

Syngamy or Karyogamy?
Interfaces between Ethics and Science

UNIVERSITY OF MALTA

THESIS PRESENTED BY

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TO THE

DEPARTMENT OF PHILOSOPHY

FOR THE DEGREE OF

Doctor of Philosophy

SUPERVISED BY

PROFESSOR EMMANUEL AGIUS

October 2011



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DECLARATION OF OWN WORK

I declare that this dissertation has been composed by myself and that the work presented is my own.

ACKNOWLEDGMENTS

I would like to thank Rev. Profs. Emmanuel Agius, for accepting to act as my supervisor, and for the clear criticism and useful encouragement that he provided of my dissertation. I must also thank other members of the staff at the Faculty of Theology of the University of Malta for their expert tips on material and content particularly Dr. George Grima and Dr. Mark Sultana.

I would also like to thank all the staff at the European Documentation and Research Centre of the University of Malta, and of MCAST for both the possibility of studying within the parameters of their aegis, and also the logistic and research support provided throughout.

I would like to extend my gratitude to the staff of the following libraries, the main library at the University of Malta, the Pope John XXIII library of the Jesuit Province in Malta, the libraries of the Malta Medical School, the Malta Institute of Health Care, the University of Malta Foundation for International Studies and Malta College for Arts Science and Technology (MCAST).

I am grateful to the staff of the laboratory of Molecular Genetics, of the University of Malta, particularly Prof. A. Felice, Dr. Chris Scerri of the Faculty of Health Science, and the visiting staff at the MCAST MA and MSc. Course set up by Fraunhofer. I am also indebted to several individual members of the Bioethics Consultative Committee, particularly the late Dr. Lino German, for the fruitful discussions and opinions put forward, which were made possible only through their good dispositions.

I must also thank Professor Joe Friggieri of the Department of Philosophy, for the support and kind advice extended, allowing me to carry out this work. I must also thank the many translators who helped me translate material from one language into another, the German-Maltese circle and particularly Dr Herbert Manfred Lenicker who was kind enough to help in reviewing material in German.

I am also greatly obliged to Dr. Charles J. Farrugia of the Space Science Center of the University of New Hampshire, who helped me with the intricacies of Einstein's Theory of Relativity and the physics that goes with it.

I am also grateful to all the persons mentioned below who corresponded with me in many ways and provided information which led me to reach my own conclusions. These include in alphabetical order, C. Alonso, S. Bauzon, F.J. Bormann, E. Busuttill, I. Carrasco, J. Fleming, B. Gahl, S. Gellner, K. Golser, M. Hogan, L. Honnefelder, D. N. Irwing, A. R. Jonsen, E. Larson, J.A. Lombo, A.R. Luño, I. Marino, G. Rager, T.A. Shannon, C. Tauer, and G. Virt, and several others too numerous to mention.

Last but not least, I am indebted to my wife Marthese, for her valued assistance and patience, and my daughters Danielle and Gillian, for having helped and suffered the brunt of my mental absence, during the work on this dissertation.

Without the solidarity shown by all these people and the many others mentioned in this dissertation this work would never have seen the light of day.

Syngamy or Karyogamy?

Interfaces between Ethics and Science

It is often discussed in academic circles, whether the human being exists at the beginning of the process of fertilization as soon as the sperm cell penetrates the ovum, or whether this occurs at some later stage particularly when the two pronuclei of both gametes have fused and they then form a new zygote, that is towards the end of the fertilization process. Opinions on this issue vary enormously especially since the whole process of fertilization or conception lasts about twenty-four hours and the only two landmarks available for verification, are when the process actually starts and when it ends. There is in effect, no moment of conception, but rather a process. In order to answer this question one must first of all set the parameters within which one has to work. The difference between the terms *human person* and *human being* has to be made clear during this study, as in society the terms are often interchangeable. I will deal with the philosophical discussions surrounding this enigma and will show in detail, that after taking every argument in perspective, one remains with that of ontological continuity as the only really valid argument to follow. I will look at the issue from the argument following from potentiality, which should be complemented by the argument following from ontogeny.

I will start my research by alluding to the scientific arguments surrounding fertilization in *Chapter One*. Following this, in *Chapter Two* I will take a look at the philosophical arguments particularly from a natural law perspective, which can shed light on the beginning of human life. I will particularly look at the classical

philosophers such as Socrates, Plato and particularly Aristotle, and the scholastic philosopher Thomas Aquinas. Since the beginning, the Greek philosophers tried to come up with several explanations for these apparent two sides of man. Could the mind exist without the body and vice-versa? Plato wrote about his hypothesis of *Forms*, Aristotle wrote about *Matter* and *Form*. Plato's analogies have within them the understanding of a dual nature of the faculties of man. A physical one and a spiritual one existing as two separate substances. His *Forms* unlike Aristotle's, lay over and above the object of the senses. Aristotle believed that any object consists of basic shapeless stuff or *matter* on which a *form* is superimposed, which *form* gives *matter* its particular identity. The relationship between soul and body is analogous to that between *Form* and *Matter*, the *Form* being immanent within the objects one perceives. This is the so called *Hylomorphic* theory. Therefore there is no dual substantiality in man. One is immanent to the other. Aristotle's laws of motion encompassing *Act* and *Potency* are also important in arriving at our conclusions on the beginning of human life. In the middle ages St. Thomas Aquinas wrote about and queried the time when the soul actually came into the body of the human embryo basing his deductive opinions on much of Aristotle's embryology and philosophy. For St. Thomas, the soul is the form of the body, and therefore the embryo could only be human at the time that the soul entered it, although he could not tell exactly when this time was. He even ascribed different times for coming into being of the male and female human foetus. This implied that prior to ensoulment, the embryo was not human at all and that ensoulment was an essential element for humanity to exist. He still perceived the possibility of the existence of the foetal body without the presence of the soul. Of course at the time of writing St. Thomas did not have a knowledge of embryology as is available today and was basing his conclusions deductively, not

scientifically. There always seems to have been a philosophical tension between man's dualistic or his monistic nature *vis-a-vis* the physical and the mental. The position regarding certain dual aspects of man was actually emphasized by the philosopher *Descartes* in what became known as the Cartesian view of Man and which has persisted in many circles up to this day! In this view, *Descartes* thinks of the mind as a bodiless consciousness and the body as an extended entity, meaning occupying space, comprising two separate substances hence the term dualism. There will also be some dwelling on the deontology of Immanuel Kant and some other modern philosophers.

Chapter Three will deal with the concept of *Process Philosophy*. Many individuals argue that once the process of fertilization has started at sperm penetration, then human life has to be respected from that point because of the continuous nature of this process. I will argue with the help of the philosophy of process, referring to philosophers of process such as Alfred North Whitehead, Samuel Alexander, and Pierre Teilhard de Chardin amongst others, that this is not so, and that even within process itself, it is possible to ascertain the existence of a human individual.

I will also, in another chapter, *Chapter Four*, allude to positions by several intellectuals and other persons of standing who maintain that the start of the human being exists from the beginning of fertilization, and those who believe that it is in fact at syngamy, and I will show throughout the dissertation, why I consider this latter argument to be correct. Other positions beyond fertilization will also be investigated. Today scientific learning seems to have cleared the way to pointing out the time when one can safely deduce the moment of individuation and the start of ontological

development of the human being. For the ethical evaluation of fertilization, the scientific facts act as important parameters for decision making. The obverse is also true. Scientific facts on human life need to keep in mind the ethical and philosophical perspectives that shed light on the interpretation of these facts and which lead to the respect that goes with human life.

In *Chapter Five*, I will show that since many of the previous positions on personhood and being have been seen in the light of Newtonian concepts of the physical world, one must now more than ever, examine if these same philosophical constructs still hold sufficient water when looked at from a perspective where the passage of time is no longer known to be a constant. They must now be seen in the light of Einstein's revelations on the concept of relativity between interpersonal relations and the fact that even in physical life, the passage of time is no longer perceived as a constant but can vary according to the physical conditions relative to different observers and time may even stop passing altogether. This means that interpersonal relationships viewed from different observers, may exhibit different qualities to the different observers! At normal slow velocities things relative to one observer are also the same, relative to a second observer. However where spatially remote events are concerned, what is simultaneously relative to one observer, is not simultaneously relative to other observers. Consequences of this line of thinking may challenge previously held differences between the terms human being and human person and show that in society and legislation, a dichotomy between the two can lead to much confusion.

In the *Chapter Six*, I intend to first deal with the problems surrounding the resolution of doubt in natural law ethics. How does one deal with an ethical problem when there

is doubt as regards the facts of nature and therefore the rational reasoning resulting from those facts becomes doubtful and inconclusive. Is there a body of evidence that can show us the way out of such a dilemma, for example, by using the experience and example of *case ethicists* and examples of *case ethics* (casuistry) that go back hundreds of years and have never been refuted? I will also consider the different ethical aspects that result from looking anew at the point where I believe the human being comes into existence, which is at nuclear fusion towards the end of fertilization. This will have profound effects on the biology and ethics and the extent of technical interventions which may raise important ethical questions, such as first and second polar body testing and genetic engineering of the pronuclei of an ovum in the process of fertilization. Does it mean that one may intervene in a utilitarian manner, for any reason, prior to this point in the maturation of the ootid? The ootid is quite definitely a living human cell with a potential to spontaneously develop into a human being. If interventions are foreseen, which are those interventions that would be ethically acceptable considering the fundamental rights of the embryo to life? Would freezing of the ootid in the pronuclear state present the same ethical dilemmas as the freezing of the embryo? Could ootids be frozen for temporary periods or actually destroyed so as to prevent fusion of the pronuclei? Is there any intervening significant marker between penetration by the sperm of the ovum and fusion of the pronuclei, which would lead one to exercise greater caution, such as the production of the second polar body? If so, should there be a gradation of those morally acceptable interventions? What light may be thrown on these developmental stages by the normal reproductive processes of mitosis and meiosis? What may be deduced by considering the cell's potential for directed transcription and translation of the new DNA produced? Does the translation by maternal m-RNA in the ootid or early embryo,

resolve any of the ethical dilemmas? How would the biological processes of cloning and stem cell research be affected by the conclusions reached?

It is perceived that I shall be able to add some light to all of these questions after having set down the philosophical and scientific basis of the question that this dissertation originally sets out to answer, that is the point when one considers a new human life to have begun during the process of fertilization.

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DEDICATION

Domine

Ut videam

Ut videant

Ut videamus

It does follow of course that all attempts to elucidate the notion of personal identity independently of and in isolation from the notions of narrative, intelligibility and accountability are bound to fail. As all such attempts have.

Alasdair MacIntyre After Virtue

Prologue

THE MORAL STATUS OF THE HUMAN EMBRYO

The important thing is never to stop questioning

Albert Einstein (after
Socrates).

Issues

Moral philosophy will not solve problems which need an absolute positive solution. Had it to do that, it would pass into the realms of empirical science. It can however clarify confusions and remove obscurities so that the options are clearer to see. At the end however the actual choice between options must be taken by the individual himself¹. Before proceeding to the main subject of this dissertation which deals with the concept of the beginning of human life, I must revisit the issue of personhood vis-à-vis being, which will crop up again at different points during this work. I use the word revisit because I have already dealt with this work extensively in my other dissertation². In fact, I will reproduce a small part of the work I did then, just to clarify the issue. Generally speaking there are two concepts of personhood, that which one can term *Ontological Personalism*³, where the concept of personhood is grounded in biological considerations, and the other which one can term *Functional Personalism*⁴, where the achievement of personhood is a procession of empirical achievement on the lines described by John Locke with the concept of self

¹ Raphael, D.D., *Moral Philosophy*, Oxford University Press, 1994, pg. 10.

² Ascjak, M., *European Political Parties' Stands on Genetic Issues*, European Documentation and Research Centre, University of Malta, 2000, pg. 62–75.

³ Feinberg, J.S., Feinberg, P.D., *Ethics For A Brave New World*, Crossway Books, Illinois, 1993, pg. 60-61.

consciousness. Other empirical paradigms, such as the development of a brain or neural tissue, may however be selected. It is also beneficial to point out that when considering the concept of ontological personalism, not everyone selects the ontic beginning of the human being as occurring at conception. There are points of view which differentiate between the *human embryo* at conception and the *human being* at individuation at about fourteen days of development. It is to clearing up this latter paradigm, that I have chosen to revisit my earlier work where I have dealt with this subject in more detail. I will return to the concept of personhood in *Chapter Five*.

Objectively, there are several reasons why ontologically one should consider the embryo as a human being from conception, and no reasons scientifically why one should not⁵. From conception the two haploid gametes, male and female, unite to form a *unique* diploid set of chromosomes, following which the process of development and growth is initiated under the control of the said aforementioned genes. This process is continuous, with no separate phase evident from the rest, but occurs as one contiguous growth process, much like the process of growth from after birth, till natural death. This process also occurs independent of the mother, as has been so obviously proven by the processes of *in vitro* fertilization, where once gamete nuclei union occurs in favourable environmental circumstances, then embryo division and growth occurs spontaneously and under the control of the genes in the same embryo⁶. Current scientific knowledge is thus sufficient to lead one to conclude that the human embryo has a distinct ontological personality from its very beginning.

⁴ *Ibid.*, pg. 62-63.

⁵ See article by Serra, A., in 'Advances in Medical Genetics Prospectives and Ethical Problems', *Melita Theologica*, Vol. XLVIII, 1997, No. 1, University of Malta, pg. vii.

⁶ See article by Lejeune, J., in *The Question of In Vitro Fertilization*, Society for the Protection of Unborn Children Educational Trust, London, 1984.

There are of course several opinions floated about regarding the ontic beginning of the human being with the most promising and credible being three. The first opinion states that life begins instantly on the penetration of the ovum by a sperm cell. The second opinion puts the start of human life at syngamy when there is fusion of the two pronuclei of the ootid⁷. The ootid is the product produced by the penetration of the sperm and the ovum after the second meiotic division has taken place. This also is an instant and non gradualist position. The third opinion deals with the formation of the primitive streak in the embryo after implantation into the uterine lining at about fourteen days of development. This is the position proposed by *Mary Warnock* in the so called *Warnock Report of the British Parliament (1978)*. This is considered to be a gradualist position but I will not be dealing with this position during the main body of this dissertation as the main bone of contention lies between the first two described above. This study will examine the empirical and deductive evidence surrounding both positions and will try to sort out the precise moment or as close as possible to the time, that man as an *esse* begins to exist. First however I must look at certain basic concepts.

The Concept of Ontological Development

Occasionally the position is clouded by declarations from writers such as *Norman Ford*, an Australian Catholic theologian, who by using the correct philosophical arguments down through from *Aristotle* and *St. Thomas Aquinas* to the present day,

⁷The term syngamy is usually co-terminous with penetration while the term karyogamy is usually co-terminous with pronuclear amphimixis, at least in Europe. Others mostly in the USA usually refer to the terms penetration and syngamy respectively. These latter terms are the the ones used throughout this work.

unfortunately comes to the incorrect conclusion, because of the lack of understanding or knowledge at the time of writing, of certain scientific facts in the fields of genetic and molecular biology, embryology and cell histology. In his book *Ford* correctly states, that “a person is a living individual with a truly human nature”⁸. He then goes on to explain that a born infant, although not able to reason, is already a person because its very nature allows it to develop to the age of reason, without losing its ontological identity.

The concept of ontological identity is central to the understanding of being and personhood, because once ontological continuity is proven in the developing foetus, then the point at which this ontological development commences is the point of the commencement of personhood. Since the *Catholic Church* in the *Council of Vienne* from 1311-1312 ruled out any dualism between the body and the soul in human nature, that is, there is no pre-existence of the soul before the body, both are separate constituents of the one same human being leading to a unitive composite, with the soul being the life-principle of the body. This Council did not however specify at what point of human development, this union of soul with body occurred. For theological purposes, the point of commencement of personhood, must therefore also be the point of ensoulment of the human body! We will never be able to pinpoint the moment when this occurs due to the immateriality of the soul. It is however scientifically possible to speak about a human being. Science can throw much light on this issue which may lead one to derive important ethical principles. In this subject matter the nature of the ‘is’ implies in itself certain ethical obligations pertaining to an ‘ought’ which have been derived through the observation of man in a scientific, cultural, legal and philosophical perspective. Once a human subject exists, it needs to

⁸ Ford, N. M., *When did I begin*, Cambridge University Press, Cambridge, 1988.

be respected. This of course goes against *Hume's* opinion that an 'is' does not automatically imply an 'ought'.

Ontological continuity can be defined as the development of the body in a coordinated, continuous manner, lending that particular body singular individuality.

The concept of the 'continuum' of the human person described by *Ford*, in fact overcomes the hurdle of several philosophical problems concerned with human personhood. What is a human person? Most of us know the answer to this question by relying on our daily experience and perceptions of meeting other rational human people, who can communicate with us and express their rationality, but we have difficulty in defining it. Does the faculty of conscious reasoning (consciousness)⁹ and the capacity to value one's own existence¹⁰ which imparts to man his singular position amongst all creatures, have to be constantly present during man's existence, for him to be considered a person? The answer *Ford* gives, is in the negative. There may be times, such as in early childhood or close to late adulthood, where this function cannot be expressed, either because the communicative faculties have not yet been developed or have been lost, or because the function itself has not yet developed or has been lost. Therefore are young children, or new-born babies, or senile adults any less human than mature and rational individuals, who have developed this rationality and are in a position to express it? The answer is obviously "no". Babies and senile adults are fully human. What connects the rational individual to the non-rational

⁹ Locke 1690, Ch. 27, Book II, pg. 188, "We must consider what person stands for; which I think is a thinking intelligent being, that has reason and reflection, and can consider itself the same thinking thing, in different times and places; which it does only by that consciousness which is inseparable from thinking and seems to me essential to it; it being impossible for anyone to perceive without perceiving that he does perceive".

¹⁰ Harris, J., 'The Concept of the Person and the Value of Life', *Kennedy Institute of Ethics Journal*, Vol. 9, No. 4, 1999, John Hopkins University Press, Maryland, pg. 303.

stages of his existence, is his ontological development or developmental continuum. The individual who was a baby and then grew into a mature adult and became degenerately senile, is the same human individual passing through different stages of the same personhood. Therefore human personhood must be accepted to be present in a particular individual, through all stages of human development, as long as there is proof that the development of the particular individual is deemed to be physically connected and unique to that person.

Therefore if the ontological development of the person may be traced down to embryological development, the first basic living cellular component giving rise to the continuous and connected development of the same human person, must be the point where the human being begins. This philosophical reasoning is correct. In his book however, *Ford* erroneously concludes, that since in the *first fourteen days* of development up to implantation, there is no unifying physical and physiological connection between the different cells of the blastula and the morula, the human individual may not be present from fertilisation. He cites as proof the fact, that the blastocyst layer, with differentiation within the embryo into embryoblastic cells proper, that eventually produce the actual foetus, undergoes separate development from the trophoblastic cells which eventually produce the membranes and placenta.

The human being, would more probably actually exist as an ontic being, from the moment of formation of the primitive streak on the embryonic plate around the fourteenth day after fertilization, around the time of implantation into the walls of the uterus. This is the stage when the third layer of the embryo responsible for the development of the internal human musculature, called the mesodermal layer, is laid

down together with the previously formed ectoderm and the endoderm layers. This is the stage, Ford concludes, that the human body plan is complete in its three layers and axis orientation, and therefore this must be the point of commencement of ontological development and therefore as a result of the commencement of personhood, the point of ensoulment. After this stage there could no longer be the formation of genetically identical twins, and therefore this supports the fact, that that was the moment of ensoulment and 'humanization'. That this statement is simply untrue, can be attested by the detailed evaluation of cell histology and the processes of early embryology, which particulars, to be fair, may not have been available to Ford at the time.

Conception as the Earliest Moment of Ontological Continuity

I would like to briefly mention some scientific facts that bring down *Ford's* hypothesis. Recent elementary cell histology¹¹ shows without doubt, that cells close to each other, such as those found in the early blastomere surrounded by the *Zona Pellucida*, are not developing in splendid isolation, but continually exchange information which limits or controls each other's growth extent and pattern. On close study of the complex cell plasma membrane, which is a semi-permeable membrane, and already by its very nature allows the passive selective diffusion of water molecules and certain simple fat soluble (hydrophobic or lipophilic) signaling molecules in and out of cells, one can observe several mechanisms by which other molecules or ions, such as mineral ions and simple proteins or lipoproteins (usually hydrophilic or lipophobic), may actively pass into the cell through the membrane. Simple ions such as those of sodium, potassium and calcium are actively transported through cell membranes using an active pump mechanism.

¹¹ Junqueira, L. C., Carneiro, J., Kelley, R. O., *Basic Histology*, Appleton and Lange, Connecticut, 1995, pg. 20-65.

Mass transport of larger molecules into the cell occurs by a process called *endocytosis*, while transport of molecules out of the cell through the cell membrane, is correspondingly called *exocytosis*. There are several forms how this can take place. The first form is called *pinocytosis*, whereby relatively large amounts of extracellular fluid and all the molecules in solution in it, are entrapped by invaginations of the cell membrane, transported into the cell, and then released inside the cell matrix. The second mechanism is *receptor mediated endocytosis*, where receptors on the surface of cell membranes specific for several lipoproteins and proteins, bind to the latter selectively, and are then invaginated into the cell and finally pinch off inside the cell membrane into the cell matrix. It is important to realize that several simple proteins are the constituents of hormones, which control cell function and growth. The third type of endocytosis is called *phagocytosis*, where the extracellular solid material is literally engulfed by cellular extrusions of the cytoplasm and cell membrane, and brought *in toto*, into the cell matrix.

Not all cells may exhibit the three forms of endocytosis at any one time. Through the second mechanism alone, cells can communicate by secreting or imbibing chemicals such as hormones or other transmitters, which signal to cells some distance away, or they may contain plasma-bound signalling protein molecules, which communicate with other interlocking plasma-bound membrane molecules of neighbour cells in direct physical contact. These signalling molecules, then activate messenger (G-Proteins) molecules which diffuse throughout the cell matrix and set off enzyme cascades that bring about a particular cellular response and behaviour, thereby regulating important cell functions. Lipid soluble hormones called *steroids*, are also able to diffuse from extracellular fluid across the cell membrane and cause a cellular

response through binding to specific DNA sequences causing transcription¹² enhancement or delay.

Another way that adjacent cells may communicate with each other is through the establishment of small open communicating junctions between them. These *gap junctions* or *connexons*, allow the exchange of informational substances directly through them, which then regulate the tissue development in a coordinated manner. It is proven that even where protein synthesis is not yet operational, these connexons may form from the existing protein subunits in the existing cell membrane! Connexons have been demonstrated to form in the human embryo around the *fourth day of development* when the morula consists of about thirty cells. Together with the formation of gap junctions, one also finds *tight junctions*, which principally contribute to the anchoring of the cells to one another¹³.

As one can easily tell from the above synopsis, the human cell contains a substantial number of mechanisms by which it can communicate and coordinate with neighbouring cells, and therefore it is difficult to imagine that there is no communication in the embryo, even at the two cell stage, and that cells are not already developing as an ontological unit, as Ford ascertained! It is practically impossible for cells to be so closely bound next to each other within the *zona pellucida*, and not be sharing developmental information. There is however another reason which also compromises *Ford's* hypothesis and that is the activated functioning of the cell genome from conception.

¹² Transcription is the process whereby the DNA replicates its information onto Messenger RNA molecules, which then travel to Ribosomal RNA in the cytoplasm, so that with the help of Transfer RNA molecules, are able to initiate the process of protein synthesis called Translation.

¹³ Larsen, W. J., *Human Embryology*, Churchill Livingstone, New York, 2001, pg. 19.

Once fertilization has taken place, and a new set of chromosomes has been formed by the single strands from the mother and the father, the new and unique genome immediately starts to control the growth and development, not only of the particular individual blastomeres, but also of the neighbouring ones. This control of cell growth is carried out by the genetic information encoded within the 23 pairs of chromosomes themselves. Genes called *operons*¹⁴, decide which characteristics are translated by the RNA (ribonucleic acid responsible for the reading and transfer of the DNA code into protein synthesis) into the building block or messenger proteins. Control by these operons may be positive, that is they stimulate protein synthesis, or negative, that is they inhibit it.

