*, William B. Eerdmans, Grand Rapids, 1996

VISHER, Glenn S., *Human Values From The Greeks to Modern Times: A Continuing Circle*, Nova Science Publishers, Commack, 1997

WALDENFELS, Hans, *Teologia Fondamentale: Nel Contesto del Mondo Contemporaneo*, San Paolo, Cinisello Balsamo, 1996

WALTER, James J. - Thomas A. Shannon, *Quality of Life: The New Medical Dilema*, Paulist Press, New York, 1990

WALTER, Jennifer K. - Eran P. Klein, *The Story of Bioethics: From Seminal Works to Contemporary Explorations*, Georgetown University Press, Washington D. C., 2003

WARNOCK, Mary, *A Question of Life: The Warnock Report on Human Fertilisation & Embryology*, Basil Blackwell, Oxford, 1985

WARREN, Mary Anne, *Moral Status: Obligations to Persons and Other Living Things*, Oxford, Oxford, 2000

WEAR, Stephen, *Il Consenso Informato: Un Nuovo Raporto fra Medico e Paziente*, Apèiron, Bologna, 1999

WILDES, Kevin Wm. - Alan C. Mitchell, *Choosing Life: A Dialogue on Evangelium Vitae*, Georgetown University Press, Washington DC, 1997

WILLIAMS, John R., *Christian Perspectives on Bioethics: Religious Values and Public Policy in a Pluralistic Society*, Novalis, Ottawa, 1997

ZUCCARO, Cataldo, *La Vita Umana nella Riflessione Etica*, Queriniana, Brescia, 2000

D. WEBSITE

www.bioethics.gov - The President's Council on Bioethics, USA
www.bioethics.net - American Journal of Bioethics Online, USA
www.bioethics.org.uk - European Bioethical Research, UK
www.ccne-ethique.org - National Consultative Bioethics Committee, France
www.doh.gov.uk/cegc - Chief Medical Officer's Expert Group on Therapeutic Cloning, UK
www.gene-watch.org - The Council for Responsible Genetics, USA
www.hgc.gov.uk - Human Genetics Commission, UK
www.humancloning.org - Human Cloning Foundation, USA
www.liebertpub.com/ebi - The Journal of Regenerative Medicine
www linacre.org - Linacre Centre, London, UK
www.med.jhu.edu/bioethics_institute - John Hopkins Bioethics Institute, USA
www.ncbcenter.org/home.html - National Catholic Bioethics, USA
www.nhgri.nih.gov - National Human Genome Research Institute, USA
www.nih.gov - National Institutes of Health, USA
www.palazzochigi.it/bioetica - Comitato Nazionale per la Bioetica, Italy
www.stemcellresearch.org - The Coalition of Americans for Research Ethics, USA
www.thehastingscenter.org - The Hasting Center for Bioethics, USA
www.tissue-engineering.net - Tissue Engineering
www.vatican.va - Vatican
http://bioethics.georgetown.edu - National Reference Center for Bioethics Literature, USA
http://databases.unesco.org/bioethics/biowebintro.shtml - Bioethics Institute Database, France
http://stemcells.alphamedpress.org - Stem Cell Magazine