A *regulator* gene codes for a regulator protein that activates or deactivates protein synthesis by binding to a particular site on the gene, thereby deciding which are the segments of DNA expressed in protein synthesis and cell development. These regulator genes, which can be further subdivided as to exact function (coordinate, selector and realizator)¹⁵, do not only regulate what occurs within their own particular cell. Due to the production of morphogenetic proteins or *morphogens*¹⁶, which are released by the cell into the extracellular spaces, they also regulate the growth and development of neighbouring cells, depending on the relative concentrations of these proteins eliciting a set of unique cellular responses, which are different from one another, according to the different cascading concentrations¹⁷. Axial orientation as well as embryo segmentation and tissue differentiation are mediated by these genes.

¹⁴ Lewin, B., *Genes VI*, Oxford University Press, Oxford, 1997, Ch. 12 & 38.

¹⁵ Serra, A., 'Advances in Medical Genetics Prospectives and Ethical Problems', *Melita Theologica*, Vol. XLVIII, University of Malta, 1997, University of Malta, pg. xii.

¹⁶ Lodish, H., Baltimore, D., Berk, A., Zipursky, S. L., Matsudaira, P., Darnell, J., *Molecular Cell Biology*, Scientific American Books, New York, 1995, pg. 568.

¹⁷ *Ibid.*, pg. 1160.

*Induction*¹⁸, is the process, whereby one cell population influences the development of neighbouring cells. Now it has been proven that inducing signals are either tethered to the cell membrane surface thereby affecting only neighbouring cells, or else can diffuse in the extracellular matrix by morphogens, and act at a distance. Therefore the control of cell development can occur by the diffusion of morphogens to other cells in the vicinity, such as those in the early stages of embryo development, and also by direct cell to cell contact of the cell membranes (this last type of control is exemplified by the development of neural tissue in the embryo). This last type of cell-cell mediated induction has also been shown to be active in the early embryo.

At the stage of pre-implantation, it has been shown that a cell-cell adhesion is mediated by cell-surface adhesive protein molecules called *cadherins*¹⁹. There are several types of cadherins responsible for cell adhesion at different stages of embryological development and in the adult organism (E, P, N, R, M), but at this particular stage of the morula, the major cell-surface adhesive protein expressed is called E-cadherin. This E-cadherin is responsible for the cells adhering into a tight mass, and has been proven in vertebrates to influence tissue morphogenesis and cell differentiation. At a later stage, around fourteen days, some ectoderm cells lose their E-cadherin, allowing them to migrate inwards and form the mesoderm. Ectoderm cells also lose E-cadherin during formation of the neural tube, and start producing another cadherin called N-cadherin, which controls nervous tissue development. This process continues unabated, allowing like-cells to develop together, by having the same cadherin and new cells groups to form by the production of different cadherins.

¹⁸ *Ibid.*, pg. 1160.

¹⁹ *Ibid.*, pg. 1150-1153.

The cadherin adhesive proteins, it is important to remember, are produced by protein synthesis mediated by the nuclear DNA in each cell.

New evidence also suggests that the differentiation and developmental growth of different cells in the developing embryo, depends to a significant extent, on the interactions with the *Basal Lamina*, which is a non-cellular amorphous matrix made up of mucopolysaccharides (carbohydrates) and collagen protein²⁰. This basal lamina underlines all epithelial and endothelial tissues, and separates these from other types of tissue. Now the *zona pellucida* surrounding the ovum and early embryo, is very similar in chemical composition to the basal lamina, and is made up of a combination of protein and polysaccharides (mucoprotein) and elaborated by the ovum and follicular cells of the ovarian follicle. One may be led to conclude, that the *zona pellucida*, should contribute in a similar manner to the ontological development of the blastomeres it encloses, at the early stage of embryonic development, as do the basal laminae during the later stages.

Therefore it is very clear that far from *Ford's* reasoning, the cells next to each other not only can communicate with one another, but the substances with which they do so, which regulate the ontological development of the foetus, have been identified and lie under the absolute control of the new genome produced at fertilization. It also seems that factors outside the cells may contribute to this integrated development. A concluding remark in a scientific publication, says it all;

²⁰ Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D., Darnell, J., *Molecular Cell Biology*, W. H. Freeman and Company, New York, 2000, pg. 1024.

In the intact developing organism, each cell must be listening to its neighbours and hence in all likelihood is detecting multiple signals, often simultaneously, and integrating them²¹.

It follows therefore, that ontological development of the human embryo must start from fertilization, that the human embryo is a human person from conception and therefore, for those who believe that a person is endowed with a spiritual soul, the human embryo from conception must be endowed with such a spiritual soul! *Ford's* effort to detach ontological continuity from fertilization, is also proven to be untrue from the particular development of monozygotic (identical) twins. *Ford* stated that monozygotic twins proved that there was no ontological development in the just recently fertilized zygote, as two individuals came to be developed from one fertilized ovum, and if it was possible for one being to give rise to two individual beings, then philosophically, there could be no ontological continuity between the original fertilized zygote and the two new genetically identical embryos. Philosophically, this position could be contested by the argument, that it may not have been that the original zygote gave rise to two new embryos, but that the original zygote continued ontological development at an early stage of which, a new and separate physical separation occurred in the dividing cells, giving rise to a new individual with the same nuclear gene set, but a different independent, ontological development²².

The scientific proof for this was forthcoming, when monozygotic twins were discovered to be composed of a twin with a karyotype of forty-seven (47) chromosomes and therefore affected by *Down's syndrome*, while the other twin had a karyotype of forty-six (46) chromosomes, and was therefore normal. In these cases, a

²¹ *Ibid.*, pg. 1050.

²² An embryo's potential for spontaneous twinning seems to be established at an early stage by factors determining the thickness of the Zona Pellucida. *Kennedy Institute of Ethics Journal*, June 1999, John Hopkins University Press, Maryland, pg. 138.

number of studies showed, that the trisomic twin was the original zygote, while the second normal embryo originated from it²³!

The Definition of Conception

It is pertinent to end this section, by referring to another ethical dilemma. The moment of conception, may be invariably defined as the moment when the cytoplasmic membrane of the two gametes fuse, at the beginning of the fertilization process. Alternatively, it may also be taken to be the moment, when the haploid genetic material in the male and female pronuclei, comes together on the mitotic spindle, to form a new diploid zygote, with a new genetic constitution, that is at the end of fertilization²⁴. Some argue that the ontological development of the embryo, can be followed from the point of the nuclear arrangement on the spindle just before the first mitotic division of the zygote, where protein synthesis, under the control of the new genome, can be detected in the two-cell stage in the mouse, and the four-cell stage in the human zygote²⁵. After the sperm cell unites with the cytoplasmic membrane of the oocyte, two to eight hours must pass, before there is extrusion of the second polar body in the second meiotic division of the oocyte²⁶. Now all the products of meiosis, produce four haploid nuclei, all with different genetic material. Therefore at the point of gamete fusion, the ootid nucleus is not yet genetically defined²⁷. The two pronuclei formed, do not actually fuse, but the nuclear membrane disappears, and the chromosomes arrange themselves on the newly formed spindle in

²³ Serra, A., 'Advances in Medical Genetics Prospectives and Ethical Problems', *Melita Theologica*, Vol. XLVIII, University of Malta, pg. xvi.

²⁴ Turnbull, Sir A., Chamberlain, G., *Obstetrics*, Churchill Livingstone, Edinburgh, 1989, pg. 50-51.

²⁵ Knobil, E., Neill, J. D., *The Physiology of Reproduction - Volume 1*, Raven Press, New York, 1994, pg. 279, 337.

²⁶ Shaw, R. W., Soutter, W. P., Stanton, S. L., *Gynaecology*, Churchill Livingstone, New York, 1997, pg. 244.

preparation for the first mitotic cleavage division of the new zygote²⁸. This is the first time that the maternal and paternal chromosomes come together. Before completion of this phase of mitosis (metaphase), the genetic material in the pronuclei, may be subject to various factors which may ultimately produce non-viable zygotes with triploidy or tetraploidy, or even subject to trisomy or monosomy²⁹. That is, the genetic composition of the new zygote can be taken, to not yet be complete before this stage.

However, the other argument concluding that the human individual is present from gamete interpenetration at the beginning of the process of fertilization, also bears some weight, but one must explain ontological continuity down to that level. Several people maintain this to be so³⁰, as the two pronuclei are taken to be the two haploid nuclei of the same single cell. Bi-nuclear cells are not a rarity in nature, and some copepods of the genus *Cyclops*, spend a very long part of their very short life, in this haploid bi-nuclear state³¹. Could this phase be represented also in man at the beginning of fertilization, as an evolutionary remnant? If so, this would explain why there is no prophase in a one-cell zygote, but only spindle formation during metaphase leading directly to the combined (2N) genome in the two-cell stage. Several new proteins have also been identified in the one-cell stage although these

²⁷ Stout, G. W., Taylor, D. J., Soper, R., *Biology*, Cambridge University Press, Cambridge, 1990, pg. 807.

²⁸ O'Rahilly, R., Muller, F., *Human Embryology & Teratology*, Wiley-Liss, Inc., New York, 1996, pg. 28-29. See also, Sadler, T. W., *Langman's medical embryology*, Williams and Wilkins, Maryland, 1995, pg. 29-31.

²⁹ Edwards, R. G., *Conception in the Human Female*, Academic Press, London, 1980, pg. 621-635.

³⁰ Serra, A., *About The Second Polar Body And Blastomere Genetic Analysis For Preimplantation Diagnosis*, and *Il Processo Della Fertilizzazione: 'Lo Zygote'*.

³¹ Balinsky, B. I., *An Introduction to Embryology*, CBS College Publishing, Philadelphia, 1981, pg. 129.

could be translated from maternal m-RNA³². However, there has been very strong evidence that the mammalian embryo, particularly the paternal pronucleus, is transcriptionally active and produces its own m-RNA, even from the one-cell stage, and not from the two-cell stage as previously thought³³. It is significant that the level of transcription is modest (about one-fifth less) at this stage compared to the two-cell rate. Since it seems that the maternal and especially the paternal pronuclei can be proven to be transcriptionally active from this stage, could this logically lead one to conclude that the ontological development of the human embryo can in fact be traced down to the level of the one-cell stage and, ultimately, ovum penetration by the sperm? Occasionally, only one pronucleus is produced, and there is now evidence that suggests, that this pronucleus is diploid. This is the point of investigation at which I had arrived while doing my Master's dissertation on a related subject. I presently intend to examine this subject on a deeper philosophical and scientific level and present new evidence to identify the moment when human life of an individual begins.

It has now become amply clear that the translation of the new genome's proteins does not start up until the two to four cell stage of the new zygote. It seems that the transcription that occurs in the two pronuclei prior to syngamy is not coded for by the DNA in either of the two pronuclei, but by maternal m-RNA molecules left over in the cytoplasm of the ovum and completely inherited from the complete diploid maternal genome. This means that all new proteins translated in the ootid are products of the maternal genome only. There does not seem to be any transcription-

³² Knobil, E., Neill, J. D., *The Physiology of Reproduction - Volume 1*, Raven Press, New York, 1994, pg. 279.

³³ *Ibid.*, pg. 337. See also *PubMed Services Journal Browser*, National Library of Medicine, at website <http://www.ncbi.nlm.nih.gov/PubMed/>, PMID: 8665158, *Zygote*. 1994 Nov;2(4):281-7; PMID: 9402290, *human reprod.*,1997 Oct;12(10):2251-6; PMID:12658627, *Mol Reprod Dev*. 2003 May;65(1):1-8; PMID: 994936, *Prenat Diagn*.1998;18(13):1366-73; *American Journal of Human Genetics*, 1997 Jul;61(1):5-8. [06.06.2000].

translation coupling of the new genome produced by fertilization prior to syngamy! It is important to keep in mind that the term ‘syngamy’ in this thesis refers to the moment that the two parental genomes come together, and not the penetration of the ovum by the sperm, which is occasionally also referred to as ‘syngamy’, while pronuclear fusion is then referred to as ‘karyogamy’.

It is also important to define the differences between the term conception and fertilization. In his book, Norman Ford explains that there are two meanings to the word ‘conception’. The active meaning, pertains to the exact moment when a human being comes into existence. The passive one, pertains to the whole process of fertilization, which commences with sperm penetration of the secondary oocyte, and finishes with syngamy. In the latter case, as has been the praxis for these past hundred years, the terms ‘conception’ and ‘fertilization’ are interchangeable and throughout this thesis, unless specifically stated, the two terms will be taken to mean the same thing synonymously.

One ought also to clear the fact that in Norman Ford’s newer book³⁴, there is a substantial shift from his previous position to accepting the stronger possibility that human ontic development does actually start from conception for the reasons given above and not rather at the fourteen cell stage as previously held.

A human embryo, may, then be defined as a *totipotent single-cell, group of contiguous cells, or a multi-cellular organism which has the inherent actual*

³⁴ Ford, N.M., *The Prenatal Person – Ethics from Conception to Birth*, Blackwell Publishing, Oxford, 2002, pg. 56. See also Ford, N.M., *Politeia*, XXIII, 88, 2007, Emilio D’Orazio, Milan, pg. 122. “Once the first cell is formed the embryo’s genome is constituted and makes the embryo genetically unique and directs development throughout life. The genetic information encoded along the chromosomes’ gene programs and controls integrated differentiation into various types of cells, tissues structures and organs in a continuous coordinated biological process...the embryo is independent from (the mother) in relation to the genetic information required for orderly development to birth and beyond”.

*potential to continue species specific, i.e. typical, human development, given a suitable environment*³⁵.

One must now take up the cudgel to try to define the point, at what point a totipotent single cell exists during the process of fertilization.

³⁵ *Ibid.*

1

CHAPTER ONE

EMPIRICAL CONSIDERATIONS OF FERTILIZATION

There is no rest for the messenger until the message is delivered

Joseph Conrad *The Rescue*

1.1. *The Fertilization Process*

Fertilization is not to be thought of as a single moment but rather a process. It is essential that before one starts to examine the philosophical ramifications of this process, one has a complete understanding of the empirical facts. Embryologically, all authors agree that fertilization is a process but not all agree when the human embryo starts to exist. A number consider the human embryo to exist immediately upon penetration of the secondary oocyte by the sperm cell, many others consider the embryo to exist just prior to the formation of or upon the existence of the zygote. Taylor, Green, Stout and Soper, state quite equivocally that the actual act of fertilization occurs when the female pronucleus chromosomes fuse with the male pronucleus chromosomes¹. We now know that the pronuclei do not actually fuse, but

¹ Taylor, D. J., Green, N.P.O., Stout, G. W., Soper, R., *Biological Science 1&2*, Cambridge University Press, Cambridge, 1997, pg. 737.

just the same there is a coalescence of both pronuclear genetic inheritances, the chromosomes. This fact does not detract from the original argument as some are wont to claim. Moore clearly states that the fertilised oocyte or zygote is the unicellular embryo². Larsen, discounts the existence of the embryo at penetration, but claims that there is an embryo after the second meiotic division of the oocyte which he calls the *definitive oocyte*, which contains a diploid quantity of chromosomes and a 2N quantity of DNA. He refers to this stage as the zygote³. In January 2003, The President's Council on Bioethics, (PCB), of the USA, held a hearing on early human embryonic development by John. M. Opitz, M.D., Professor of Paediatrics, Human Genetics, and Obstetrics/Gynecology, School of Medicine, University of Utah. He states quite clearly that,

the essence of fertilization is not the fusion of the germ cells because that could not necessarily lead to development, but the process of karyogamy. That is the process of the male and female pronuclei so that the diploid number of chromosomes is reestablished, each pronucleus having a half number of chromosomes and only then can the spindle be set up for the first cell division in the beginning of development.

In another report of the PCB⁴, termed under the subheading 'Fertilisation and Cleavage', one find the following description,

their nuclear membranes disintegrate and the paternally and maternally contributed chromosomes pair up, an event called syngamy. In this integration, the diploid chromosome number is restored, and a new complete genome comes into being. The result of syngamy is an entity with an individual genome. Further, if all goes well, it is an entity that is capable of

² Moore, K.L., *The Developing Human: Clinically Oriented Embryology*, W.B. Saunders Company, Philadelphia, 1998, pg. 37.

³ Larsen, W.J., *Human Embryology*, Churchill Livingstone, Philadelphia, 2001, pg. 18.

⁴ The President's Council for Bioethics, *Notes on Early Human Development*, January 2004, pg. 7. www.bioethics.gov [10.01.2006]

developing into a fully formed individual of the species. The fertilized egg is now called a zygote.

R.E. Jones in the second edition of his book *Human Reproductive Biology*⁵, edited for internet lectures for teaching the biology of reproduction (1998), clearly defines conception as the fusion of the two pronuclei leading to the 2n zygote.

*T.W. Sadler*⁶, in *Langman's Medical Embryology*, under the heading of fertilization, considers the zygote as the two cell entity which is formed after the first cleavage division after syngamy has occurred. However, he does not consider fertilization as being over until this stage is reached and continually refers to the presence of the definitive oocyte after the 2nd meiotic division and the spermatozoon until coalescence of the two pro-nuclei, not intimating that there is a separate biological entity beforehand.

Shaw, Soutter and Stanton, describe how,

[t]he coming together of the gametic chromosomes, syngamy, is the final phase of fertilization. Immediately anaphase and telophase are completed, the cleavage furrow forms and the one cell zygote becomes a two cell embryo⁷.

F.Scott Gilbert, states that once the two pronuclear membranes break down and the male and female chromosomes coalesce,

instead of producing a common zygote nucleus (as happens in sea urchin fertilization), the chromatin condenses into chromosomes that orient

⁵ pg. 161-181. <http://courses.usd.edu/biol1429001/gi-html> [09.02.2005]

⁶ Sadler, T.W., *Langman's Medical Embryology*, Lippincott, Williams and Wilkins, Baltimore, 2004, pg.29.

⁷ Shaw, R. W., Soutter, W. P., Stanton, S. L., *Gynaecology*, Churchill Livingstone, New York, 1997, pg. 244.

themselves on a common mitotic spindle. Thus a true diploid nucleus in mammals is first not seen in the zygote, but at the two-cell stage⁸.

However he does not state there is a zygotic entity before coalescence of the two pronuclei.

*Günter Rager et al*⁹, hold that whether one can speak of a zygote already at the ootid stage or later at the beginning of mitosis, is only a question of definition, as the content of the genetic information does not change beyond this point¹⁰.

However as a standard, I will be taking the description put forward by *O’Rahilly and Muller*, in their classical text book *Human Embryology and Teratology*¹¹. This author (Ronan O’Rahilly) is considered to be the Dean of human embryology worldwide, and sits on the international *Nomina Embryologica Committee* now called the *Terminologia Embryologica Committee(DNI)*, which standardizes name giving in human embryology. The last revision of *Terminologia Embryologica* took place in October of 2010. It is the joint integer of the Federative International Committee for Anatomical Terminology (FICAT) and the member societies of the International Federation of Associations of Anatomists (IFAA) aimed at realising the the objectives of the General Assembly of the Federative World Congress of Anatomy held in Rio de Janiero in 1989. In O’Rahilly’s book, fertilization is descriptively divided into

⁸ Gilbert, Scott F., *Developmental Biology*, Sinauer Associates Inc., Massachusetts, 1997, pg. 154.

⁹ Boden-Heidrich, Ruth; Cremer, Thomas; Decher, Karl; Hepp, Hermann; Jäger, Willie; Rager, Günther; Wickler, Wolfgang.

¹⁰ Rager, Günther, *Beginn, Personalität und Würde des Menschen*, Alber, Freiburg/München, 1998, pg. 66-77.

¹¹ O’Rahilly, R., Muller, F., *Human Embryology and Teratology*, Wiley-Liss, Inc., New York, 2001, pg. 31.

fourteen cascading stages. These authors are also quoted by the *Human Anatomy Development Center* of Washington DC¹².

Stage 1. Passage of a spermatozoon between the follicular cells of the corona radiata is followed by contact and binding with human-specific glycoprotein spermatozoal receptors of the zona pellucida.

Stage 2. Acrosomal reaction. A strong binding occurs between the spermatozoon that has penetrated the corona radiata and zona pellucida. This connection between the intact acrosome and particular molecules on the zona is species specific. The acrosomal reaction is necessary for penetration of the zona. It is initiated by a glycoprotein known as ZP3 (studied in the mouse), and it is stimulated by a massive entry of extracellular calcium into the spermatozoon. Progesterone is probably also important. The reaction entails the liberation of enzymes (eg., acrosine and hyaluronidase) that allows penetration of the zona. A series of point fusions take place between the cell membrane and the underlying external acrosomal membrane, thereby causing gaps through which the acrosomal contents can diffuse. The external acrosomal membrane disintegrates and is shed. Exposure of the internal acrosomal membrane is necessary for spermatozoal penetration of the zona pellucida. The internal acrosomal membrane then fuses with the cell membrane of the oocyte.

Stage 3. Passage of the spermatozoon through the zona, which triggers meiosis II.

Stage 4. Fusion of cell membrane of spermatozoon and oocyte.

It is interesting to point out that the zona pellucida is not in direct contact with the oolemma of the secondary oocyte, but is separated by a space called the *perivitelline space*. Inside this space one finds the 1st and eventually the 2nd polar bodies. Therefore moving from the outside towards the inside of the oocyte one finds the corona radiata composed of loose cumulus cells, the zona pellucida, the perivitelline space, the

¹² http://nmhm.washingtondc.museum/collections/hdac/stage_1.htm [12.07.2005]

oolemma and the cytoplasm. The penetration of the sperm from the corona radiata to the oolemma takes about an hour¹³.

Stage 5. Entry of the spermatozoon into the ooplasm.

Stage 6. *Cortical Reaction*. Before fertilization, cortical granules, which accumulated at the diplotene phase, are situated peripherally in the oocyte, near the cell membrane. During fertilization, the contents of the cortical granules, are deposited in the subzonal space, which alters spermatozoal receptor molecules in the zona and induces the zonal reaction.

Stage 7. Extrusion of the polar body 2. Moreover, polar body 1 may divide into two, and it is thought that, under rare circumstances, each of the three polar bodies is capable of being fertilized. Dizygotic twinning is believed to arise from (a) two oocytes, (b) a binucleate oocyte, or (c) an oocyte and a polar body.

Stage 8. *Zonal Reaction*. A structural change in the receptors of the zona pellucida prevents binding of more spermatozoa and their penetration. Reactions in the zona and in the cortex of the oocyte are thought normally to block fertilization by more than one spermatozoon (polyspermy).

Stage 9. Formation of female pronucleus, the nuclear membrane of which develops from fusion of vesicles.

Stage 10. Dissolution of nuclear membrane and decondensation of chromatin and spermatozoon.

Stage 11. Reformation of nuclear membrane and reorganization of chromatin to form the male pronucleus.

Stage 12. Two pronuclei, which migrate to a central position in the **ootid**.

Stage 13. Coalescence of homologous chromosomes, resulting in a one-cell **embryo**. The two pronuclei do not fuse, but their nuclear envelopes break down and form vesicles. The two groups of homologous chromosomes then move together and become arranged on the first cleavage spindle.

Stage 14. Beginning of the first mitotic division of the zygote. The **zygote** is characteristic of the last phase of fertilization and is identified by the first cleavage spindle. It is a unicellular embryo and is a highly specialized cell. The

¹³ Leone, Salvino, *Rivista di Teologia Morale*, Vol. 28, No.149, 2006, 'La Questione Dell'Ootide:

combination of 23 chromosomes present in each pronucleus results in 46 chromosomes in the zygote. Thus the diploid number is restored and the embryonic genome is formed. The embryo now exists as a genetic unity. RNA synthesis occurs early during pronuclear formation and is followed by DNA synthesis after fertilization.

Items twelve to fourteen above are considered to constitute developmental **Stage One** (1) in human embryological development as per *Carnegie* staging nomenclature. This consists of twenty-three stages which cover the first eight weeks of development collectively known as the embryo.

“In 1887, Franklin P. Mall, who had studied under Wilhelm His, the ‘Vesalius of human embryology’ [Müller and O’Rahilly, 1986], began what became known the Carnegie Collection, which, in George Corner’s felicitous phrase, constitutes the embryological ‘Bureau of Standards’....stages 1-9 were established by O’Rahilly [1973], and the entire system was revised by O’Rahilly and Müller [1987] in a monograph that contains the appropriate references and has now become the standard account of the system...furthermore, to conform with staging systems used in other vertebrates, O’Rahilly replaced the term horizon by stage, changed Roman to Arabic numerals, and introduced the term Carnegie stage. The stages are based on both internal and external features”¹⁴.

Stage one is divided into three stages, 1a, 1b and 1c. The committee lists the names of each stage in its primary Latin terminology and in its current English usage. In the Latin nomenclature, the first term laid down in the column is the preferred term and is the term to be used in any translation into any vernacular language. All other terms

Evidenze Scientifiche e Valutazioni Bioetiche’, pg. 89-100.

¹⁴ O’Rahilly, R., Müller, F., ‘Developmental Stages in Human Embryos: Revised and New Measurements’, *Cells Tissues Organs* 2010;192;73-84.

are indicative alternatives but are not to be translated¹⁵. There are also unique identifying numbers listed concurrently. The first term in the Latin column for Carnegie Stage 1a is E2.0.1.2.0.0.7 and is termed the *Oocytus penetratus* (penetrated oocyte). That for stage 1b is E2.0.1.2.0.0.8 and is termed the *Ootidum* (ootid). The one for stage 1c is E2.0.1.2.0.0.9 and is termed *Zygoticum* (zygote). It is also interesting to observe that according to E2.0.1.1.0.1.23 *Syngamia* (syngamy) is defined as “[t]raditionally, syngamy has meant sexual reproduction or, more specifically, the fusion of gametes. However, in *in vitro* fertilization it has come to describe a stage, beginning some 21.32 hr after insemination, in which maternal and paternal chromosomes intermingle, although this is not easily discernable by ordinary microscopy”¹⁶.

It is essential to keep in mind that all this process takes between fourteen to twenty-four hours depending on each individual case. It is also important to point out that one must consider fertilization to have a beginning and an end, which beginning and end are laid out above. It certainly is not a single moment. One should also point out that even before any of the sperm approach the oocyte, on ovulation, the oocyte releases a chemical signal which attracts the sperm towards it by chemotaxis.

Therefore chemical contact between the sperm cells and the oocyte is established well before the sperm cells actually touch or come close to the surface of the oocyte itself.

One must remember that fertilization usually takes place within twenty-four hours of

¹⁵ General terms of Carnegies Stages of Human Embryological Development. Listed 21.04.10. <http://www.unifr.ch/ifaa/Public/EntryPage/ViewTE/TEe02.html> [03.04.11].

¹⁶ General terms of Carnegies Stages of Human Embryological Development. Listed 21.04.10. <http://www.unifr.ch/ifaa/Public/EntryPage/ViewTE/TEe02.html> [03.04.11].

ovulation and occurs within the ampulla of the Fallopian tube. To summarize, I shall lay out the time-frame *in vitro* which accompanies fertilization¹⁷:

Penetration of the Zona Pellucida	Between 30-40 minutes post-insemination
Fusion of the cellular membranes	From 45-60 minutes post-insemination (pi.)
Formation of the 2 nd Polar Body	From 2-8 hours pi.
Formation of the Pronuclei (PN)	From 3-12 hours pi.
Juxtapositioning of the PN	From 5-13 hours pi.
Replication of the chromosomes	From 8-17 hours pi.
Disappearance of the PN	From 15-30 hours pi.
First cellular division (cleavage)	From 18-35 hours pi.

It has recently been demonstrated that normal human embryos can develop from zygotes manifesting a single nucleus after IVF was performed (2-5%). This seems to represent a normal variant of human pronuclear association during syngamy as a normal variant of fertilisation. These findings may suggest, that the underlying cause of this single pronucleus would likely be the association of maternal and paternal genomes in a single pronuclear envelope during the course of syngamy¹⁸.

¹⁷ Nagy *et al.*, 1998; Payne *et al.*, 1997; Van Blerkom *et al.*, 1995; from *Il Processo Biologico della Fecondazione – Analisi della Possibilita di Congelare Ootidi*, pg.8-12. www.carloflamigni.com , [23.03.2005].

¹⁸ Levron, J., Munné, S., Willadsen, S., Rosenwaks, Z., Cohen, J., ‘Male and Female Genomes Associated in a Single Pronucleus in Human Zygotes’, *Biology of Reproduction*, 52, 653-657 (1995).

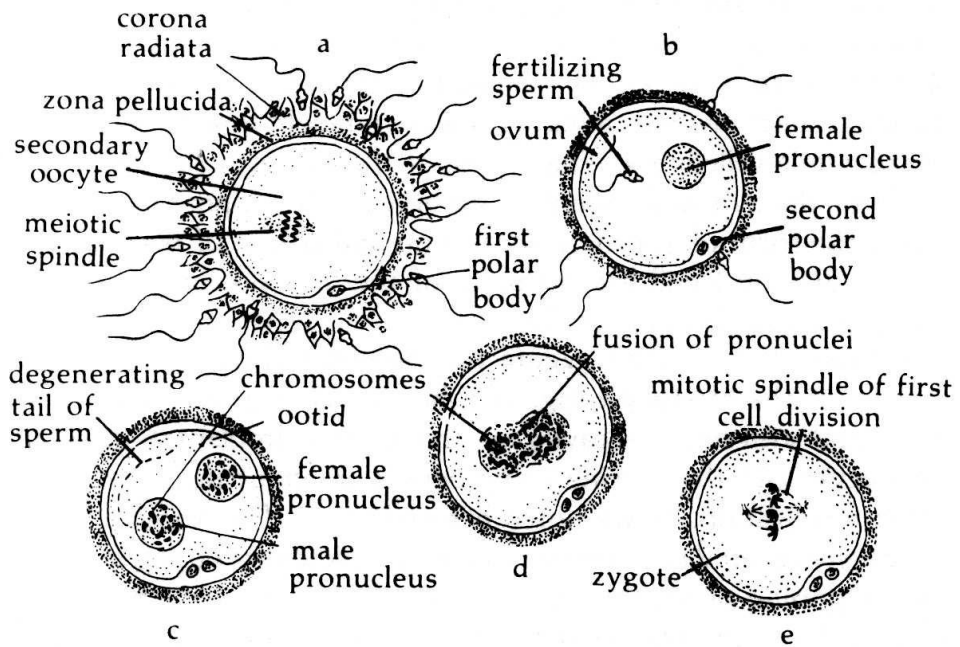


Fig. 1.1 Fertilization¹⁹

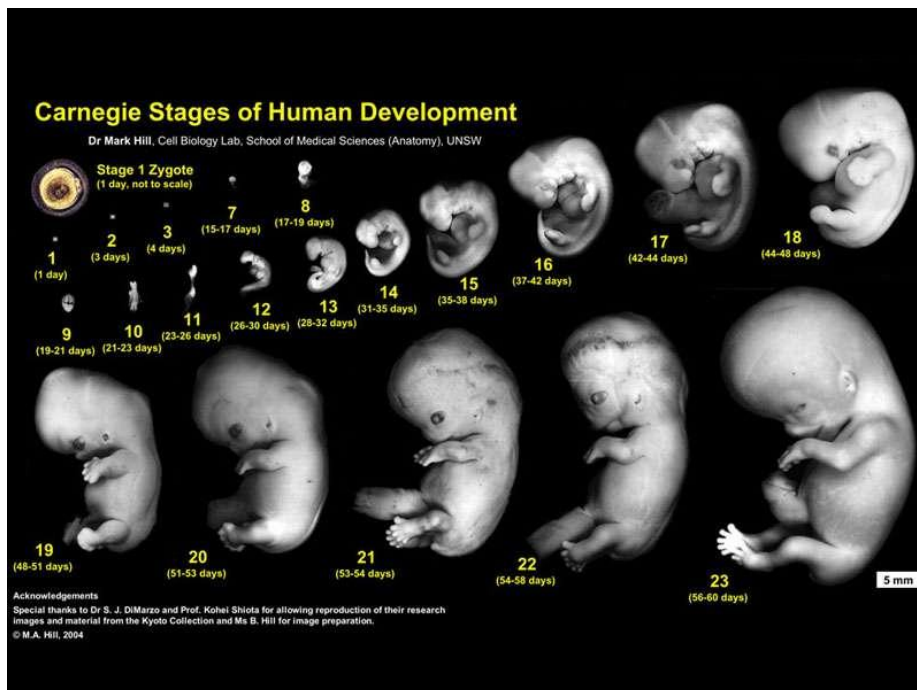


Fig. 1.2 Carnegie Stages of Human Development²⁰

¹⁹ www.highermeaning.org [20.05.08].

²⁰ www.embryology.med.unsw.edu.au [20.05.08].

1.2. Meiotic Division in Gametogenesis

Although a discussion about mitosis and meiosis would seem to be rather technical, elementary biology, it is essential to have a sound knowledge of these procedures to actually understand the issues surrounding the ethical constructs surrounding individuality.

Mitosis is the process whereby during ordinary cell division the chromosomes replicate in order to divide into two, providing each new cell with a replica of the previous chromosomal set up. This is the process used for ordinary growth in the human body and is an asexual form of reproduction. If this process goes wrong and the wrong genetic information is copied without correction for whatever reason, then a mutation is said to have occurred. On the other hand, meiosis (*meio*, to reduce) only occurs in the organs where gametes or germ cells are produced. The ovaries in the female and the testicles in the male producing ova and sperm cells respectively. In the female of the species, the meiotic processes actually start during the intrauterine life of the mother but stop at the phase of anaphase I until puberty. In the male the whole process occurs after puberty starts. In this process, the divisions involved prepare the cells for sexual reproduction whereby the number of chromosomes in the cell nuclei are halved so that on combination with another germ cell of the opposite sex, the normal chromosomal number is restored. Cells with a normal chromosomal number of 46 or 23 homologous pairs are termed as *diploid* while gamete cells with half the number of single chromosomes, that is 23, are termed *haploid*. Haploid cells therefore contain only half the number of chromosomes of diploid cells.

A very important consequence of meiosis is that the daughter cells produced are all genetically different to the original cell. Whereas in mitosis each parent cell produces two genetically identical or cloned daughter cells, in meiosis, each parent cell produces four genetically different daughter germ cells which then combine with a gamete from another parent to restore the original number of chromosomes, but with a completely different genetic variation. Meiosis therefore also produces a profound genetic variation of the daughter cells from the mother cell which is further profoundly enhanced when there is combination with the father cells which have undergone the same process. Therefore each primordial cell layer in the germinal layer of the seminiferous tubules in the testis produces four genetically different sperm cells, and each primordial oocyte in the ovary, gives rise to four genetically different germ cells! However whereas in the testis all the sperm cells produced are all the same size and all capable of fertilization, in the ovary, out of the four germ cells produced, only one, the secondary oocyte which changes into the mature ovum, usually actually participates in the fertilization process. This is usually the much bigger gamete containing a larger share of the cytoplasm, while the other three germ cells contain very little cytoplasm and do not usually partake in fertilization although this is by no means impossible. These germ cells are referred to as the polar bodies of which there are three. The nucleus in each polar body is genetically different to the nuclei in the other polar bodies and also to that in the mature ovum.

In mitosis, although we have a continuous process, we subdivide the process descriptively into the following²¹;

Interphase

Often mistakenly called **resting stage**. Variable duration depending upon function of the cell. Period during which cell normally carries out synthesis of organelles and increases in size. The nucleoli are prominent and actively synthesizing ribosomal material. Just prior to the cell division the DNA and histone of each chromosome replicates. Each chromosome now exists as a pair of **chromatids** joined together by a **centromere**. The chromosomal material will stain and is called **chromatin** but structures are difficult to see.

Prophase

Usually the longest phase of division. Chromatids shorten (to 4% of their original length) and thicken by **spiralisation** and condensation of the DNA protein coat. Staining shows up the chromatids clearly but the centromeres do not stain. The position of the centromeres varies in different chromatid pairs. In animal cells and some plants, the **centrioles** move to opposite poles of the cell. Short **microtubules** may be seen radiating from the centrioles. These are called **asters** (*astra*, a star). The **nucleoli** decrease in size as their nucleic acid passes to certain pairs of chromatids. At the end of prophase the nuclear envelope fragments into small vesicles which disperse and a spindle is formed.

Metaphase

The pairs of chromatids become attached to the spindle by **spindle fibres** at their centromeres. The chromatids move upwards and downwards along the spindle until their centromeres line up across the '*equator*' of the spindle and at right-angles to the spindle axis.

²¹ Green, N.P.O., Stout, G.W., Taylor, D.J., Soper, R., *Biology*, Cambridge University Press,

Anaphase

This stage is very rapid. The centromeres split into two and the spindle fibres pull the daughter centromeres to opposite poles. The separated chromatids, now called **chromosomes**, are pulled along behind the centromeres.

Telophase

The chromosomes reach the poles of the cell, uncoil, lengthen and lose the ability to be seen clearly. The spindle fibres disintegrate and the centrioles replicate. A nuclear envelope re-forms around the chromosomes at each pole and the nucleoli reappear. Telophase may lead straight into **cytokinesis** (cell division).

In meiosis²², the process is longer and is divided into two parts meiosis I where the original diploid cell splits into two and where the genetic variation occurs at *crossover*, and meiosis II, where each cell is further subdivided into two so that a total of four cells are obtained. Meiosis II is actually mechanically similar to the process of mitosis.

Interphase

Variable length depends upon species. Replication of cell organelles and increase in size of cell. Most of the DNA and histone is replicated in premeiotic interphase but some is delayed and prolonged into early meiotic prophase I. Each chromosome now exist as a pair of chromatids joined together by a centromere. Chromosomal material will stain but no structure clear except prominent nucleoli (as for mitosis).

Cambridge, 1994, pg. 798-807.

Prophase I

The longest phase. It is often described in five stages called **leptotene**, **zygotene**, **pachytene**, **diplotene** and **diakinesis** but will be considered here as a progressive sequence of chromosomal changes.

(a) Chromosomes shorten and become visible as single structures. In some organisms they have a beaded appearance due to regions of densely stained material called **chromomeres** alternating with non-staining regions. Chromomeres are regions where the chromosomal material is tightly coiled.

(b) Chromosomes derived from maternal and paternal gamete nuclei come together and pair up. These are **homologous chromosomes**. Each pair is the same length, their centromeres are in the same position and they usually have the same number of genes arranged in the same linear order. The chromomeres of the homologous chromosomes lie side by side. The pairing process is called **synapsis** and it may begin at several points along the chromosomes which then completely unite as if zipped up together. The paired homologous chromosomes are often described as **bivalents**. The bivalents shorten and thicken. This involves both molecular packaging and some visible coiling (or **spiralisation**). Each chromosome and its centromeres can now be seen clearly.

(c) The homologous chromosomes of the bivalents now fall apart and appear to repel each other partially. Each chromosome is now seen to be composed of two **chromatids**. The two chromosomes are seen to be joined at several points along their length. These points are called **chiasmata** (*chiasma*, a cross). It can be seen that each chiasma is the site of an exchange between chromatids. It is produced by breakage and reunion between two of the four strands present at each site. As a result, genes from one chromosome become attached to genes from the other chromosome leading to new gene combinations in the resulting chromatids. This is called **genetic crossing over**.

²² *Ibid.*

The two chromosomes do not fall apart after crossing over (chiasma formation) because sister chromatids (of both chromosomes) remain firmly associated until anaphase.

(d) The chromatids of homologous chromosomes continue to repel each other and bivalents assume particular shapes depending upon the number of chiasmata. Bivalents having a single chiasma appear as open crosses, two chiasmata produce a ring shape and three or more chiasmata produce loops lying at right angles to each other. By the end of prophase I, all chromosomes are fully contracted and deeply stained. Other changes have occurred within the cell including: the centrioles (if present) migrate to the poles, the nucleoli and nuclear envelope disperse and then the spindle fibres form.

Metaphase I

The bivalents become arranged across the equatorial plate of the spindle. Their centromeres (although often visibly double) behave as though single and organize spindle fibres pointing towards only one of the poles. Gentle pulling from these fibres places each bivalent on the equator, with each centromere equidistant above and below it.

Anaphase I

The two centromere of each bivalent do not divide, but sister chromatid adhesion ends. Spindle fibres pull whole centromeres, each attached to two chromatids, towards opposite poles of the spindle. This separates the chromosomes into two haploid sets of chromosomes in the daughter cells.

It is important to point out here, that the two sister chromatids, because of crossing over at the chiasmata during anaphase I, no longer contain the same genetic information, even though at this stage of events they technically form one

chromosome. It is one chromosome with two homologous but very genetically different chromatids.

Telophase I

The arrival of homologous centromeres and their pairs of chromatids at opposite poles marks the end of the first meiotic division. Reduction of chromosome number has occurred but each pole possesses chromosomes composed of two chromatids. As a result of crossing over, or chiasma formation, **these chromatids are not genetically identical** and must be separated in the second meiotic division. Spindles and spindle fibres usually disappear. In animals and some plants, the chromatids usually recoil and a nuclear envelope reforms and the nucleus enters interphase. Cleavage (animals) or cell wall formation (plants) then occur as in mitosis. In many plants there is no telophase, cell wall formation or interphase and the cell passes straight from anaphase I into prophase of the second meiotic division.

In the human species, it is **at this stage that sperm penetration occurs** when there is still the second meiotic division left to proceed for meiosis to finish. At this stage, one of the cells is called a secondary oocyte and is not yet the definitive oocyte or ovum. This happens at the completion of the second meiotic division. In the secondary oocyte there is also contained within the zona pellucida, the 1st polar body. These are the by-products of the first meiotic division. Only after penetration by a sperm cell has occurred or only after artificial stimulation of the secondary oocyte, does the oocyte start its second meiotic division.

Interphase II

This stage is present usually only in animal cells and varies in length. There is no S-phase and no further DNA replication occurs. The processes involved in

the second meiotic division are mechanically similar to those of mitosis. They involve separation of the chromatids of both daughter cells produced during the first meiotic division. The second meiotic division differs from mitosis mainly in that (a) these sister chromatids are often separated at metaphase II (not at mitosis) and (b) the haploid number of chromosomes is present.

Prophase II

This stage is absent from cells omitting interphase II. The length of the stage is inversely proportional to the length of telophase I. The nucleoli and nuclear envelopes disperse and the chromatids shorten and thicken. Centrioles if present, move to opposite poles of the cells and spindle fibres appear. They are arranged with their axes at right angles to the spindle axis of the first meiotic division.

Metaphase II

At this division the centromeres now behave as structurally double. They organize spindle fibres on each side to both poles and hence become aligned on the equator of the spindle.

Anaphase II

The centromeres divide and the spindle fibres pull the two double centromeres to opposite poles. The separated chromatids, now called chromosomes, are pulled along behind the centromere.

Note that at this stage the two homologous but **genetically different** sister chromatids become the new different chromosomes of two new cells. No one can claim these two cells to be genetically the same.

Telophase II

This stage is very similar to that found at mitosis. The chromosomes uncoil, lengthen and become very indistinct. The spindle fibres disappear and the centrioles replicate. Nuclear envelopes reform around each nucleus which now possesses half the number of single chromosomes of the original parent cell (haploid). Subsequent cleavage (animals) or cell wall formation (plants) will produce four daughter cells from the original single parent cell.

These four daughter germ cells are genetically completely different from each other and will combine with one of another four daughter cells of a different parent of a different sex, to undergo fertilization. In the case of the sperm cells, all sperm released into the female are already at this stage and therefore all sperm cells have a different genetic composition. In the case of the human female gametes, it is important to point out however, that at the start of fertilization, the oocyte is still at the stage of telophase I. Sperm penetration sets off interphase II. Therefore as pointed out above, at penetration the complex inside the zona pellucida consists of a very large secondary oocyte and a very small 1st polar body containing different genetic material. The sperm is inside the secondary oocyte when the changes during the second meiotic division occur. The result is four gametes, all genetically different before the male pronucleus has joined to any of the other four female nuclei which all have this potential although not to the same extent.

At the end of meiosis II, one finds the following structures within the zona pellucida. The genetic material in the secondary oocyte splits into two, to produce the 2nd polar body and the definitive ovum. The sperm inside the definitive ovum has the greatest chance of combining with the genetic material within the same definitive ovum and

usually does so. At this stage the definitive ovum is called the *ootid*. The second polar body is generally discarded to the side of the ootid together with the 1st polar body which has meanwhile also started its meiosis II division to produce two other polar bodies. So that the actual product of meiosis II in the human female, during fertilization, is one definitive ovum or ootid and three polar bodies all containing different genetic material. The polar bodies usually degenerate after the male and female pronuclei go through syngamy (karyogamy) in the ootid, whereupon the zygote is formed which immediately starts to go through ordinary mitotic division during *cleavage* to form two cells which then undergo mitosis to form four cells, so on and so forth. We shall see that although the male pronucleus formed from the sperm, in the ootid usually unites with the female pronucleus of the definitive ovum to form the zygote after syngamy, this is not always the case. It is also very important to keep in mind that the second meiotic division of the secondary oocyte need not be precipitated only by sperm penetration, but can also be artificially induced by pricking of the zona pellucida by a sharp instrument such as a needle²³.

1.3. *Transcription and Translation*

It is essential at this stage to take a look at the processes of transcription and translation. One should keep in mind that chromosomes are made of DNA and that specific sections of chromosomes are called genes. *Transcription* is the process whereby the genetic code written on DNA molecules, usually inside the cell nucleus, is copied onto strips of other nucleic acids called *ribonucleic Acid* or *RNA* for short. This type of RNA is called *messenger RNA* or *m-RNA* for short. Lengths and type of RNA vary according to size and function. They can be very short or quite long. M-

²³ Talk by Professor Alex Felice (molecular genetics) of the University of Malta to the *Bioethics*

RNA can then act either to regulate genetic expression through m-RNA cleavage from the same or different chromosomes, or they can repress translation. These are called the small non-coding m-RNAs or microRNAs (ncRNAs, miRNAs) that is, they are usually the short nucleotides²⁴.

Consultative Committee vide minutes for 25 October 2005.

²⁴ *Science*, Vol. 309, 2 September 2005, pg.1454.

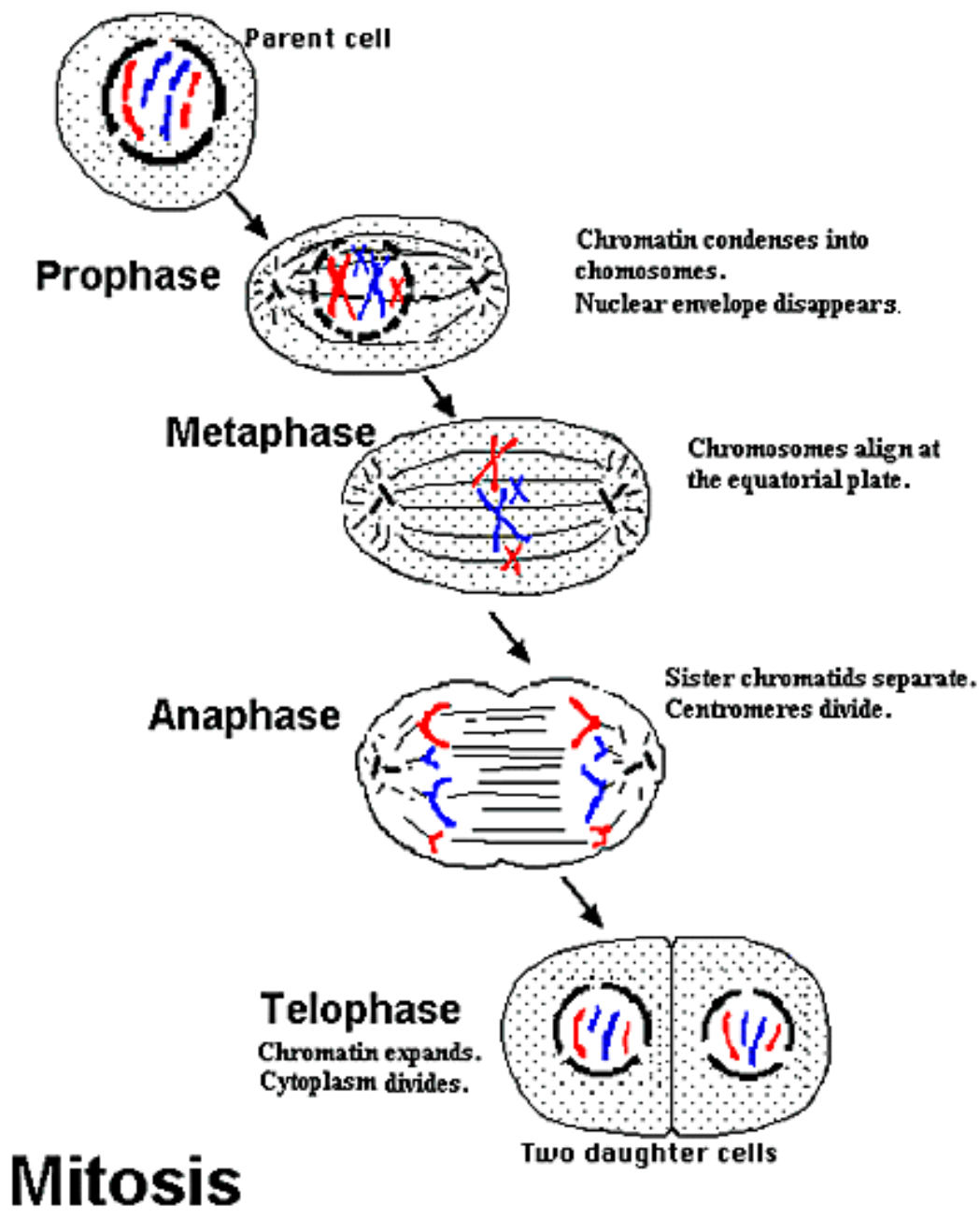


Fig. 1.3 Mitosis²⁵

²⁵ www.nte-serveur.univ-lyon1.fr [08.05.2008].

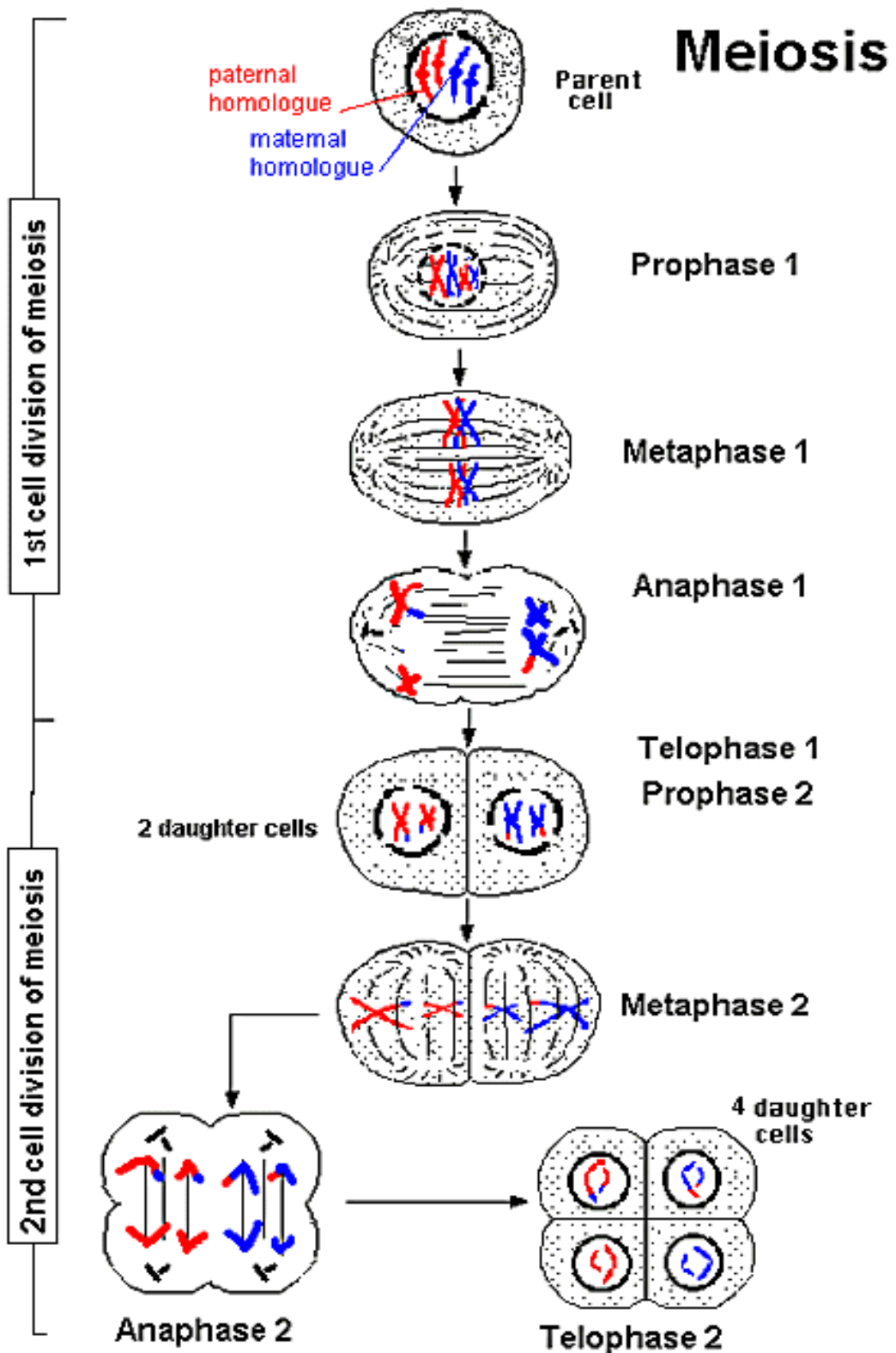


Fig. 1.4 Meiosis²⁶

²⁶ www.nte-serveur.univ-lyon1.fr [08.05.08].

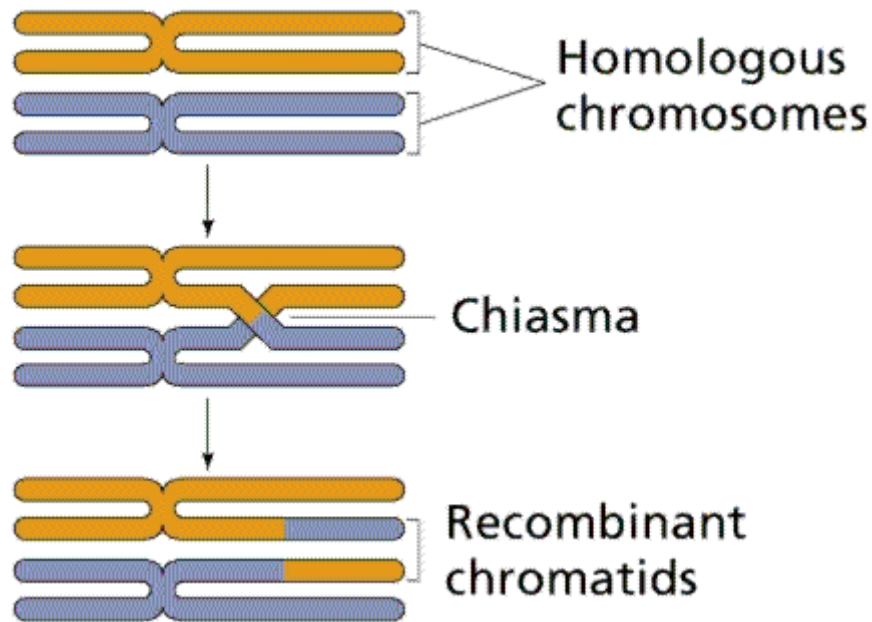


Fig.1.5 Genetic crossover²⁷

M-RNA can also be coding, whereby they transfer to the cytoplasm, if that is their function, and they come to anchor on a type of RNA called *ribosomal RNA* or *r-RNA*.

The function of r-RNA is to act as an anchor and open up the strands of m-RNA for reading the transcribed or transcribed material therein. A third type of RNA is called *transfer RNA* or *t-RNA*. T-RNA is composed of nucleotides which have the capacity to attach at their long ends, to amino-acids of different types. Amino acids are the basic building blocks of proteins. Once the m-RNA is anchored and opened up for reading, the t-RNA attaches specifically to the open sites of the m-RNA so that a chain of t-RNA is produced with the amino acids at its free ends. The specificity of the t-RNA corresponds to the specificity of both the m-RNA and the amino acids so that according to the code on the m-RNA, which is actually a nucleotide copy of the

²⁷ www.emc.maricopa.edu [08.05.2008].

DNA in the nucleus, a specific chain of t-RNA is produced. Once the amino acid chain is held in close proximity, these unite to each other and break off from the t-RNA, so that at the end of this process we are left with new chains of proteins which are specifically coded for, by the original information in the DNA molecules in the nuclei (there is also DNA in the mitochondria in the cytoplasm but for clarity's sake we shall leave this out of the discussion). This process, whereby the information from the m-RNA is specifically translated into proteins, which are the physical building blocks of life, is called *translation*.

The original code inside the DNA molecules is called the genetic code or *genotype* of an individual. It is specific to that individual cell unless twinning or mitosis has occurred. This genotype is then said to translate into the actual *phenotype* of the proteins actually produced by translation. If there is an individual with a genotype for blue eyes there is the potential for blue eyes in that individual. The potential becomes actual, when those same genes are translated into the phenotype by building proteins for blue eyes to actually result in a blue-eyed individual. Not all DNA in chromosomes is actually translated, as this depends on other regulating strands of DNA inside the same or other chromosomes (mediated by short m-RNA strands). Some strands of DNA in chromosomes have either an unknown function or are useless for translation being a by-product of evolution. This is called junk DNA which is by no means junk but rather DNA of unknown function.

1.4. *MET and ZGA*

When I was writing my previous thesis on bioethics, I was led to believe that during the early hours of fertilization, new proteins were produced by translation, after the

penetration of the sperm into the ovum (*vide introduction*). This is true to an extent, however what was not known by me earlier, was the important fact that these newly translated proteins in the secondary oocyte and ootid were not mediated by the new transcripts of the male and female pronuclei, but were derived from maternal transcripts that already existed in the secondary oocyte even before fertilization and were totally inherited from the mother's genes. This means that all new translated proteins produced just after fertilization, are maternal in origin and are not transcribed or translated by the new genomes in the ootid, but by the genome in the mother from whom the ootid was derived²⁸. It is also known that the whole process of fertilization is actually concerted by these inherited m-RNA in the secondary oocyte and ootid. It is only after syngamy has taken place and the new zygote with a new diploid genome is produced that new translated proteins specific to the new genome start to be appear in man, at the four cell stage of blastular development (two cell stage in mouse). It is therefore only now that the phenotype of the individual human being as coded by the new genome, actually starts to be physically laid down. This is called maternal to embryonic transfer of developmental control²⁹ & ³⁰ or *MET*, because the control of development is passed from the maternal genes to the zygotic genes which start to express themselves instead. Once the zygote genome is activated, it is called zygotic genome activation or *ZGA*³¹ and it is evident that *ZGA* only occurs after syngamy. It

²⁸ Gilbert, S.F., 1997, 'Early Research Documenting Stored Maternal m-RNAs', *Developmental Biology Online*, April 18, 2003 <http://www.devbio.com/printer.php?ch=5&id=52>, 2003. Gilbert, S. F. 1997. <http://www.devbio.com/about.php> [12.04.2005].

²⁹ Allan King, W., 'Maternal to Embryonic Transition of Developmental Control', *Bovine Embryo Gene Collection*, 2003 <http://www.bege.crbr.ulaval.ca/themes/themes3.htm> [03.04.2005].

³⁰ Schulz, Richard M., The Molecular Foundations of the Maternal to Zygotic Transition in the Preimplantation Embryo, *Human Reproduction Update*, Vol.8, No.4, pg. 323-331, European Society of Human Reproduction and Embryology, 2002.

³¹ Bloor, D.J., Metcalfe, A.D., Rutherford, A., Brison, D.R., Kimber, S.J., 'Expression of Cell Adhesion Molecules during Human Preimplantation Embryo Development', *Molecular Human Reproduction*, Vol. 8, No.3,237-245, European Society of Reproduction and Embryology, 2002, <http://molehr.oupjournals.org/cgi/content/full/8/3/237> [24.03.2005]. See also identifying number E2.0.1.1.0.1.27 in the *Terminologia Embryologica – Activatio prima genorum zygoticum* (First

is a well documented fact that until MET occurs, although the ootid may be already transcribing genes from the separate pronuclei (PN), there is no actual translation of these genes.

[W]e noticed a dramatic reprogramming of transcription and translation during preimplantation development in a stage-specific way. In the D2-D3 (4-cell to 8-cell embryo) and D3-D5 (8-cell embryo to blastocyst) transition, the number of transcripts that had increasing or decreasing expression was approximately the same. However in the MII-D2 (metaphase II oocyte to 4-cell embryo) transition, more transcripts had decreasing expression than increasing expression. This ‘unbalance’ may be due to the large scale degradation of maternal transcripts and lower number of newly activated transcripts during this stage³².

Transcription/translation coupling does not occur, as it seems possible that both the inherited genetic material in the male PN and the inherited genetic material in the female PN, need to come together in the same nucleus for translation to occur. This is born out by events, but also by other observations in living human cells. In a study on children with sickle cell disease, the Hb S allele is on chromosome 11, while the alpha thalassaemia one is on an allele of the alpha globulin genes on chromosome 16. Thus the interplay on developmental phenotypes occurs due to chromosomes from either of both parents³³. There is no ZGA prior to syngamy, at least not to the degree necessary for the go ahead of translation of the zygotic genome and therefore no

transcription ZGA1 which is listed following the formation of the embryonic genome following syngamy at E2.0.1.1.0.1.26), “This first transcription produces only a minor population of mRNAs whereas the second transcription (ZGA2) in the two celled embryo produces a major population: most maternal mRNA is degraded at this time although maternal proteins persist into the blastocyst stage (Selwood L, Johnson MH. Trophoblast and hypoblast in the monotreme, marsupial and eutherian mammal: evolution and origins. *BioEssays* 2005;28:128-145)” in <http://www.unifr.ch/ifaa/Public/EntryPage/ViewTE/TEe02.html> [03.04.11].

³² Zhang, P., Zucchelli, M., Bruce, S., Hambiliki, F., Stavreus-Evers, A., *et al*, ‘Transcriptome Profiling of Human Pre-Implantation Development’, *PLoS ONE*, 4 (11): e7844. doi:10.1371/journal.pon.0007844

³³ Felice, A.E., McKie, K.M., Cleek, M. P., Marino, E.M., Kutlar, A., McKie, V.C., ‘Effects of alpha-Thalassaemia-2 on the Developmental Changes of Hematological Values in Children with Sickle Cell Disease from Georgia’, *American Journal of Haematology*, 25: 389-400 (1987).

MET is possible prior to syngamy. In the mouse, MET is observed by the two to four cell stage, while in man, it is noted between the four to eight cell stage³⁴ & ³⁵.

1.5. Mutations and Genetic Changes

When a single celled organism, which contains homologous sets of chromosomes, such as protists, divide, they do so by a process of mitosis. This simply replicates the double DNA strands in the cell so that this genetic inheritance is passed on to future generations of cells. This genotype translates into the phenotype of the specific organism. This goes on uninterrupted for several millions of generations, and as long as the genotype is intact, it guarantees the individual characteristics of that particular species. Spontaneous mutations are rare and are unlikely to occur more than once in many millions of divisions. They are more likely to be precipitated by external environmental factors such as radiation or certain chemicals. When the mutation does occur, the genotype is changed and if the mutation occurs in part of the DNA that is not presently considered superfluous, a new phenotype may be expressed. Mutations can occur in any region of the genome; however, phenotypic changes are only observed in the organism if a mutation occurs in the sequence of a gene. Cells employ DNA repair mechanisms to correct mistakes in the base sequence of DNA molecules, and there are several different types of repair mechanisms. Some mutations are of course completely lethal to the organism³⁶.

³⁴ Braude, P., Bolton, V., Moore, S., 'Human Gene Expression First Occurs between the Four- and Eight-cell Stages of Preimplantation Development', *Nature*, Vol. 332, 31 March 1988, pg. 459-461.

³⁵ Mayer, W., Nivelau, A., Walter, J., Fundele, R., Haaf, T., Demethylation of the Zygotic Paternal Genome, *Nature*, Vol. 403, 3 February 2000.

³⁶ Elrod, S. L., Stansfield, W. D., *Schaum's Outline of Theory and Problems of Genetics*, Mc Graw Hill Companies, USA, 2002, pg. 99-106.

After *Gregor Mendel's* work, a gene was defined as a discrete factor that controlled a given phenotype. Today, since it is now known that DNA sequences may also code for RNA sequences forming t-RNA and r-RNA, the definition of a gene may be changed to that of a *transcription unit* or a region of DNA (on a chromosome or mitochondrion), between the sites of initiation and termination of transcription. Thus a gene has the following characteristics, (1) the physical unit of heredity, (2) a sequence of DNA that occupies a particular locus on a chromosome (or mitochondrion), and (3) codes for a functional product such as a protein or RNA molecule³⁷.

The more the genetic changes which occur are profound, the greater the difference in the phenotype which results after translation. One should also keep in mind that the genetic component of a cell forms a necessary component of the identity of such a cell³⁸. However it is essential to note that mutations occur in one individual cell and that once that mutation occurs and is not corrected, that changes the individual character of that particular cell. Other genetic changes may occur which involve the movement of genetic material from one cell to the other. This also leads to changes in genotype and phenotype. These processes include, *transformation, transduction* and *conjugation*. The important thing to keep in mind is that once a genetic change occurs to a unicellular organism, then the individual character and plan of that organism changes, and the greater the genetic changes, the greater the change in the nature of its individuality³⁹ and that of its progeny.

³⁷ *Ibid.*, pg. 106.

³⁸ Professor Alex Felice. *Op.cit.*

1.6. Epigenetic Changes of the Genome

Eukaryotic DNA is primarily associated with a basic class of proteins known as *histones*. Together, the DNA, histones, and nonhistone chromosomal proteins form nucleoprotein (nucleosome), or *chromatin*. In the first level of packaging, a specific length of the double-stranded DNA molecule is wrapped around a specific number of different histone proteins to form a *nucleosome*. A fifth kind of histone protein occupies the linker DNA that connects one core particle with another (analogous to beads on a string). “This ‘string’ first coils up into a solenoid and then into a filament. Even higher levels of compaction occur during cell division when, under the light microscope, the chromatin material seems to condense from an amorphous chromatin mass into distinctive chromosomes”. Nonhistone proteins (including various DNA and RNA polymerases, regulatory proteins, etc.) can also be found associated with chromatin, but they are not responsible for the basic structure of chromatin⁴⁰.

Although the genome present in all the cells of an individual organism is the same, the potential for transcription and translation changes in each specific cell line in order to have differentiation. Thus although in a human being the genome of a liver cell and of a heart cell are the same, there are specific chemical radicals which attach to specific sites of the genome in order to differentiate cellular development, so that the liver cell in this case may develop differently to the heart cell. The addition of a methyl group to the cytosine residue in a CG (cytosine-guanine dinucleotide), known as CpG methylation, is involved in gene silencing in DNA and thus in phenotypical changes

³⁹ Turk, D.C., Porter, I.A., *A Short Textbook of Medical Microbiology*, Hodder and Stoughton, London, 1982, pg. 33-34.

⁴⁰ Elrod, S. L., Stansfield, W. D., *Schaum's Outline of Theory and Problems of Genetics*, Mc Graw Hill Companies, USA, 2002, pg. 217. See also Cooper, G.M., Hausman, R.E., *The Cell: A Molecular Approach* (3rd ed.), ASM Press, Washington DC, 2004, pg. 150-153 and 256-261.

independent from the primary genome sequence. Therefore unlike genetic alleles, epialleles have the same genetic DNA sequence but differ in their epigenetic signals. These signals may exist in *cis* or in *trans*, that is on the same DNA strand or on different DNA strands respectively. Inheritance of epigenetic signals occurs in both mitotic and many may occur in meiotic cell division⁴¹.

Zygotic Genome Activation (ZGA) is the main developmental transition occurring after fertilization and it is the *central point* wherein embryonic control of development takes over from its maternal counterpart. It is a known fact that prior to ZGA, the paternal and maternal genomes, (though at different embryonic stage) undergo chromatin remodelling that includes various degrees of demethylation, in order to present a clean slate for the new genome to translate into a new phenotype⁴². The difference between a totipotent and a pluripotent embryonic cell, is that the totipotent cell is unmethylated and has the full potential to develop as an embryo, while the pluripotent cell has already started to differentiate into specific cells by selective methylation of the genome and therefore specific differentiation.

As already mentioned, following syngamy and ZGA, the (previously pronuclear) genomes must generally be first demethylated to clear the parents' methylation pattern, before they may be re-methylated according to the new zygotic genome

⁴¹ Bonasio, R., Shengjiang, T., Reinberg, D., 'Molecular Signals of Epigenetic States' and Bourc'his, D., Voinnet, O., 'A Small-RNA Perspective on Gametogenesis, Fertilization, and Early Zygotic Development', both in *Science*, Vol. 330, 29.10.10, pg. 612-622.

⁴² Feng, S., Jacobsen, S.E., Reik, W., "Epigenetic Reprogramming in Plant and Animal Development", *Science*, Vol. 330, 29.10.10, pg. 625. "Genome-wide epigenetic reprogramming occurs in mammalian development at two stages: in primordial germ cells (PGCs) primarily once they have reached the embryonic gonads (embryonic day E 10.5 to E 13.5), and in the early embryo beginning in the zygote immediately after fertilization and extending to the morula stage".

pattern. It is a known fact that the paternal genome is actively and significantly demethylated within hours of the start of fertilization⁴³, while the maternal genome is demethylated after several cleavage divisions (post-fertilisation) of the zygote until the blastocyst stage (ICM)⁴⁴. This difference in the demethylation rates could be accounted for by drastic changes in the histone complement (the protein backbone upon which the DNA strand spools in chromatin) that occurs during spermatogenesis in contrast to the minor changes in the oocyte. In the maternal genome, demethylation is slower and is most significant during the second and third cleavage stages in mice⁴⁵ and there is evidence that its timing is species specific.

It has been shown that the acetylation, of histones and the remodelling of the chromatin in the pronuclear chromosomes is dependant on the replacement of the sperm chromosomal proteins such as protamine, by maternally provided histones early in fertilisation. This process itself is determined by maternally inherited RNA transcripts in the secondary oocyte⁴⁶ from the mother's genome (a smaller quantity are also inherited from the father through the sperm, at least in mice)⁴⁷ and will not occur if the transcripts, such as those of the Hira gene, are missing due to genetic aberrations in the mother's genome and thus stopping the process of fertilization. Not only that, but it seems to be the case that for this process to proceed smoothly,

⁴³ Feng, S., Jacobsen, S.E., Reik, W., "Epigenetic Reprogramming in Plant and Animal Development", *Science*, Vol. 330, 29.10.10, pg. 625. "Notably, demethylation of the paternal genome may occur in two phases, one before DNA replication and one associated with the S and G2 phases.

⁴⁴ *Ibid.*, at E 3.5, pg. 626.

⁴⁵ Mayer, W., Niveleau, A., Walter, J., Fundele, R., Haaf, T., 'Demethylation of the Zygotic Paternal Genome', *Nature*, Vol. 403, 3 February 2000, pg. 501-502.

⁴⁶ Loppin, B., Bonnefoy, E., Anselme, C., Laurencon, A., Karr, T.L., Couble, P., 'The histone H3.3 chaperone Hira is essential for chromatin assembly in the male pronucleus', *Nature*, Vol. 437, 27 October 2005, pg. 1386-1390.

⁴⁷ Choi, C.Q., 'RNA can be a hereditary molecule', *The Scientist*, 25th May 2006. <http://www.the-scientist.com/news/display/23494> [09.04.10].

transcripts are also necessary from the maternal granulosa cells which surround the secondary oocyte. Companion granulosa cells therefore play an active role in modulating the transcriptional activity of the oocyte genome⁴⁸.

Therefore, there is an element of gene expression in cells that is caused by mechanisms other than those in the cellular DNA sequence and which might even be passed on to future offspring lasting for multiple generations without there being any change in the underlying DNA sequence. This element of expression is referred to as the epigenetic expression of the genome as it is over and above the DNA sequence.

Epigenetic effects...involve heritable but potentially reversible alterations in gene expression without changes in nucleotide sequence⁴⁹.

One may also define epigenetics as “the sum of the alterations to the chromatin template that collectively establish and propagate different patterns of gene expression (transcription) and silencing from the same genome”⁵⁰. Methylation of DNA is only one form of how the molecular mechanism of epigenesis may be expressed. Chemical tagging of the histone protein tails including methylation, acetylation, phosphorylation, glycosylation and other mechanisms, change the histone-DNA interaction and the interaction of nonhistone protein with chromatin essentially altering the transcription of the DNA molecule itself and therefore

⁴⁸ De La Fuente, R., Eppig, J. J., ‘Transcriptional Activity of the Mouse Oocyte Genome: Companion Granulosa cells Modulate Transcription and Chromatin Remodeling’, *Developmental Biology* 229, Academic Press, 2001, pg. 224-236.

⁴⁹ Jakowitsch, J., Papp, I., Moscone, E.A., van der Winden, J., Matzke, M., Matzke, A.J.M., ‘Molecular and cytogenetic characterization of a transgene locus that induces silencing and methylation of homologous promoters in *trans*’, *The Plant Journal*, (1999) 179(2), pg. 131.

translation⁵¹. This is how the natural environment and other nurturing factors can alter genetic expression in human beings. Lamarck has in fact been partially vindicated! Evolutionary mechanisms are evidently both Darwinian and Lamarckian.

There are several issues in epigenesis that may throw a light on the issue of the beginning of human life. First of all, as already alluded to, epigenesis does not occur only due to the methylation/demethylation of the DNA as seen above but also due to the modification of the amino acids that make up the histone proteins⁵². These new amino acid changes may modify the shape of the histone sphere. These modified histones may then be carried into new copies of DNA wherein these same histones may act as templates setting off the surrounding molecules in the nucleosome to change their own new shape modelled on the template of the original modified histone molecule, much like an infective prion does to other normal proteins in the human body.

These modified histones would ensure that the epigenetic effects would give rise to a change in gene expression. Would this effect be limited to neighbouring nucleosome molecules on the same chromosomes alone or would they even effect nucleosomes on neighbouring or homologous chromosomes? (In fact infective prions causing a conformational state are found to be one of the mechanisms by which epigenesis may occur⁵³). If this is found to be so, in this latter case, it is obvious that for the human

⁵⁰ Grech, A., Baldacchino, S., Tufignio, m., 'Epigenetics and its Medical Repercussions', *Maltese Family Doctor*, Vol. 19 - Issue 01 December 2010, pg. 10. Quoted from Allis, C.D., *et al*, *Epigenetics*, Cold Spring Harbor Laboratory press, 2007.

⁵¹ Grech, A., Baldacchino, S., Tufignio, m., 'Epigenetics and its Medical Repercussions', *Maltese Family Doctor*, Vol. 19 - Issue 01 December 2010, pg. 10.

⁵² Halfman, R., Lindquist, S., 'Epigenetics in the Extreme: Prions and the Inheritance of Environmentally Acquired Traits', *Science*, Vol. 330, 29.10.10, pg. 629-632.

⁵³ True, H.L., Lindquist, S.L., 'A yeast prion provides a mechanism for genetic variation and phenotypic diversity', *Nature*, Vol. 407, 28 September 2000, pg. 477-482.

genome to be read properly the male and female inherited genome in the embryo needs to be together in the nucleus. Could this be the reason for genetic nuclear encapsulation? Do we have enough information yet to conclude this?⁵⁴

However I must now turn my attention to cases of a phenomenon called *paramutation* which has been observed in maize in the 1950's and has been recently found in mice⁵⁵, but there is clearly a long way to go before it can ever be definitely established in humans⁵⁶. Paramutation is the interaction between two alleles of a single locus wherein alleles of homologous genes can communicate with each other with the result of silencing one allele by the other⁵⁷ resulting in a heritable change in subsequent generations of the phenotypic expression of the DNA code⁵⁸. This type of silencing is referred to as *trans*-silencing⁵⁹. This is thought to occur first through the intercession of short non-coding intermediary RNA (RNAi) molecules⁶⁰, but other mechanisms are thought to play a part in paramutation such as secondly the direct

⁵⁴ Jablonka, E., Lachmann, M., Lamb, M.J., 'Evidence, Mechanisms and Models for the Inheritance of Acquired Characteristics', *Journal of Theoretical Biology*, 1992, Vol. 158 Pt. 2, pg. 245-268.

⁵⁵ 'Paramutation in mice', 25th May 2006,

<http://www.nature.com/nature/journalv441/n7092/edsumm/e060525-07.html> [11.03.10].

⁵⁶ Cuzin, F., Grandjean, V., Rassoulzadegan, M., 'Inherited variation at the epigenetic level: paramutation from the plant to the mouse', *Current Opinion in Genetics and Development*, 2008, 18:193-196.

⁵⁷ Keith Slotkin, R., Martienssen, R., 'Transposable elements and the epigenetic regulation of the genome', *Nature*, Volume 8 April 2007.

⁵⁸ Della Vedova, C.B., Cone, K.C., "Paramutation: The Chromatin Connection", *The Plant Cell*, 16: 1358-1364 (2004). <http://www.plantcell.org/cgi/content/full/16/6/1358> [11.03.2010].

⁵⁹ Jakowitsch, J., Papp, I., Moscone, E.A., van der Winden, J., Matzke, M., Matzke, A.J.M., 'Molecular and cytogenetic characterization of a transgene locus that induces silencing and methylation of homologous promoters in *trans*', *The Plant Journal*, (1999) 179(2), pg. 131.

⁶⁰ Chandler, V.L., 'Paramutation's properties and Puzzles', *Science*, Vol. 330, 29.10.10, pg. 628-629. It seems that for this mechanism to occur, the paramutagenic alleles need to be in the same genome and nucleus. See Griffiths A.J.F., Gelbarth, W.M., Miller, J.H., *Modern Genetic Analysis*, W.H. Freeman, New York, 1999, in 'Epigenetic Inheritance' on <http://www.ncbi.nlm.nih.gov/books/NBK21276/>

contact of homologous regions⁶¹ the so called physical interaction model through the means of pairing protein complexes or by thirdly a mixture of both⁶². One finds that

[t]he epigenetic state of one chromosome can be transferred to its homolog during chromosome pairing⁶³,

and that,

[t]rans-silencing could result when methylation is transmitted to a sensitive target locus by a process requiring pairing or physical proximity of homologous promoters⁶⁴.

One also finds that,

besides the RNAi machinery, physical interactions could be involved in paramutation as well. Further studies are needed to investigate this hypothesis⁶⁵.

There is also a direct allusion to the fact that the allele homologues need to be together in the same nucleus as quoted below. This is a very significant finding in itself, which if proven to also effect human mammalian epigenetics, as increasingly

⁶¹ ‘Alleles of homologous genes can silence one another through paramutations’, *Science Centric*, 29 June 2008, reporting on work by Dr Vicki Chandler *et al.* <http://www.sciencecentric.com/news/article.php?q=08062937> [11.03.2010]. See also Chandler, V., Alleman, M., ‘Paramutation: Epigenetic Instructions Passed Across Generations’, *Genetics*, 179: 1839-1844 (April 2008).

⁶² The so called RNA-physical interaction model. See Stam, M., ‘Paramutation: A Heritable Change in Gene Expression by Allelic Interactions *In Trans*’, *MolecularPlant*, published April 8 2009, <http://mplant.oxfordjournals.org> [06.07.2010]. Also Chandler, V.L., ‘Paramutation’s properties and Puzzles’, *Science*, Vol. 330, 29.10.10, pg. 629.

⁶³ Della Vedova, C.B., Cone, K.C., ‘Paramutation: The Chromosome Connection’, *The Plant Cell*, 16: 1358-1364 (2004).

⁶⁴ Jakowitsch, J., Papp, I., Moscone, E.A., van der Winden, J., Matzke, M., Matzke, A.J.M., ‘Molecular and cytogenetic characterization of a transgene locus that induces silencing and methylation of homologous promoters in *trans*’, *The Plant Journal*, (1999) 179(2), pg. 132.

⁶⁵ Haring, M., Bader, R., Louwers, M., Schwabe, A., van Driel, R., Stam, M., ‘The role of DNA methylation, nucleosome occupancy and histone modifications in paramutation’, *The Plant Journal*, Vol. 63, Issue 3, 29.04.2010, pg. 366-378.

seems to be the case⁶⁶ (but this requires further study), would show that the two pronuclei would have to be combined in one nucleus before effective transcription may be finalised and proceed to translation. One finds in the article that

*[t]rans-silencing interactions involve a methylated silencing locus...that is able to transcriptionally inactivate and methylate a sensitive target locus...when they are together in the same genome (my italics)*⁶⁷.

In a separate article one also finds that,

[o]nce combined in one nucleus, (allele) *B-I* is *trans*-inactivated by (allele) *B'* during plant development⁶⁸,

and also in the same article one finds that,

transcription factors activating the *B-I* repeat enhancer function also bind to the *B'* repeats, mediating *physical interactions* (my italics) with the *bITSS* region...and triggering changes in nucleosome occupancy and histone modifications⁶⁹.

⁶⁶ *Ibid.*

⁶⁷ Jakowitsch, J., Papp, I., Moscone, E.A., van der Winden, J., Matzke, M., Matzke, A.J.M., 'Molecular and cytogenetic characterization of a transgene locus that induces silencing and methylation of homologous promoters in *trans*', *The Plant Journal*, (1999) 179(2), Figure 1, pg. 132. Note also that "Strong *trans*-silencing ability might be associated with genes close to heterochromatic domains, which could act by dragging homologs into a heterochromatic nuclear compartment", pg. 137. Also, "[t]hese results imply that *trans*-silencing interactions occur most effectively between transgenes present on chromosomes that might be able to interact by virtue of their similar size and/or morphology. This proposal is compatible with a model of interphase chromosome arrangement in some cereals where preferential associations between chromosome arms of similar length were observed", pg. 138.

⁶⁸ Haring, M., Bader, R., Louwers, M., Schwabe, A., van Driel, R., Stam, M., 'The role of DNA methylation, nucleosome occupancy and histone modifications in paramutation', *The Plant Journal*, 29.04.2010.

⁶⁹ Haring, M., Bader, R., Louwers, M., Schwabe, A., van Driel, R., Stam, M., 'The role of DNA methylation, nucleosome occupancy and histone modifications in paramutation', *The Plant Journal*, 29.04.2010.

Particularly in plants, paramutation offers a striking example of an epigenetic modification which “results from somatic interactions between alleles”⁷⁰. This phenomenon is even observed in dipteran insects so that,

somatic pairing underlies several intriguing genetic and epigenetic phenomena involving both allelic and non-allelic interactions⁷¹.

Although we do not yet know the effects of these mechanisms in humans, they shed light on other mechanisms in human beings such as so called loss of genomic imprinting (LOI) such as that of the *H19* gene causing Wilm’s tumour. This phenomenon seems to be explained by DNA-DNA pairing related to somatic recombination which can be seen as a by-product of DNA repair⁷². From recent discoveries of paramutation-like interactions which have been found in mammals, it appears that paramutation is a much more widespread phenomenon than thought and this could have profound implications for human genetics⁷³.

Paramutation and paramutation-like phenomena have been observed in plants, fungi and mammals suggesting that the underlying mechanisms may be evolutionarily conserved⁷⁴.

⁷⁰ Colot, V., Maloisel, L., Rossignol, J.L., ‘Interchromosomal Transfer of Epigenetic States in *Ascbolus*: Transfer of DNA Methylation is Mechanistically Related to Homologous Recombination’, *Cell*, Vol. 86, 855-864, September 20, 1996.

⁷¹ Henikoff, S., Comai, L., ‘*Trans*-Sensing Effects: The Ups and Downs of Being Together’, *Cell*, Vol. 93, 329-332, May 1, 1998.

⁷² Colot, V., Maloisel, L., Rossignol, J.L., ‘Interchromosomal Transfer of Epigenetic States in *Ascbolus*: Transfer of DNA Methylation is Mechanistically Related to Homologous Recombination’, *Cell*, Vol. 86, pg. 862, September 20, 1996.

⁷³ Jakowitsch, J., Papp, I., Moscone, E.A., van der Winden, J., Matzke, M., Matzke, A.J.M., ‘Molecular and cytogenetic characterization of a transgene locus that induces silencing and methylation of homologous promoters in *trans*’, *The Plant Journal*, (1999) 179(2), pg. 132.

⁷⁴ Stam, M., ‘Paramutation: A Heritable Change in Gene Expression by Allelic Interactions *In Trans*’, *MolecularPlant*, published April 8 2009, <http://mplant.oxfordjournals.org> [06.07.2010].

These last proposals would necessitate that the maternal and paternal pronuclei would have to come together in the same nucleus before allowing transcription processes to be sufficiently advanced to finally allow the process of translation of the zygote's own phenotype to begin. One may hazard to speculate here that eukaryotes, including human cells, have evolved to have both the maternally and paternally derived genome within the same nucleus and bound by the nuclear cytoplasmic membrane containing pores to allow them to communicate chemically with the cytoplasm of the cell. Unlike the evolutionary earlier prokaryotes, they do not contain their DNA dispersed within the cell cytoplasm. Knowing that evolution works always within the principle of natural selection (and sexual selection), the evolution of this eukaryotic feature must have had some evolutionary advantage over the dispersal of the DNA in simple prokaryotes and this could possibly be the better transcription capacity and allowing final translation of the larger amount of DNA found in eukaryotes such as in the human organism.

1.7. Individuation

When Norman Ford, first wrote *When Did I Begin*, he clearly pointed out that the really valid argument that may be used in identifying the point of human individuation during embryological development, is not the argument of potential, but that of ontological development of the human being. This means looking back at the time-fractions preceding a present moment and going back to trace the beginning of the existent individual, as much as possible. Ford himself was actually misled by the argument on twinning from the same monovular embryo. Had it not been for this, which can be explained by realising that a new individual arises when a new totipotent

cell separates from the developing cell mass⁷⁵, Ford himself could have come to an entirely different conclusion. His conclusion could have invariably been genetic union of the two pronuclei to form the zygote, that is about 20 hours after penetration of the ovum by the sperm cell or at least the existence of the pronuclei after the 2nd meiotic division. Beyond that point, it is difficult to trace the ontogenic continuation of the same human individual for both anatomical and functional reasons.

Anatomically, when the sperm enters the secondary oocyte, it sets off a reaction to seal off the ovum from the outside environment and creates a number of ionic changes in the ovum which leads to certain changes in the female pronucleus. The sperm itself loses its tail and becomes known as the male pronucleus! It is interesting to note that, after two or three hours after penetration, the genetic information in the female pronucleus changes substantially in a haphazard fashion as the ovum passes through its so called 2nd meiotic division with sufficient crossing over and changes between chromosomes, thereby ensuring that the result of this is a genetically different female pronucleus than the one just before. The excess chromosomes after this division are thrown out into the now newly called ootid, as the 2nd polar body, which usually comes to sit just inside the outer border of the ootid. There is no way that the genetic information inside the now present female pronucleus is the same as that previous to the 2nd polar body formation, so there is no way that ontological development may be traced beyond this particular point in time! According to the different genetic result obtained within the second meiotic division, the new zygote will be able to specifically read for protein synthesis, which is the material basis for a new body. This reason alone should alert one to the fact, that therefore it is not

⁷⁵ *Kennedy Institute of Ethics Journal*, June 1999, John Hopkins University Press, Maryland, pg.138.

possible to have a human individual before this point. At penetration, the cell is a human living cell with the potential to become a zygote or embryo. If there is a human individual at penetration, it is definitely not the same one that exists after the 2nd meiotic division! So do we get two individuals out of the same ovum? It seems not.

Another point of interest is that the original female oocyte II nucleus after penetration and before the 2nd polar body formation, although nominally haploid, actually contains two chromatids which are totally diverse from each other, because of the cross-over results of the first meiotic division and therefore prior to this point in human development, the total complement of hereditary material, that is chromosomes, between the male and female pronuclei is triploid, that is containing three sets of chromosomes, which is not exactly the normal complement for the human species. It is interesting that once the 2nd polar body is extruded, this may itself be fertilised by a second sperm cell to produce monovular twins which are however genetically non-identical⁷⁶.

After the formation of the ootid with the two pronuclei, male and female, each with a haploid (one half) set of chromosomes, the two come together, the nuclear membrane disappears and the new complete set of chromosomes of the zygote meet for the first time. As Professor Jerome Lejeune (Geneticist; 1st President of the *Pontifical Academy for Life*) remarked, this is the human embryo with a new combined set of diploid (one whole) human chromosomes. Therefore this must mark the beginning of a complete individual with consequent connected ontogeny. The information from

both the male and the female pronuclei is necessary to form the zygote, otherwise it will not develop into a foetus, but change into a shapeless hydatidiform mole, which sometimes happens when one of the two pronuclei dies out.

Sometimes a pathological process occurs after fertilization. Only the male pronucleus stays in , and the female pronucleus dies out. *That is not a human being* (my emphasis). That will make vesicles and membranes, and we call it a hydatiformis mole. This will end in a miscarriage with no baby inside. *Conception has not really taken place* (my emphasis). Only the masculine know how, has been transmitted: how to build the hut and go hunting.

On the contrary, it happens (very rarely), that in the ovary of a virgin one of the eggs begins to divide (*parthenogenesis* – my addition), and produces what is programmed in the feminine way of life. That is, elaborate the components of the body. That makes teeth, hair, nails, even sore nervous tissue, all this totally disordered. No human being is conceived, only spare pieces are made⁷⁷.

For those who maintain individuation from penetration, this would mean that there would first have been a specific individual, who then was changed at the 2nd meiotic division into another genetically different second individual, who then disappeared completely when the hydatidiform mole formed. Rather preposterous I would think! The reality probably is that with the formation of the hydatidiform mole, the individual never did exist and never will, because development is disordered! As we shall see in the second chapter, there are other possibilities of non-union between the male and female pronucleus. These are a lack of, or wrong reading of, the *Hira* gene in the mother's genetic code, gestational trophoblastic disease such as moles which

⁷⁶ Gilbert, S. F., *Non-identical Monozygotic Twins*, www.devbio.com/printer.php?ch=11&id=111
Gilbert, S. F. 1997. <http://www.devbio.com/about.php>. April 18, 2003. [25.03.2005].

can be complete or incomplete, invasive mole (*chorioadenoma destruens*) and choriocarcinoma and other placental site trophoblastic tumours⁷⁸. This is not to mention anything about parthenogenesis. I will go into further detail on these conditions in the next chapter (two).

It appears that the only really substantial change in human development, is when the male and female pronuclei each carrying 23 single chromosomes, transform themselves into a completely different entity with 46 chromosomes, the human zygote. Beyond this stage substantial change does not occur⁷⁹.

Some individuals are saying that the full complement of genes exist at penetration so there is a human individual here. They are alluding to the fact that since the full complement of genes exist in two separate pronuclei, that constitutes the full human genome, but again I ask when is this, prior to or after the 2nd meiotic division? Or are there two individuals? Other individuals are claiming that there is an individual human being in the pronuclear stage of the ootid because some new protein is being laid down and the two pronuclei have actually started some *transcription* of their DNA (transcription is the copying of the DNA information in the gene, onto RNA templates called m-RNA). First of all, for the formation of protein as the physical basis of the new individual, transcription is not enough, but it must be followed by another process called *translation*, where another form of RNA called t-RNA, must bind to the m-RNA produced previously and bring the protein precursor units

⁷⁷Lejeune, Jerome, summary of testimony in *Davis v. Davis*, Circuit Court for Blount County, State of Tennessee at Maryville, Tennessee, February 1989, <http://www.sedin.org/propeng/embryos.htm> [14.12.2008].

⁷⁸Rosai, J., *Rosai and Ackerman's Surgical Pathology, Vol.2*, Mosby, 2004, pg. 1738-1749.

together, which then join and form the protein! This takes place outside the nucleus on another type of RNA called r-RNA which acts as an anchor and bottle opener at the same time. At the pronuclear stage, transcription is spurious and haphazard and is not coupled to translation⁸⁰. It is also non directed. If one adds some DNA to a test tube and pours in the precursors of RNA molecules, these will start to be formed spontaneously after some time. Does this mean that there is human life inside the test tube? The answer is of course 'no'. This transcription is non-directional and passive. Directional transcription coupled with the translation of the new body proteins only occurs after pronuclear fusion to form the zygote. New embryonic proteins then appear at the four cell stage of morular development at what is called *Zygotic Genome Activation* or ZGA. It is here that the first signs appear that the zygotic genome is directing the development of the new individual!

One can conclude that the first sign of an active potency of an independent organism (but not of a living cell where this potency is passive), is the transcription-translation coupling forming the organism's own specific proteins from its own specific genome. The fact that translation from the organism's genome is actually taking place signifies that the organism is able to co-ordinate all its nuclear and cytoplasmic compounds to allow the organism to carry out the essential functions of life according to its own specific plan in an *independent manner*. In the human embryo, this sign is called ZGA. Therefore translation is a necessary but not sufficient sign of an active potency

⁷⁹ German, L.J., *Fundamental Ethical Issues in Assisted Procreation*, paper from personal correspondence. [29.11.2004].

⁸⁰ Schultz, R.M., *The Molecular Foundations of the Maternal to Zygotic Transition in the Preimplantation Embryo*. Human Reproduction Update, Vol.8 pg. 323-331, 2002.

in an organism. Transcription on the other hand is always a sign of a passive potency emanating from the nature of the DNA's component chemical properties

In fact up to this stage, the new cells only grow in number not in size as the existing cytoplasm is shared between the ever increasing number of dividing cells and it is only after ZGA that the cell volume increases in size too. It is also important to add that initial short segments of special m-RNA are needed from certain specific chromosomal transcriptions to read off the information for new transcription from other different chromosomes within the same nucleus, so it seems that all the chromosomes should be present together in one nucleus for the whole genome to be read properly as seen earlier.

This still leaves one unanswered question: the detection of new proteins in the pronuclear ootid. It seems that these new proteins are transcribed and translated by 'new' m-RNA, which lay dormant inside the original ovum and sperm and which were produced by the mother and the father, so called maternal and paternal m-RNA⁸¹. It is a fact that fertilization and early zygotic development up to the 4 cell stage of the embryo is under maternal m-RNA control from the ovum. If one removes both pronuclei of a developing ootid (enucleation), this will continue to develop spontaneously up to the 4-cell stage of the morula or embryo and then stop suddenly. It therefore shows that the elements for fertilization and very directed early embryological development already lie dormant within the ovum and they are then superceded by the directed control of the new embryonic genome after pronuclear

⁸¹ Gilbert, S. F., *Early Research Documenting Stored Maternal mRNAs*, www.devbio.com/printer.php?ch=5&id=52, Gilbert, S. F. 1997. <http://www.devbio.com/about.php>. April 18, 2003. [22.03.2005].

syngamy at ZGA. This process is called *maternal to embryonic transition* of developmental control, or MET for short⁸².

In my mind, all this leaves little doubt that when integrating the anatomical and functional imperatives of embryological development, the point of individuation lies with pronuclear syngamy. There is an adage which runs that when one delves into these matters with questions, one comes out with answers, but when one enters with preconceived answers, one comes out with many questions!

1.8. *The DNA Essence*

I, of course fully agree that our DNA alone does not constitute new life. If I were to believe that, I would be a genetic reductionist which I am not. However one cannot agree that a new human life exists without the existence of a first definite normal genetic constitutional template or plan which is human. This is analogous to stating that a silicon chip is not a computer, but there is no computer without the silicon chip! The argument that an individual zygote is more than its DNA complement is usually used by many to justify research up to the 14th day after fertilization, as they imply that due to the conditional environmental milieu there must be implantation in the uterus for the human individual to exist. I have rarely seen this argument used to rationalize the logic that there is an individual human being from penetration, when there is not yet any final DNA template.

A definite genetic constitutional template occurs at syngamy at the time of the pronuclear coming together (amphimixis or karyogamy are the better terms) and

⁸² Allan King, W., *Maternal to Embryonic Transition of Developmental Control*,

although there is no fusion as we originally understood it to mean, it is the first instance when the two genetic messages from the two parents first come together. Prior to that point all development, including the totally maternally inherited mitochondrial DNA, is controlled by the mother's genes in the fertilised egg and there is not any protein synthesis linked to the new genome. It is only after syngamy that new protein translation from the new constituted zygotic genome finally takes place, and it is significant that up to a *short period beyond* syngamy, the whole cell may develop without any nuclei at all! It is also interesting to keep in mind that it seems that the development of the new genome only becomes autonomous and active after syngamy (Zygotic Genome Activation), and the fact that it does not occur before that point in time, means that both gene sets must be together for normal functioning to occur. Before syngamy, it is the mother's gene products which are in charge and the new genetic constitution of the embryo does not begin to take control of development until at least two days after that (at the four- to eight- cell stage).

It is important to accept that for a human life to exist *de facto*, both the mother's and the father's genomes must come together for the first time. This is one of the first principle conditions for life to exist, not only human life. It is also interesting to recall Loeb's and Lillie's experiments where fertilisation was initiated very easily, without any sperm at all, simply by changing the ionic concentration of the medium around the egg. This is a very common occurrence in the animal kingdom and this shows that sperm is not always essential for initiating fertilisation. In humans, the sperm's genome is essential for normal development and is important in delivering half the coded message, for the 'computer' to work properly, however the 'computer' only

works at all after syngamy! It seems that “Once fertilisation is accomplished, development and inheritance may be left to look after themselves”⁸³ as the organism becomes self moving.

Even *Cardinal Ratzinger*, in a summary document of the *Consistory of Cardinals* on the threat to life written for the preparation of the Encyclical Letter *Evangelium Vitae*, recalling the definition of the zygote in *Donum Vitae* (English translation) as the “moment of the fusion of the two pronuclei”, reaffirms that,

from the time that the ovum is fertilised, a new life is begun which is neither that of the father nor of the mother; it is rather the life of a new human being with its *own* growth,

and,

in the zygote *resulting* from fertilisation the biological identity of a new human individual is already constituted⁸⁴.

Fertilization is a process that has a beginning and has an end, and it is not accomplished before it is complete. It seems that there cannot be an *individual* human being until fertilisation is complete.

I have to refer to the fact that defining the human embryo from penetration will create problems for the human definition of cloned human beings as there is no fertilisation there at all! This would also be the case with stem cell research. I have personally talked to many of my colleagues in the field of molecular genetics, and other fields

⁸³ Farley, J., *Gametes and Spores: Ideas about Sexual Reproduction 1750 – 1914*. <http://zygote.swarthmore.edu/fert4a.html> [30.05.2005].

⁸⁴ *The Problem of Threats to Human Life*, Vatican City, April 4-7, 1991.

and most of them single out amphimixis as the first instance of human individual ontological development.

1.9. *Amphimixis*

Although everyone is entitled to their own opinion, I cannot follow the logic of those who are saying that a human individual exists from the moment of sperm penetration into the ovum. Incidentally the process of penetration itself, takes about an hour to finalize! The Catholic *Magisterium* leaves this issue open for science to answer. It insists on conception or fertilization, but does not define exactly when, considering that science has shown us that it is around a twenty hour process. Anybody with the least knowledge of biology, cannot possibly hold that there is a human individual being at penetration, now that certain scientific facts have become much clearer than a couple of years back. Those who contend for potentiality as a singularly sufficient reason have to realise that this reason alone is not enough. Potentiality must be crossed by actual individual existence to become act, otherwise it is still a potency, to use *Aristotle's* definition! As for the argument of process having begun or whatnot, well the whole of life is a process and therefore the whole of biological development. Life is a circle. If life is a circle, then ontological continuity and development of a species is also a circle! What is not a circle is *individual* ontological development or ontogeny. There is a specific beginning to every physical *individual* human being and a specific end. Our individual life is not a circus.

Donum Vitae (1987) insists specifically that “The zygote is a cell produced when the nuclei of the two gametes have fused”. This document is produced by the *Congregation for the Doctrine of the Faith*. There is however much that needs be

said about the original Italian version and the translations in other languages faithful to this original and the official Latin version issued some time later. This point will be taken up in detail in *Chapter IV*. Even the more recent dated encyclical (1995) *Evangelium Vitae* by *John Paul II*, clearly states that,

from the time that the ovum is fertilised (*not penetrated – my italics*), a life is begun which is...the life of a new human being with its own growth...modern genetic science offers clear confirmation...that from the first instant (*of the human being – my italics*) there is established the structure or genetic programme of what this living being will be: a man and indeed this individual man, with his characteristic aspects already well determined.

I have very little doubt scientifically that for human individuation to be in act, fertilisation must be completed. This is furthermore most important when considering the new ways that fertilisation may today be circumscribed by such processes as various cloning techniques, pronuclear transfers between different cells, and embryonic stem cells obtained at the totipotent stage! None of these procedures requires penetration of the ovum by the sperm to produce the full complement of genes necessary for development. Does that mean that the cloned human being is not a full or real human being? No pronuclear stages or earlier development including penetration occurs here! There is the creation of a *de facto* cell with an instant new complete 46 chromosome genome. That would be a dangerous presumption!

Back to science, it has been proven since 1988 by *Peter Braude et al*⁸⁵ that the expression of the newly established human genome in the fertilised ovum or zygote, first occurs between the four and eight cell stages of preimplantation development. It is only at this stage that the newly set up genome starts to be physically expressed

(translation) by the laying down of new polypeptide proteins, that is, actual physical development under the control of the new genome starts to take place. The same article proves beyond doubt that the development up to the four cell stage is directly controlled by the prior maternal transcripts already existing in the ovum prior to fertilisation and therefore maternally regulated. This is not to say that before the four cell stage there is no human individual. A living individual is defined by function and form. The observed function starts to unravel at the four cell stage and maybe even earlier but the new physical form is established at amphimixis, that is the pronuclear coming together in the single cell. At amphimixis, one has the normal human complement of chromosomes that is 46 (23 pairs), contained within one cell (or complete nuclear coming together as both pronuclear walls break down) which is the normal human number at that stage of development. Normal human cells at that stage of development do not contain two nuclei! Furthermore, at penetration, although there are passive catalytic reactions occurring as in all normal living cells, the real chromosome complement is 69, which is not normal. That is not counting the 46 chromosomes of the first polar body in the same ovum, which may themselves be potentially fertilised by other sperm. This is not to forget that before amphimixis occurs there is no coupling of transcription to translation processes.

Professor (Senator) Adriano Bompiani (Obstetrics and Gynaecology) stated very clearly in *Fecondazione Assistita. Una Proposta di Legge da Discutere*⁸⁶;

[c]irca l'inizio dello sviluppo del nuovo essere (definito genericamente 'concepito') l'opinione diffusa tra i biologi pone questo evento nella fertilizzazione dell'ovocita, processo divisibile in vari stadi, ma che si svolge in un lasso relativamente breve di tempo e che da luogo comunque ad un

⁸⁵ Braude, P., Bolton, V., Moore, S., *Nature* Vol. 332, 31 March 1988.

⁸⁶ Busnelli, F.D., Genazzani, A.R., Ripepe, E., *Fertilizzazione Assistita. Una Proposta di Legge da Discutere*. CIC Edizioni Internazionali, Roma, 1997, pg 19-32

‘evento’: il possesso, nell’entità che si è formata, di una informazione genetica unica e irripetibile. Volendo precisare il momento culminante all’interno di questo processo, l’opinione dominante identifica nello stadio detto di “amfimissi” (o singamia) l’inizio della nuova “entità” o “essere” a questo stadio dello zigote.

It is interesting that now the same individual has changed his mind for not so compelling reasons. I am sure that with all this scientific and also philosophical evidence working together, one would want to avoid the situation similar to where *Galileo* was forced to retract the statement that the Earth rotated round the Sun, rather than the inverse as held up to that time. In fact scientifically the former position was shown to be the correct one. One would also be tempted to ask whether one may be one hundred percent sure of oneself to maintain this position. *Voltaire* had a lot to say about people being hundred per cent sure;

[d]oubt is not pleasant, but complete certitude is ridiculous. Only imbeciles are perfectly sure of what they say.

However, as things scientifically present themselves in a well informed manner, I am conscientiously, fairly and sufficiently sure of myself about this matter as are many others. As the quotation at the beginning of the chapter says, “*There is no rest for the messenger until the message is delivered*”. In the case of the new individual human being, the message is delivered at amphimixis leading to the formation of a zygote, when the new diploid genome is formed which then proceeds to lay down a new phenotype⁸⁷. Syngamy is a point of convergence –the hereditary endowment of the

⁸⁷ Maltese Bioethics Consultative Committee minutes of meeting on 06.09.2005 on definition laying down the point of commencement of a new human life.

parents – and divergence – the *de novo* distinct new human life⁸⁸. Later on in this work, I need to point out the seminal difference between a *living cell* and a *living organism* and the reasons for my affirmation of the fact that before syngamy occurs we have a living cell entity belonging to the species *Homo sapiens*, but after syngamy has taken place, we have a new entity which is a living organism of this same species.

⁸⁸ Monahan Hogan, Margaret, Professor of Philosophy, University of Portland, Oregon, personal correspondence [22.03.2006].

2

CHAPTER TWO

PHILOSOPHICAL CONSIDERATIONS OF FERTILIZATION

Between the potency and the existence between the essence and the descent falls the Shadow

T.S.Eliot *The Hollow Men*

2.1 *My Philosophical Understanding of Man*

In discussing this issue I first have to take a look at both the scientific and philosophic underpinnings of man. I have looked at the first consideration in a previous chapter, so I must now turn my attention to the philosophical concepts. When one considers man, one immediately asks oneself, what is man? The philosopher cannot answer this question through revealed authority, but anthropologically through reason and observation of ourselves and our daily activities and that of others. That is, one must base his conclusions on general facts that are directly observable in the common experience and behaviour of all mankind. The first clear observable point that comes to mind is that man consists of a physical body and depends on a directly physical existence. But is man just a body? If somebody had to step on my feet, one would consider that the other person has stepped on me not just my feet. Conversely one

often speaks of having a body rather than being a body and this shows that there is also a psychological component to man.

Man is able to perceive and know. It is the subject (man) who is the knower of the known, which is the object, although these form a continuum rather than a dichotomy. In perception, the whole is more than the sum of the parts. Man is a reasonable and conscious being, not just a consciousness however, whose nature connotes awareness, such as being aware of the presence of a tree or another man. There is a specific type of consciousness that is a specific reflection on our subjective selves. Man is said to be self-conscious or self-reflective. That is, we are aware that we are aware. I am able to examine my conscious act or thought itself. If I look at myself in a mirror, I am able to perceive that the other person in the mirror is the light being reflected off myself and reflected back to my eyes by the mirror. That is, I am aware that the image is a reflection of myself. This type of consciousness or awareness is not present in other animals, at least not to the profound extent present in man¹, although higher primates are now thought to exhibit a more elementary form of this type of consciousness including the use of tools.

Is man a whole or is he composed of two parts? The answer is obviously clear that although there are different sides to the same individual, I am one person, as some would clearly affirm. Biology and psychology are somehow united into a unified whole. There were times in the past when philosophers spoke of the duality of man, known as *dualism*, such as *Plato* with his transcendental forms separate from particulate matter and *Descartes* with his animation of machines, but simple observation shows that although there is diversity and complexity in man's being,

observational philosophy of man abhors any dualism. Is man a *monad*, is there only one ultimate principle of reality in the universe? There are many individuals who consider man and mind made up simply of a single material substance. Hence the word *monism*. It is common nowadays to come across ideas of man that are purely materialistic especially in the milieu of science and medicine. One can find allusions such as,

[t]he human species and all of its features are the wholly physical outcome of a wholly physical process. Like all but the simplest of organisms, we have a nervous system. And for the same reason: a nervous system permits the discriminative guidance of behavior. But a nervous system is just an active matrix of cells, and a cell is just an active matrix of molecules. We are notable only in that our nervous system is more complex and powerful than those of our fellow creatures. Our inner nature differs from that of simpler creatures in degree but not in kind².

Or,

[i]f this is the correct account of our origins, then there seems neither need, nor room, to fit any non physical substances or properties into a theoretical account of ourselves. We are creatures of matter. And we should learn to live with that fact³.

Similar statements conclude that,

[i]n this (scientific) view, consciousness emerges from the properties and organization of neurons in the brain⁴,

and that,

[s]hort term memory (lasting minutes) involves chemical modifications that strengthen existing connections called synapses, between neurons, whereas long term memory (lasting days or weeks) requires protein synthesis and

¹ Morell, V., 'Animal Minds', *National Geographic Society*, March 2008.

² Churchland, P. M., *Matter and Consciousness*, Massachusetts Institute of Technology, 1999, pg 1-21.

³ *Ibid.* pg. 21.

⁴ Miller, G., What is the Biological Basis of Consciousness? *Science*, Vol.309, 1 July 2005, pg. 79.

probably the construction of new synapses...the hippocampus, of all places is a virtual neuron nursery throughout life⁵.

Despite these monistic allusions does man have a substantive vital principle which can transcend material reality? Many authors subscribe to what is termed as *hylomorphism*. Hylomorphism counters so called substance dualism, which considers a dualistic arrangement of soul and matter, by suggesting the forming of one complexity by soul and matter as separate substances. One may therefore find such references to this as,

[a]nother alternative is that man is neither two beings, as dualism asserts, nor composed of only one principle, as the monists say. Rather man is composed of two principles, but he is one being⁶.

It is clear that this model of man has a formal causality which refers to a kind of being and a material causality which refers to quantity of being and is passive but none the less important. One may define the soul as being the substantial (as opposed to accidental) form (formal cause) of the prime material or matter (material cause) of the body. Soul is the “ultimate internal formal principle by which we live...that by which man is living”⁷. Matter and form are one living flesh, one human being, like the two sides of the same coin. Therefore one could state that, “I am my body rather than I have a body”⁸. This concept of man as matter and form referred to as *hylomorphism* was expounded by *Aristotle* in classical philosophy⁹ and adopted by scholastic

⁵ Miller, G., How are Memories Stored and Retrieved? *Science*, Vol. 309, 1 July 2005, pg. 92.

⁶ Royce, J. E., *Man and Meaning*, McGraw Hill Book Company, New York, 1969, pg. 241.

⁷ *Ibid.*, pg. 249.

⁸ *Ibid.*, pg. 247.

⁹ Aristotle, *De Anima*, II.1, 412a-413a, II.4, 415b. There are other models of form and matter developed within scholastic philosophy, with the form being present always in the particular. *Thomas Aquinas*, kept *Aristotle's* same model with the form (nature) of man being the same in every human individual being while it is the matter which accounts for the individual anatomical differences in human beings. *Duns Scotus* believed that it was a third individuating principle besides the common human form and matter that accounted for the differences in human individuals, a principle which he called '*Haecceitas*' and which may be appropriately translated as 'thisness'. *William of Ockham*

philosophy. One last note on this matter in hand. What distinguishes the nature of a living body from that of a non-living body? All living organisms have plans formed by an efficient cause (parents) within their genes and chromosomes, and it is the ability of the living organism to implement its own plan, which distinguishes it from the nature of non-living things. Without any such plans, of course there is no ability for the single cell as a structure, to organize itself as a living thing, and therefore the genetic plan of a cell is a necessary but not sufficient condition of a living cell. It is interesting that according to this model of events, an author such as *Royce* would point out quite clearly that with respect to factual evidence in embryology and genetics,

[a]t the moment sperm and ovum unite and the two pronuclei fuse, an orderly process of development begins, with a definiteness compared by one professor of embryology to the action of a stop watch when you press the release. The new individual is characterized by its unique pattern in the DNA molecule, and its resulting peculiar constellation of genes and chromosomes, before the zygote divides for the first time. This organization is not only intricate and vital; it is specifically human¹⁰.

In another passage, the same author states that,

since the soul is the vital principle of vital operations, the human soul is present when there is specifically human operation. But there is evidence of specifically human operation from the first moment of conception. Therefore the human soul is present from the first moment of conception¹¹.

believed that although the concept of an individual species, the universal, was the same, as did *Aquinas*, it was similar but different forms that accounted for differences in human individuals and not matter.

Aquinas, T., *Summa Theologiae*, Ia. 75, 1-7; 90, 1-4; 118, 1-3.

¹⁰ Royce, J. E., *Man and Meaning*, McGraw Hill Book Company, New York, 1969, pg. 283-284.

¹¹ *Ibid.* pg. 283.

2.2 *Delayed Versus Instant Animation*

It is well known that Aristotle had proposed a theory of gradual animation of the human being¹². He had suggested that there was first a *vegetative* soul, which then gave way to a *sensitive* soul and in human beings to a *rational* soul. All this process took time to occur. So that Aristotle and later Aquinas¹³ believed that the actual rational ensoulment of the human being was a gradual process which took several days to occur. Stephen Heaney puts it in a nutshell when he states,

while the embryo is alive, it is alive first through the power of a vegetative soul, then a sensitive soul, and finally, when the body is organized enough to be able to perform the functions demanded of it, by a rational soul, this ultimate form replacing the previous one¹⁴.

This process is referred to as gradual animation (psychic hierarchy). All the different souls as forms would be different from the others so that it is not the same form which is changing but three different forms, each giving way to the other. So in a nutshell,

form is not the sort of thing that can split. In order for splitting to occur, obviously, there would have to be something that can be first one then two; but a form, *qua* form, is always one¹⁵.

Plant life would remain with a vegetable soul. Animals would proceed to a sensible soul, while only human beings would get a rational soul. Thereby human beings would proceed through a different progression of three different forms, before reaching the final rational form¹⁶. The same idea was taken up by Thomas Aquinas

¹² *Vide infra*, Aristotle, *De Anima*, II.3, 414b. See also II.2, 413b.

¹³ Aquinas, T., *Summa Theologiae*, Ia. 118, 2.

¹⁴ Heaney, S. J., *The Human Rational Soul in the Early Embryo*, University of Saint Thomas, Saint Paul, Minnesota. <File://C:\program%20Files\TeamWARE\Office\T\M\V4\ThomistFertilization.htm> [03.01.2005].

¹⁵ Flannery, K. J., 'Applying Aristotle in Contemporary Embryology', *The Thomist*, 67 (2003): 249-278.

¹⁶ Aristotle, *De Anima*, II.3, 414b. "Now of the faculties of the soul, some living things have all those that we have talked of...some have some of them, and some only one. The faculties we spoke of were

whereby he echoed Aristotle in concluding that the existence of a rational soul existed in man and woman at different times and much later (forty days for a man, ninety days for a woman)¹⁷ than what we now term fertilization. Of course both Aristotle and Aquinas although expounding sound philosophy, knew nothing of the embryology and genetics of this day and age, so one cannot really blame them for arriving at different conclusions. Many commentators have concluded that Aristotle thereby believed that the rational soul comes to exist with the completion of the bodily form, 40 days for the male and 90 days for the female respectively and Aquinas too seems to have been one of these. However it is important to add that, some others differ from this opinion, stating that Aristotle believed that the rational principle comes ‘from outside’¹⁸ with the seed of the male parent, and therefore the time that it is a being in its own right is when,

the embryo possesses a rational soul *potentially* from the time it is a being in its own right...which is when the embryo ‘sets’...and has the power of development within it when it gains a heart...and starts to nourish itself...when it becomes an animal potentially though a simple one...that is, after a week or so¹⁹.

There are still some today, such as Joseph Donceel and Robert Pasnau²⁰ who expound the gradual animation type of theory as an explanation for the lack of rationality in

the nutritive, perceptive, desiderative, locomotive and intellectual, plants having only the nutritive, other living things both this and the perceptive”, See also II.2, 413b.

¹⁷ Aquinas, T., *Commentary on the Book of Sentences*, Bk. III, dist. 3, q. 5, a. 2, *Responsio*, citing Aristotle’s *History Of Animals* 7.3, 583b 3-5, 15-23.
http://www2.franciscan.edu/plce/aquinas_on_human_ensoulment.htm [30.06.09].

¹⁸ Jones, D.A., *The Soul of the Embryo*, Continuum, London, 2004, pg. 28, quoting from Aristotle, *GA*, 2.3, 736b 28.

¹⁹ Jones, D.A., *The Soul of the Embryo*, Continuum, London, 2004, pg. 27 – 28, see also Aristotle, *GA*, 2.3, 737a 10; 2.4, 739b 21 – 35; 2.1, 734b 12, 17. Also pg. 123, “Aristotle clearly stated that the rational soul principle was given with the male seed...thus at or before conception. There are no grounds in Aristotle for the identification of completion of form at 40 days with the acquisition of a rational soul. Furthermore, Aristotle did not say that the development of the embryo was due to an external power, but that the cause of generation was in a way from the parent and in a way inherent in the embryo”.

²⁰ Eberl, J. T., ‘Aquinas’ Account of Human Embryogenesis and Recent Interpretations’, *Journal of Medicine and Philosophy*, 30:379-394, 2005.

the human early embryo²¹. They hold that the human body must have a high degree of organization before it can be ensouled and be considered a person, at least having a functioning cerebral cortex. This is the basic metaphysical principal employed by *Aquinas* that a rational soul does not inform a material body resulting in a human being's existence, unless the body is properly disposed for the sake of that type of soul:

For ensoulment, for the presence of a human rational soul, we must have the organs necessary for the activities proper to the human being, i.e. we need a brain and sense organs. If form and matter are strictly complementary, as hylomorphism holds, there can be an actual human soul only in a body endowed with the organs required for the spiritual activities of man. We know that the brain, and especially the cortex, are the main organs of those highest sense activities without which no spiritual activity is possible²².

Another person who holds this view is Thomas Shannon, who argues that there is no immediate person formed in early embryology, but the process is a gradual one, what one would call a graduality argument, and that there must at least be the presence of neural tissue in the foetus for it to be considered as a person. He thinks that in the embryo, the more critical distinction is personhood rather than the term human life.

For example he states,

I am not persuaded that the human blastocyst is a human person in the strong sense of that term...such a position requires...a static view of biology and somewhat a collapse of the traditional Aristotelian distinction between potency and act²³.

Again he asserts,

²¹ Heaney, S. J., *The Human Rational Soul in the Early Embryo*, University of Saint Thomas, Saint Paul, Minnesota. <File://C:\program%20Files\TeamWARE\Office\T\M\V4\ThomistFertilization.htm> [03.01.2005].

²² Eberl, J. T., 'Aquinas' Account of Human Embryogenesis and Recent Interpretations', *Journal of Medicine and Philosophy*, 30:379-394, 2005. (QDP III 9.ad 6, ad 20; SCG II 89;ST Ia 90.4).

²³ Shannon, T. A., personal correspondence, [03. 03. 2005].

[p]otency is not act²⁴,
or ultimately,

These various stages...(of embryology)...are necessary but not sufficient, biological stages in the development of personhood as we understand it...the developing organism... at the very early stages of embryogenesis, does not have the moral status associated with personhood....other competing values can come into play in relation to an evaluation of possible uses of that organism²⁵.

These exponents seem to miss out on the very complicated internal organization of the early cell, which I referred to in the first chapter. This comprises the presence of several cell organelles and the presence of DNA, with its highly complicated and attenuated form and structure, which is able to give us the specifically human structure. There are many philosophers and legal experts who agree that the DNA exists in the nucleus as the chromosomes and genes of the cell, and the nucleus may be thus considered as the primary organizer of the same cell²⁶. Benedict Ashley²⁷ goes on to argue that the existence and dynamic continuity of man goes on to be traced from “the nucleus of the zygote to the cortex of the human infant”. Therefore I too agree with Stephen Heaney that,

there is no power other than the embryo’s own soul which can perform the formation of the organs necessary for the operations of the soul; that soul must be a human intellectual soul from the beginning of the embryo’s being; from the time of fertilization the conceptus is matter properly disposed to be the subject of such a form as the rational soul. Thus, it is reasonable to say that infusion of this soul...takes place at conception and that we are from

²⁴ *Ibid.*

²⁵ *Ibid.*

²⁶ Noonan, J. T., Jr., ‘An Almost Absolute Value in History’, from Teays, W., Purdy, L.M., *Bioethics, Justice, and Health Care*, Wadsworth, USA, 2001, pg. 472-476.

²⁷ Heaney, S. J., *The Human Rational Soul in the Early Embryo*, University of Saint Thomas, Saint Paul, Minnesota. <File://C:\program%20Files\TeamWARE\Office\T\M\V4\ThomistFertilization.htm> [03.01.2005].

conception human persons....It is in fact the soul which makes this matter to be a human ontological individual²⁸.

For the sake of this thesis it is also important to keep in mind some of Aquinas' other conclusions. First that for a foetus to be a human being, it need not actually think rationally, but there has only to be the active potentiality for rational thought present. Secondly, Aquinas²⁹, (after Aristotle) distinguishes between *first* and *second* actuality of a thing. The first actuality is its form and integrity, while the second is its operation.

A first actuality is the *active* potentiality to perform some operation. The locus of a substance's set of first actualities – or active potentialities – is its substantial form, which for a human being is a rational soul. A second actuality is the operation of a first actuality brought about through some additional cause. In contrast to an active potentiality, something has a *passive* potentiality if it can be the subject of externally directed change such that it can become what it is not already³⁰.

First actuality also comes in two varieties. The first refers to a capacity in hand such as the ability to speak a language which is however not being exercised presently. The second refers to a substance's natural potentiality to develop a capacity to perform an action, such as the ability to learn a language which I have not yet learnt. Aquinas holds that all that is required for a rational soul to inform the matter of a particular body is that the body has an active potentiality to perform the operations proper to a rational soul, thus since a rational soul is the substantial form of a human body, the existence of a human body with active potentialities for life, sensation and rational thought entails the existence of a rational soul informing that body. A soul in

²⁸ *Ibid.*

²⁹ Aquinas, T., *Summa Theol.*, Ia, 76, 4, ad.1.

³⁰ Eberl, J. T., 'Aquinas' Account of Human Embryogenesis and Recent Interpretations', *Journal of Medicine and Philosophy*, 30:379-394, 2005.

first actuality is a soul. A sufficient condition for something's having an actual potentiality is if it can actualize the potentiality by some active principle internal to it³¹.

I will therefore defend the position throughout this thesis that there is immediate and not gradual animation from the moment of formation of the embryo leading to the zygote and that the formation of the diploid DNA in the zygote is an internal principle guiding it to development of all necessary organs and functions.

2.3 Aristotle's Definition of Motion

Motion is sensible and successive movement and can exist insensibly and unsuccessively in the category of substance, and sensibly in the categories of quantity, quality or location. Aristotle taught that change or movement could exist between non-being and being, between *potency* and *act*³². There is an analogy of this in the scientific treatment of movement when we define the energy of movement in physics as being *potential* or *kinetic*.

Aristotle however also maintained that there is a third possibility. This is something called a *potency in act*³³, motion situated midway between potentiality and actuality. "Motion is the actualizing of what exists in potency insofar as it is in potency"; it is therefore an incomplete act. *Aristotle* goes on to define motion as occurring in the same substance, which is "immanent action". This is also called *active potency*³⁴ or where a being goes from not acting to acting and is also the agent of that same action.

³¹ *Ibid.*

³² Aristotle, *Metaphysics*, Bk. V, 1019a/b, and Bk. IX, 1048a/b respectively.

³³ *Ibid.*, Bk. XI, 1065b16.

³⁴ Hogan, M. M., *Tris Engelhart and the Queen of Hearts Sentence First; Verdict Afterwards*, personal correspondence, pg. 28, [Jan-April 2006]. Also Aristotle, *Metaphysics*, Bk. IX, 1046a10-11.

In active potency, motion is described in terms of its proper formality, or in terms of its formal cause.

However Aristotle also defines a second definition of motion, as a result of *passive potency*³⁵. In passive potency a being has a capacity to receive a modification, but the agency of the modification is an external agent. Thus here, motion may be described in terms of its proper subject (proper matter) and so in terms of its material cause. Aristotle's second definition of motion is considered in the following quotation. "Motion is the actualizing of the moveable (changeable) insofar as it is moveable (changeable)"³⁶.

Therefore in the case of growing, motion is the actualizing of the potential insofar as it is potential, may be translated into growing being an actualizing of the body's ability to be of a size larger than it is now. The growth is in the body which is the subject undergoing an increase in quantity³⁷. Motion is a flowing continuum which has parts which come into existence successively (unlike a line all of which parts are known at the same time), and these parts are only known because we are capable of retaining them in memory³⁸. I shall return to this when I shall treat the subject of process.

³⁵ Aristotle, *Metaphysics*, Bk. IX, 1046a11-26.

³⁶ Wallace, W. A., *Nature's Property*, International Catholic University, 2004, pg. 1-10, <http://home.comcast.net/~icuwweb/c02004.htm> [05.09.2005].

³⁷ Wallace, W. A., *Nature's Property*, International Catholic University, 2004, pg. 1-10, <http://home.comcast.net/~icuwweb/c02004.htm> [05.09.2005].

2.3.1 Aristotelian Concepts of Act and Potency

Considerations of act and potency in an Aristotelian context³⁹ need to be well understood. The title to this paragraph is in intentional order; actuality is prior to potency, although we may be accustomed to think of it the other way round. In *De Anima*⁴⁰, Aristotle refers to Being (*ousia*) designated as form⁴¹, as *entelecheia* which in the *Metaphysics* is associated with *energeia* (motion) which may be translated as act⁴². Being (*ousia*) is therefore act (*energeia*). For example, a man who can build is the potential, while a man building would be the actual or *energeia*. One is also familiar with the terms active and passive potency as noted above. Basically in active potency, movement is *intrinsic* to the act as form and substance, while in passive potency there is *extrinsic* cause to the movement of a particular act as form and substance⁴³. The most important point to keep in mind is that both passive and active potency follow act in the same subject⁴⁴. Actuality is prior to potency⁴⁵. Potency cannot be defined except through act. The potency of matter as act, becomes new act as form (form in matter as act = composite substance) in man. The potency of man (composite) as act, leads to further and future development to the adult form. The embryo thus potentially is the child who is the potential adult. Act is prior to potency

³⁸ *Ibid.*

³⁹ Aristotle, *Metaphysics – A revised Text With Introduction And Commentary*, Vol. II, by Ross, W. D., Clarendon Press, Oxford. 1924.

⁴⁰ Aristotle, *De Anima*, Book II.1 412a3.

⁴¹ “Being (*ousia*) is said to designate three things: the matter, the form, and that which is composed of matter and form”. De Lacy, P.H., *Greek, Roman and Byzantine Monographs*, Number 2, by Emerson Buchanan, *Aristotle’s Theory of Being*, University, Mississippi : Cambridge, Massachusetts, 1962, pg. 56.

⁴² *Ibid.*, pg. 56. Aristotle, *Metaphysics*, Book Θ.6 1048b18 and 8 1050a21

⁴³ Conway, P., edited by Spangler, M.M., *Metaphysics Of Aquinas – A Summary of Aquinas’s Exposition of Aristotle’s Metaphysics*, University Press of America, Maryland, 1996, pg. 141-142. See also Aristotle, *Metaphysics*, Bk. V, 1019a and Bk. IX, 1046a.

⁴⁴ *Ibid.*, pg. 216.

⁴⁵ Aristotle, *Metaphysics*, Book Θ, 1049b, 4, “Actuality is prior to potency, not only to that which is a principle of change in another thing or in the thing itself *qua* other, but to any principle of change or rest”.

1051a, 21, “...Thus potency comes from actuality...though the actuality is later in genesis than its own potency”.

by notion, substance and time⁴⁶. Act is also prior to potency in conception as all imperishable things are potentially existent while every potency for an act is also a potency for not being in act. Therefore every potency is at the same time a potency of opposites⁴⁷. Act is also prior to potency in this latter sense.

As already seen above, one also speaks of first act and second act.

A composite particular may have a first and second actualization. It is in virtue of the first of these that its matter is so arranged as to render it capable of performing its characteristic functions and it is in virtue of the second that it ‘actually’ performs them⁴⁸.

Aristotle’s entelechism speaks of form as substance which is in first act⁴⁹, with the active potency to function, but actual functioning constitutes so called second act. Form and functioning in Aristotle’s metaphysics are closely connected⁵⁰. It is in virtue of a thing’s form that it can perform its functions and by its functions, one can know its form. So it is possible for form to exist but without any actual exhibition of the form’s function at a given point in time.

The reflection of Aristotle’s concept of substance being in first or second act is also found in the writings of Thomas Aquinas⁵¹. A being may be in first act but may not exhibit its function here and now. It contains the potency to function, but this potency may not yet be in (second) act. Think of a car that exists and is in full functioning

⁴⁶ Conway, P., edited by Spangler, M.M, *Metaphysics Of Aquinas – A Summary of Aquinas’s Exposition of Aristotle’s Metaphysics*, University Press of America, Maryland, 1996, pg. 219.

⁴⁷ Aristotle, *Metaphysics*, Book9 Part 8 para.9.

⁴⁸ Aristotle, *De Anima*, translated with an introduction and notes by Lawson-Tancred, Hugh, Penguin Books, Middlesex, 1986, pg. 71.

⁴⁹ *Ibid.*, *De Anima*, 412b, “soul is the *first* actuality of a natural body which potentially has life”.

⁵⁰ *Ibid.*, pg. 14.

⁵¹ Aquinas, T., *Summa Theol.* Ia, 76. 4.ad 1. “But the first actuation has a relation of potentiality to the second, which we call activity; there is no such potentiality apart from or excluding the soul”.

order but is switched off. It exists in first act but cannot be seen to function although it has the capacity to do so. When the car is switched on, we can observe the actual functioning of the car and its potency is clearly in (second) act. Of course with a car, the potency is always passive, as it needs a human being to switch it on. Now think of an acorn in one's hand, a seed, wherein the essential form or first act of the plant is already present. Being a living organism the acorn has a potency, an intrinsic capacity, which in this case is active as it moves itself, but the functioning of this active potency or second act, may not yet be visible *i.e.* it is dormant, so slow as to be not visible. In this case one could call this active potency, a *remote* potency⁵². So one could call such an acorn, a living being in first act, with an active potency or latent function which is not yet visibly in second act or perceptible function. If the acorn is now put in the ground in spring, given the proper environmental conditions, then the active potency becomes *proximate* and second act becomes perceptible. The problem between remote and proximate active potencies is really in our level of perceptions. That should not really bother a realist.

The same logic applies to cryo-preserved life⁵³. In a cryo-preserved morula which is then thawed to resume living functions, there is the same analogy. Here what is important is not the actual exercise of the capacity of the morula to function here and now, but rather its possession of the capacity to function or its act of possessing it⁵⁴. There is a distinction between life and life processes and the equation of the life processes with the exercise of the canalizing capacity.

⁵² O'Rourke, K.D., *Is The Human Embryo a Person?* Neiswanger Institute of Bioethics and Public Policy, Stritch School of Medicine, Loyola University, Chicago, <http://www.domcentral.org/study/kor/> [31.07.08]

⁵³ Ramellini, P., *Life and Organisms*, Pontifical Council for Culture, Libreria Editrice Vaticana, 2006, pg. 334-358.

Through the concept of person, as an individual substance of a rational nature by the fifth century Boethius⁵⁵, Thomas Aquinas believed that this definition applied to human beings, because they are *separate* individuals and because they are *rational*. His concept of rational was “to have control over their own actions and are not only acted upon as are all other beings, but act of their own initiative”⁵⁶. One can conclude that Aquinas’ concept of rationality as a functional concept in man is comparable to Aristotle’s concept of an ‘active potency’. Rational beings exhibit rational functional capacity, or as the maxim goes, *operatio sequitur esse*.

Another interesting insight into the beginning of human life and the attainment of the active potency of the zygote is *Aquinas’* conception that the form must be able to function in the matter that it enlivens, that is the powers of the soul and the biological capacities must correspond to each other. Matter must be commensurate with form⁵⁷. One could easily argue that at the zygote stage there cannot be a human soul because its material conditions cannot sustain the operations of an intellectual soul. However one should not forget that,

the soul is more fundamentally a principle of human life. That is, as a being in first act, the human soul is the principle of human life (rather than a principle of human operations – my parenthesis); only in second act does the soul become the principle of distinct operations which require organs⁵⁸.

⁵⁴ *Ibid.*, pg. 358.

⁵⁵ Boethius, “Persona est rationalis naturae individua substantia”, *Liber de Persona et Duabus Naturis*, ch.3.

⁵⁶ Aquinas, T., *Summa Theol.*, Ia, 29,1.

⁵⁷ Aquinas, T., *Summa Theol.*, Ia, 90.4.1, ad 1. “[T]he powers of the soul and biological capacities must correspond to each other”. See also O’Rourke, K.D., *Is The Human Embryo a Person?* Neiswanger Institute of Bioethics and Public Policy, Stritch School of Medicine, Loyola University, Chicago, pg.3 <http://www.domcentral.org/study/kor/> [31.07.08]

⁵⁸ Bracken, J.W., ‘Is The Early Embryo A Person?’, *Linacre Quarterly*, Feb. 2001, 68:1:49-70.

These two insights seem to echo the passage in Aristotle's *Ethics*⁵⁹, when the term 'life' should be taken to refer to the actualization of the part of us which possesses reason, that is the rational principle of soul. The work (function) to be done by a human being is "rational or not irrational actualization of the soul"⁶⁰. Therefore one may conclude that since the work to be done by a human individual being is the rational actualization of the soul, and since the rational actualization or 'in act' of the soul is equivalent to the attainment in man of the active potency through form as act, then the functional capacity of the human being commensurate with his rational form is correspondent to this active potency. We shall see why the attainment of this active potency in man occurs only after syngamy has taken place, and not before.

2.4 Human Being versus Human Person

It is essential before starting this section to establish certain parameters. I will not be fully entering into the debate on human personality at this juncture, but in a later chapter. I too believe, like *Aquinas*, that for several reasons, some mentioned above, there is a human person when there is ensoulment. Like *Aquinas*, I also believe that there is a human person when there is a human being for the same reasons mentioned above. However unlike *Aquinas*, for reasons already mentioned, I hold that this person exists from conception or fertilization (I will be using the passive form of the word conception which is co-terminous for the word fertilization) precisely at the point of syngamy.

Others hold the personification of the biological matter to occur at the penetration

⁵⁹ Aristotle, *Nicomachean Ethics*, Book I Chapter 7.

⁶⁰ Aristotle, *Nicomachean Ethics*, 1098a4-8.

by the sperm into the 2° oocyte. I will be looking in detail at this very moot point. Contrary to public perceptions, the Catholic Church for example, does not formally teach that the human individual and person begin with sperm entry into the egg, but rather from conception or fertilization⁶¹. However to avoid confusion with other theories of personhood beheld to be later than syngamy, such as the appearance of the primitive streak at ten to fourteen days of development and also implantation into the uterine lining, at about the same time, or even theories of later personification such as at the development of neural tissue, the brain, at birth, or even the exhibition of self-consciousness in the Lockean tradition, I will refer to the beginning of human life as the beginning of a *human being*. The beginning of membership of the species *Homo sapiens* is the beginning of human life. That way, I will avoid the dichotomy that may arise by some who declare that there may be a human being but not yet a person and therefore this human being would not be eligible for legal protection since there is not yet personhood. I will argue for several reasons, that once a human being exists, being a human individual, it ought to be protected. The cut-off point comes precisely when normal human living cells come to be considered as organismic human life and there is then a new human individual.

2.5 The Naturalistic Fallacy

It may be also appropriate at this stage to treat a moot point about whether the nature of the matter under review can in any way be charged with the accusation of falling under the naturalistic fallacy. Naturalist theories of ethics maintain that goodness can be defined in terms of some non-moral position. There will be those who argue however, that no moral statement can be defined in terms of a non-moral statement

⁶¹ Ford, N.M., *The Prenatal Person-Ethics from Conception to Birth*, Blackwell Publishers Limited, Oxford, 2002, pg. 64. See also Sacred Congregation for the Doctrine of the Faith, *Donum Vitae*, 1987,

and therefore the simple physical existence of a human being need not lead one to show any moral respect for such a human being. This argument was first put forward by the empiricist David Hume in an argument later referred to as the *naturalistic fallacy*. This implies that empirical observation (sensory input) alone, does not confer on that object any moral or ethical consideration, ‘Is does not imply ought’. There are many arguments which can lead one to conclude that this argument is a relative one depending on the point of departure of the viewee. Ethical *teleologists* maintain that actions are to be judged good or bad by reference to the (teleological) end to which they aim. Ethical *deontologists* maintain that an action is good or bad, right or wrong, by something within the action itself⁶².

An interesting interpretation is given by Alasdair MacIntyre.

But a careful reading of the passage leaves it ambiguous as to whether Hume is asserting that the transition from *is* to *ought* needs great care, or that it is in fact logically impossible; whether he is deducing that most transitions from *is* to *ought* have in fact been of a fallacious kind, or that any such transition must necessarily be fallacious. Some very primitive support for preferring the former to the latter interpretation might be drawn from the fact that in Hume’s own moral philosophy the transition from *is* to *ought* is made and made clearly. But too much must not be made of this, for Hume is a notoriously inconsistent author⁶³.

A rationalist argument is again referred to in MacIntyre’s other book⁶⁴. The fact remains that when considering the nature of the ‘is’ which happens to be that of a

and *Dignitas Personae*, 2008.

⁶² Vardy, P., Grosch, P., *The Puzzle Of Ethics*, Fount, London, 1999, pg. 77.

⁶³ MacIntyre, A., *A Short History Of Ethics*, Macmillan, London, 1966, pg. 174. See also MacIntyre, A., *After Virtue*, (2nd edition), Duckworth, London, 1985, pg. 56-58.

⁶⁴ *Ibid.*

human being one is not simply considering the scientific epistemological nature of a human being but must also consider the anthropological, historical and cultural baggage that goes with it ‘*a priori*’. When practical reason acts to deduce substantial natural law norms, it must not only consider the scientific nature of man but also his anthropological existential constitution.

[W]hen the reason exercises its function of guiding action, it encounters non-arbitrary presuppositions and conditions which must be heeded in an exact manner if human praxis is to succeed. Without this insight, it is impossible for our human existence to develop its true potential⁶⁵.

It suffices to say at this juncture, that the moral angle I am approaching the problem from, throughout this dissertation and particularly this chapter, is a classical natural law ethical perspective⁶⁶. There is no doubt from this approach, that the presence of a physical human ‘is’, rationally and intellectually implies an ‘ought’. If a human being exists, one ought to respect him or her. Does an ‘is’, in ethics imply an ‘ought’? Does a descriptive statement entail an evaluative statement? It all depends of course on one’s philosophical departure point as already mentioned and on the nature of the ‘is’. Proponents who believe and apply the principles of natural law and those who believe in an objective morality would have difficulty understanding the problems concerned with the conversion of an ‘is’ into an ‘ought’ when the ‘is’ refers to a human being.

⁶⁵ Schockenhoff, E., translated by McNeil, B., *Natural Law and Human Dignity: Universal Ethics in an Historical World*, Catholic University of America Press, Washington D.C., 2003 pg. 177.

⁶⁶ Aquinas, T., *Summa Theologiae*, Ia2ae. 91, 2, “Ad secundum dicendum quod omnis operatio rationis et voluntatis derivatur in nobis ab eo quod est secundum naturam, ut supra habitum est. Nam omnis ratiocination derivatur a principiis naturaliter notis, et omnis appetitus eorum quae sunt ad finem derivatur a naturali appetitu ultimi finis; et sic etiam oportet quod prima directione actuum nostrorum ad finem fiat per legem naturalem”.

Gilby, T., *St. Thomas Aquinas - Summa Theologiae – Principles of Morality*, Blackfriars, Cambridge, 1966, Ia2ae, 18-21, Appendix I, pg. 128, “Natural law is a *moral law*, not the ‘laws of nature’ such as may be considered by non-moral sciences. As such it does not compose a code or a juridical complex to be treated like any other body of legislation. ‘Natural’ does not mean that it lies only at the level of nature as opposed to supernature, but that its movement comes from within without imposition from external authority”.

To kill an existing innocent human being is always a morally evil act in itself. There is the existence of a moral object. Killing innocent people is always objectively evil.

Other, more modern, philosophers engaging certain ethical theories of a more post-utilitarian bent for example might consider that the very fact that there is an empirical description of a physical object, does not lead one to conclude that the object should be respected universally as being objectively good in itself. One may rather look at the utility/consequences such as in the philosophies of Jeremy Bentham and John Stuart Mill, whereupon, the morality applied becomes subjective and relativist. Two such well known philosophers are David Hume (1711-1776),⁶⁷ as mentioned above, and the philosopher G.E. Moore (1873–1958)⁶⁸.

Hume with his empiricist scepticism actually paved the way for utilitarianism. He doubted, theoretically, the existence of material objects preferring to believe that what we see around us are just the subjective perceptions of such things in the mind in line with his empiricist prejudice. He doubted the nature and reality of the connection of the causal reality with personal identity and thought of morals as a question of sentiment over which reason has no bearing. Reason had to be the slave of our passion according to him⁶⁹. No wonder this leads to a very subjective form of morals.

⁶⁷ Hudson, W.D., *Modern Moral Philosophy*, Macmillan Press Limited, London, 1983, pg. 253, "...when of a sudden I am surprised to find that, instead of the usual copulations of propositions *is* and *is not*, I meet with no proposition that is not connected with an *ought* or *ought not*...the distinction of vice and virtue is not founded merely on the relations of objects, nor is perceived by reason." *Treatise* III.i.1.

⁶⁸ McGlynn, J. V., Toner, J. J., *Modern Ethical Theories*, Bruce Publishing Company, Milwaukee, 1962, pg. 84, "...Moore works out his own variety of utilitarianism. He maintained that our duty is to perform the act which is most conducive to the production of good. Now for Moore the only ultimately valid criterion in this case is an investigation of the consequences the act will produce. He does not interpret these consequences hedonistically; rather he expects us to accept all the varieties of goodness which we perceive in the consequences and weigh them against the evil therein".

Moore, unlike Hume, was not a sceptic but a realist. He believed that the things which we sensed were real objects. However he believed “that moral judgements were incapable of being proved (what he referred to as ‘intuition’)”⁷⁰. He thereby believed that these intuitions were not in any way infallible thereby rendering them teleological and subjective. Actions were to be considered good or bad not in themselves, but depending on the results achieved in terms of the states of consciousness ascribed to pleasure such as those from sexual intercourse and aesthetic beauty⁷¹.

They have both come up with different versions of the ‘naturalistic fallacy’ as it is called (a term coined by Moore in his *Principia Ethica*, 1903)⁷². Thereupon, as seen above, they insist that the empirical description of a physical object does not necessitate any ethical conclusions. It would be a mistake to explain morality in terms of something non-moral. This approach was meant to counter traditional ethics and the modern naturalistic philosophies which depended on their objective moral evaluation on scientific empirical qualities of the natural order.

The problem posed by the naturalistic fallacy may, however, be answered using the post-utilitarian analytical language itself because, the fact remains that rules are often taken to be constitutive rather than regulative. ‘Regulative’ rules regulate activities,

⁶⁹ Friggieri, J., *In-Nisga Tal-Hsieb – Storja Tal-Filosofija*, Vol. II, Media Centre, Malta, 2007, pg. 131-169.

⁷⁰ Vardy, P., Grosch, P., *The Puzzle Of Ethics*, Fount, London, 1999, pg. 77.

⁷¹ Vardy, P., Grosch, P., *The Puzzle Of Ethics*, Fount, London, 1999, pg. 78.

⁷² Mac Intyre, A., *A Short History Of Ethics*, Macmillan, London, 1966, pg. 252. “To the doctrine that *good* was the name of a natural property Moore gave the name ‘the naturalistic fallacy’. For Moore this fallacy is committed in the course of any attempt to treat *good* as the name of a property identifiable under any other description. *Good* cannot mean ‘commanded by God’, any more than it can mean *pleasant*, and for the same reasons the expression ‘the naturalistic fallacy’ has since been adopted by the adherents of the view that one cannot logically derive an *ought* from an *is*; but although this latter doctrine is a consequence of Moore’s, it is not identical with it”. See also pg. 249,

which are independent of the rules. 'Constitutive' rules constitute and regulate activities whose existence is dependent on the rules⁷³. When we carry out activities, one must distinguish between a fact which lies outside an institution and one that lies within an institution. Kicking a ball around frivolously is not playing Association Football (FA). Playing Association Football is not kicking a ball around frivolously, but the rules of playing football emanate and are associated with the 'institution' of football as a particular game. Therefore there are facts that are associated with an institution and other facts that are not associated with an institution or noninstitutional facts. If while playing football I am called to be in an 'offside' position by the referee, or if I touch the ball with my hands, and a foul is called, I may not personally argue that he may not derive an 'ought' from an 'is', because the rules of football emanate from the institution of football, the activity is dependant on the rules of Association Football⁷⁴. In American Football, the rules would allow me to touch the ball with my hands! Likewise, in the case of the empirical existence of a human being, that very fact 'associates' that very being with the institution called humanity. There are rules, which when being members of humanity, one has to follow, such as respecting another human being's dignity and right to life.

A sensitive being which is recognized biologically as a dog, is not subject to the same rules of respect as a human being but would be subject to other rules of respect falling under the institution of 'sensitive beings'. A biological organism identified as a particular plant would not fall under the institutional heading of a sensitive being, but a 'vegetative being' and therefore the rules of respect are different. This is why, so

where for Moore the term *natural* meant an analyzable property, while the term *good* was *non-natural* in the sense that it was simply an unanalyzable property and therefore indefinable.

⁷³ Searle, J. R., 'How to derive 'Ought' from 'Is'', from Foot, P., *Theories of Ethics*, Oxford University Press, 1967, pg. 101-114.

many sectoral and global human institutions of a political nature, such as the Council of Europe, the EU and the UN, have established internationally recognized rights that go with being human and, once an organism is recognized as being human, then that human has to be given the respect that those rights convey⁷⁵.

At this juncture, one ought to mention Elizabeth Anscombe who writes of the *Divine law* conception of ethics derived from Christianity, being dominant for many years over the minds of the West, which creates a civilization and culture whereby the concepts of obligation from facts remains bound within these same cultural contexts⁷⁶. However without this specific cultural background, they lose their meaning, which then diverts the discussion to the debate whether all the various cultures are to be considered as myths and why one ought to choose the Christian myth over the others. A myth is here qualified in the sense that there is nothing at all in cultures which can convince one of the existence of an internal organising principle beyond the haphazard collection of objects and occurrences which formulate the said cultures, occurrences which willy nilly are very often ascribed to the capricious whims of minor or not so minor gods⁷⁷. I have my own answers to that question, in the sense that Christianity is witnessed to and has a history, but this goes beyond the scope of this study.

⁷⁴ See also Alan Gewirth's derivation of 'ought' from 'is' in Hudson, W.D., *Modern Moral Philosophy*, Macmillan Press Limited, London, 1983, pg. 277-294.

⁷⁵ Mifsud Bonnici, G., 'Entrenchment and simple majority voting', *The Times*, Wednesday December 14, 2005, Allied Malta Newspapers, Malta.

Mifsud Bonnici, G., 'Now that human rights are entrenched...', *The Times*, Monday February 27, 2006, Allied Malta Newspapers, Malta.

⁷⁶ Anscombe, G.E.M., *Collected Philosophical Papers – Vol. III Ethics, Religion and Politics*, Basil Blackwell, Oxford, 1981. Chapter 4, 'Modern Moral Philosophy', pg. 30 and 'Authority in Morals', pg. 43. "[S]ome of the facts, of what is the case, will help to determine moral truth - i.e. some of the truth about what is the case will help determine truth about what kinds of thing ought and ought not to be done....just as the grounds on which the authority itself tells you moral truth may be either *per se* revealed truth as to facts, or facts discoverable by reason's unaided investigation", pg. 49.

2.6 Respect for Human Dignity

There are several reasons which lead one to conclude that if the “*is*” constitutes a human subject, then there should be an “*ought*” which intrinsically goes with it. That is, the “*ought*” is contained in the “*is*”. It is clear that a human being by simple observation, cannot be accorded the same moral status as a dog or no moral status such as that of an inanimate chair. There are several sources which contribute to the concept of intrinsic moral worth for the human subject and therefore to the concept of human dignity. One ought to trace the traditional derivation of this concept.

The first source is derived from a particular school of philosophy in ancient Greece and Rome, that of the so called *Stoics*⁷⁸. As opposed to other schools of thought at their time, the *Stoics* believed that human beings have dignity because they possess reason. They believed that despite external circumstances, it was always possible to live in a dignified manner, and that nothing that anyone could say or do, in effect, could diminish one’s dignity or integrity. The idea of dignity was as relevant for the slave as for the emperor.

Another concept derived from antiquity which contributes to the recognition of the universal moral worth of man through the possession of reason, associated with names like Socrates, Plato and Aristotle is, of course, that of natural law⁷⁹. It would be beneficial to trace the origin of the contribution of reason to determine good from bad. The Socratic concept of the existence of an objective truth as against the *Sophist* tradition of truth being a relativistic concept leads him to conclude that this truth is

⁷⁷ Friggieri, J., *In-Nisga Tal-Hsieb – Storja Tal-Filosofija*, Vol. I, Media Centre, Malta, 2006, pg. 2.

⁷⁸ Schulman, A., *Bioethics and Human Dignity*, working paper presented to the President’s Council on Bioethics in the December 2005 meeting, http://www.bioethics.gov/background/human_dignity.html [16.01.2006].

accessible to every man through reason. It is difficult to tell exactly which of the dialogues written by Plato belong to him or to Socrates. In *Phaedo*, Socrates, through Plato, declares that it is only through reason that the soul is able to grasp truth⁸⁰. In *Euthyphro*, Plato argues against the Socratic concept of a God-command theory of ethics and opts for a standard of morality independent of God and based on an absolute moral order. He argues against morality as being relative to the individual (*Theatetus*) and places the absolute moral standard in the theory of *Forms*. The Forms represent an absolute reality as opposed to the reality grasped by our senses (Plato's dualistic metaphysics), with the form of the *Good* being the highest of the Forms (*The Republic*) and one may arrive at this form of the 'good' only by seeing (Id) through the eyes of reason⁸¹.

Aristotle's main work in ethics is *The Nicomachean Ethics*. Here, Aristotle identifies a number of interesting points with respect to the concept of what constitutes the ultimate good which is an identifiable goal and towards which all human endeavours point. Life is an "activity in accordance with virtue in a life that is *teleion*"⁸². For Aristotle, man's ultimate good lies in seeking his happiness (*eudaimonia*) and the best way to achieve this is through a life of reason grasping⁸³ virtuous laden activity⁸⁴, in

⁷⁹ Haas, J., *Introduction to Moral Theology*, Lecture 2: Natural Law, International Catholic University, <http://home.comcast.net/~icuwweb/c00502.htm> [13.03.2006].

⁸⁰ Friggieri, J., *In-Nisga Tal-Hsieb – Storja Tal-Filosofija*, Vol. I, Media Centre, Malta, 2006, pg. 56 from *Phaedo* 65c.

⁸¹ *Ibid.*, from *Phaedo* 76c,d. See also Wain, K., *The Value Crises: An Introduction to Ethics*, Malta University Publishers, Malta, 1995, pg. 38.

⁸² Aristotle, *The Nicomachean Ethics*, 1098a18.

⁸³ Aristotle, *The Nicomachean Ethics*, translated by David Ross, Oxford University Press, 1998, pg. 4, "[B]ut to those who desire and act in accordance with a rational principle knowledge about such matters will be of great benefit" 1095a6 – 1095a17. Footnote 1 pg. 4, "Till recently the accepted translation was 'reason'. But it is, I think, quite clear that normally (logos) in Aristotle does not stand for the faculty of reason, but for something grasped by reason, or perhaps something for an operation of reason... But for (logos) I have used... such renderings as 'rational principle', 'rational ground', 'rule', 'argument', 'reasoning', 'course of reasoning'". See also pg. 266, "for man, therefore, the life according to reason is best and pleasantest, since reason more than anything else *is* man. This life is therefore the happiest" 1178a5.

⁸⁴ Friggieri, J., *In-Nisga Tal-Hsieb – Storja Tal-Filosofija*, Vol. I, Media Centre, Malta, 2006, pg. 96.

the sense of seeking excellence. “A virtue is a trait that makes a thing of a certain kind good and in view of which we call a thing of that kind ‘good’”⁸⁵. His theory of good is thus built on the attainment of excellence of both character (moral)-related and intellectual virtues (*areté*).

In Books III and IV⁸⁶, Aristotle speaks of the concept of *kalon* in character-related virtue. One can translate this to mean ‘beautiful’ in the sense that something is beautiful or ‘noble’. This echoes *Plato’s* use of the terms (quoting *Socrates*) in *Gorgias* and in the *Symposium*. Although Aristotle lists *kalon* as an attraction to virtuous action which is *not* attributable to the part of the soul that has reason, he also means to suggest that such an action is rationally justified⁸⁷. He lists twelve of these moral virtues, such as courage, temperance, generosity, friendship and justice, which are inculcated by habit. As for the thinking-related virtues, Aristotle describes these as a state of the soul which when operative leads one inevitably to the truth⁸⁸. Thinking-related virtues are inculcated by learning and he subdivides these into five major types (theoretical knowledge, technical knowledge or art, intuitive reason, practical wisdom and philosophic wisdom) of which the highest is philosophic wisdom (*sophia*).

Aristotle seems to want to maintain that the various moral virtues dispose individuals in the right direction in order to seek happiness and that the thinking-related virtue called *phronēsis* or practical wisdom, through its work of governing and ordering

⁸⁵ Pakaluk, M., *Aristotle’s Nicomachean Ethics – an introduction*, Cambridge University Press, 2005, pg. 75.

⁸⁶ Aristotle, *The Nicomachean Ethics*, Bk. III, 1115b23-24, 1116a11-12, 1119b15-16, and Bk. IV, 1120a23-26, 1122b6-7, 1126b28-29, 1127a28-30.

⁸⁷ Pakaluk, M., *Aristotle’s Nicomachean Ethics – an introduction*, Cambridge University Press, 2005, pg. 115.

⁸⁸ Aristotle, *The Nicomachean Ethics*, Bk. VI, 1139b14-18.

one's affairs appropriately, helps one attain such a goal⁸⁹. For example, phronesis would help determine the necessary mean in character-related virtues. Inappropriate excess of say courage, could mean foolish rashness in a battle, which could cost lives, while inappropriate lack of courage could mean cowardice, also costing lives. This is called the *doctrine of the mean*⁹⁰ which is thus established by the help of phronesis. These virtuous activities would ultimately be in the service of the ultimate target and most highly ranked virtue, *sophia* or philosophical wisdom⁹¹.

At the end of Book I Aristotle divides the soul into rational and irrational parts with further subdivisions. The moral or character-related virtues are connected to the irrational part of the soul while the thinking related virtues are connected to the rational part. The character-related virtues, although connected to the irrational unreasonable soul, still somehow 'listen' or respond to reason as if "to a father"⁹². Coupled with his description of the soul in *The Nicomachean Ethics*, Aristotle also describes the soul in *De Anima*, which distinguishes between the nutritive, sensory and thinking soul.

According to the natural law view point therefore, there is inside man a natural propensity for reason, and this reason predisposes one to respect other human beings. Human beings are made in such a way that we can discover truths about reality starting with the information given to us by our senses. One of the main precepts of natural law is that good is to be done and pursued, while evil is to be avoided. Another one derived from justice as a moral virtue, is that one should do to others as

⁸⁹ Aristotle, *The Nicomachean Ethics*, Bk. VI, 1144a20-22.

⁹⁰ Aristotle, *The Nicomachean Ethics*, Bk. II, Ch. 6 – 7.

⁹¹ Pakaluk, M., *Aristotle's Nicomachean Ethics – an introduction*, Cambridge University Press, 2005, pg. 323.

⁹² Aristotle, *The Nicomachean Ethics*, 1102b31, 1102b32, 1103a3.

one would want others to do to him. One must not forget that law in essence is principally something pertaining to reason and directing the actions of the community. Thomas Aquinas, believed like Aristotle, that man's greatest consolation is the rational self-conditioning towards a virtuous life, particularly the intellectual virtues of which the highest is the virtue of the contemplation of the essence of God. Thomas' God is of course here the Christian God.

Thomas Aquinas⁹³ says that whatever is ruled by reason is contained under the law of reason. Natural moral law is a prescriptive law, that is, it tells one what should be done, and not a descriptive one. Those truths that are discovered and established by reason in the moral realm are called the truths of natural law⁹⁴. Natural moral law is part of God's eternal law (*lex aeterna*) as applied to man, who has a rational capacity⁹⁵. It is the first sharing by intelligent creatures in eternal law⁹⁶.

The eighteenth century German enlightenment philosopher, Immanuel Kant⁹⁷ shared with Aquinas a commitment to reason as a guide to right action. His primary purpose was to show how, in a world governed by the laws of mathematical and physical principles, moral freedom and responsibility could still be possible. For Kant, intrinsic worth and dignity belonged to all human beings because of their rational autonomy, "*ought implies can*". Human dignity was to be located entirely in rational autonomy. Kant's theory is called deontological as it stresses duty. He considers the

⁹³ Aquinas, T., *Summa Theologiae*, Ia2ae. 94.

⁹⁴ Smith, J. E., *Introduction to Sexual Ethics*, I. What is Natural Law, International Catholic University, <http://home.comcast.net/~icuwweb/c00201.htm> [13.03.2006].

⁹⁵ Friggieri, J., *In-Nisga Tal-Hsieb – Storja Tal-Filosofija*, Vol. I, Media Centre, Malta, 2006, pg. 258 & 260.

⁹⁶ Aquinas, T., *Summa Theologiae*, translated by Thomas Gilby, Blackfriars, Cambridge, 1966, Appendix 3, 'Natural Law', pg. 169.

⁹⁷ Mc Glynn, J.V., Toner, J.J., *Modern Ethical Theories*, The Bruce Publishing Company, Milwaukee, 1962, pg. 28-43. *Immanuel Kant's* (1724-1804) main ethical thought is found in the following works:

goodness of a human being's will as apodeictic or categorical this being fostered by a human being acting rationally. Kant termed the demands upon us of moral law as "*the categorical imperative*".

The *Categorical Imperative* is based on a number of formulations on which all other moral commands are based. The most well known of these are the following three.

1) The formula of the Law of Nature:

Act as if the maxim of your action was to become through your will a universal law of nature.

2) The formula of the End in Itself:

Act in such a way that you always treat humanity, whether in your own person or in the person of any other, never simply as a means, but always at the same time as an end.

3) The formula of the Kingdom of Ends:

Act as if you were through your maxims a law-making member of a kingdom of ends⁹⁸.

One may use Kant's formula of the law of nature, to rationally conclude that all members of the human race, even those in embryonic or infant form, should be accorded equal respect due to their membership of the human race! However having said this, due to the emphasis that Kant applies to the doctrine of *rational autonomy* or *will*, it is difficult sometimes to apply this particular philosophy to those human beings without the powers of rational autonomy such as embryos and infants, except

- *Foundations of the Metaphysics of Morals*, - *Critique of Practical Reason*, - *The Metaphysics of Morals*, of which the second is the most important.

⁹⁸ Acton, H.B., *Kant's Moral Philosophy*, Macmillan, London, 1970. See also Kant, I., *Fundamental Principles Of The Metaphysic Of Ethics*, translated by Thomas Kingsmill Abbott, Longmans, London, 1955.

for the fact that they are members of the human species with the active capacity to develop to adult rationality⁹⁹. This fact alone would not, for example, be helpful if our discussion were to be oriented to show that a human being is to be considered a person in his own right.

Since the second world war, several national constitutions and international declarations such as the *Universal Declaration on Human Rights* of the *United Nations*, the *European Convention of Human Rights* of the *Council of Europe* setting up the *European Court of Human Rights* in *Strasbourg*, and the *Helsinki Declaration of Human Rights* of the *OSCE*. The *Universal Declaration of Human Rights* (1948) declares the recognition of,

the inherent dignity and the equal and inalienable rights of all members of the human family”.

For example, the German *Basic Law (Grundgesetz)* of 1949, begins by stating,

[H]uman dignity is inviolable. To respect and protect it is the duty of all state authority.

These rights are necessary and inherent and not the least contingent. Therefore these human rights are to be considered as moral rights because they belong to the widespread human race. Moreover they are dealing with both concrete and abstract goods¹⁰⁰. Of course there are also religious accounts of the dignity of man such as the revealed concepts of man created in the image of God, found in the Christian and Jewish religions¹⁰¹, but since these sources are derived from revelation not rationality,

⁹⁹ Schulman, A., *Bioethics and Human Dignity*, working paper presented to the President’s Council on Bioethics in the December 2005 meeting, http://www.bioethics.gov/background/human_dignity.html [13.03.2006].

¹⁰⁰ Vardy, P., Grosch, P., *The Puzzle Of Ethics*, Fount, London, 1999, pg. 206.

¹⁰¹ Soskice, J. M., *Imago Dei*, *Discern Institute for Research on the Sign of the Times*, Occasional Paper 7, Malta, March 2006.

they are not of much use to us here. Some authors are today questioning why¹⁰² we should not dispense with human dignity and simply refer precisely to what “respect for persons” should demand for us, such as,

the need to obtain voluntary, informed consent; the requirement to protect confidentiality; and the need to avoid discrimination and abusive practices¹⁰³.

Others however maintain its importance in applied ethics, especially bioethics¹⁰⁴. In the Maltese newspaper *the Times*, from August 2005 through 2006 and beyond, there was a whole series of correspondence between those who would term the application of observational human dignity to any member of the human species at whatever stage of development as a naturalistic fallacy, and others who more or less put forward several views to the contrary. It is interesting that in one of the articles, Professor Giuseppe Mifsud Bonnici former Chief Justice of Malta, in reply to a previous article by Professor Kenneth Wain in the same newspaper, wrote,

[T]o put it in a nutshell, for Prof. Wain this is ‘vacuous’ and he thinks that natural law is made by nature instead of ‘in accordance with nature’. Most of the fundamental human rights are based on human nature and they are the outcome of the discoveries and insistence of jurists and philosophers in their quest for the limitations of the powers of the state to enact laws without constraint to suit the will of the sovereign or of the ruling majority¹⁰⁵.

Professor Wain in his earlier piece referred to above, had stated,

¹⁰² Pinker, S., ‘The Stupidity of Dignity’, *The New Republic*, 2007, http://www.tnr.com/story_print.html?id=d8731cf4_e87b-4d88-b7e7-f5059cd0bfbf [05.06.2008].

¹⁰³ Schulman, A., *Bioethics and Human Dignity*, working paper presented to the President’s Council on Bioethics in the December 2005 meeting, http://www.bioethics.gov/background/human_dignity.html [16.01.2006].

¹⁰⁴ Jordan, M.C., ‘Boethius and “Human Dignity”’, *Journal of Medicine and Philosophy* 35:180-196. Also Kass, L., *Life, liberty, and the defence of dignity*, Encounter Books, San Francisco, 2002.

¹⁰⁵ Mifsud Bonnici, G., ‘Now that human rights are entrenched...’, *The Times*, Allied Malta Newspapers, 27 February, 2006, pg. 12.

[T]oday it (natural law) is not worth keeping and unnecessary for sustaining human rights¹⁰⁶.

To which Professor Mifsud Bonnici adds

I take this to be an acknowledgement that, at least up till today, natural law was necessary to bring forward human rights and sustain them. It is only now, today, since the battle has been won, that natural law is not worth keeping as it is no longer necessary for sustaining human rights as they have now taken root and are entrenched in most constitutions.

Having established the historical trace for the development of the concept of human rights¹⁰⁷, I now move on to consider the philosophical interpretation of the scientific principles involved.

2.7 The Single-Cell Organism or Living Cell of Species *Homo sapiens*

One of the most important scientific distinctions one must make clear, is the distinction between an organism and a living cell. These two nouns do not have the same biological meaning or ethical implications where these are applicable. Does a living single cell of the species *Homo sapiens* necessitate the showing of any moral respect? A single cell or cell-lines of skin tissue or intestine or brain, a single sperm cell or ovum need not be shown any ethical merit! They are single cells of no ethical merit even though they belong to a human being.

¹⁰⁶ Wain, K., 'Enhancement, democracy and special procedures', *The Times*, Allied Malta Newspapers, Malta, 5 January 2006.

¹⁰⁷ See also The President's Council on Bioethics, *Human Dignity and Bioethics: Essays Commissioned by the President's Council on Bioethics*. Washington, D.C., March 2008. http://www.bioethics.gov/reports/human_dignity/index.html [12.12.2008]

What then demarcates a human one cell zygote from these other one-celled human body cells or gametes, albeit they are both living? It would be presumptuous of me to answer this question in one or two lines. A single cell zygote is one human cell while the sperm cell is also one single cell from the human organism. The answer lies in the province of teleology. A sperm cell left alone does not have any intrinsic capacity to develop into anything else. It does not have an active potency to develop into a human adult. A human zygote is totipotent as one cell and the cells derived thereof remain so for some divisions. This means it has the intrinsic capacity to develop into a foetus, then a child and eventually into an adult.

Nevertheless, first one ought to define a *living body*. Since one is dealing with life on Earth, I need not repeat that one understands that the basis of this terrestrial life is carbon related so as not to exclude the possibility of the existence of other unknown forms of life, for example silicon-based ones! One can define the life of a living body (act) as the possession of the canalizing capacity by that body¹⁰⁸ (potency). One can define the canalizing capacity as the capacity of a body to canalize an exchange with its surrounding environment and a largely assimilative-dissimilative replacement inside it of material particles such that that body is able to maintain itself¹⁰⁹.

What therefore is the distinction between a living body and an organismically living body or *organism*? There have been several attempts to define organism in

¹⁰⁸ Ramellini, P., *Life and Organisms*, Pontifical Council for Culture, Libreria Editrice Vaticana, 2006, pg. 273.

¹⁰⁹ *Ibid.*, pg. 273. See also pg. 396, “living body of terrestrial type *LB*, *qua* living during a time interval *t* short at will (provided sufficient to actualize the processes involved by the *definiens*) = macroscopic body possessing during *t* a canalizing capacity largely determined by the kinds, relations and events of those carbon polymers which largely compose it (above all, its proteins and its deoxyribonucleic acids, whose sequences almost completely determine the sequences of its proteins”. “Life of a living body of terrestrial type *LB* during a time interval *t* short at will (provided sufficient to actualize the processes involved by the *definiens*) = possession during *t* of the canalizing capacity by *LB*”.

biophilosophical literature. Some commendable views mentioned by Ramellini, are those of Kant in his *Kritik der Urteilskraft – Critique of Judgement*. Here he defines an organism as “*Ein organisiertes Product der Natur ist das, in welchem alles Zweck und wechselseitig auch Mittel ist*”, that is an organized product of nature is one in which every part is reciprocally both ends and means¹¹⁰.

Another important effort is by Mario Bunge and Martin Mahner who came up with the definition of an organism as a biosystem which is not a proper subsystem of a biosystem¹¹¹. Finally Joshua Hoffman and Gary Rosenkrantz define a living organism only if it is an organic living entity which is not a part of another living entity, and whose discreet biotic entities are functionally united¹¹². Having assumed the critical definitions provided by these important authors, Ramellini goes on to arrive at the definition of organism by adding some other considerations. First, there has to be some principle of *unity*. Second, that there has to be the subordination of all parts to an *immaterial biological master entity* such as genetic information. The third, relates to the *subordination* of all parts to the whole. The fourth and final consideration, mentions *coordination* or the reciprocal subordination of each part to another¹¹³. His final analysis leads to the definition of an organism (terrestrial) as¹¹⁴,

¹¹⁰ Kant, I., *The Critique of Judgement*, translated by James Creed Meredith, Oxford, Clarendon Press, 1952, pg. 24 (§ 66).

¹¹¹ Ramellini, P., *Life and Organisms*, Pontifical Council for Culture, Libreria Editrice Vaticana, 2006, pg. 287 from Mahner, M., Bunge, M., *Foundations of Biophilosophy*. Berlin-Heidelberg-New York, Springer, 1997.

¹¹² Ramellini, P., *Life and Organisms*, Pontifical Council for Culture, Libreria Editrice Vaticana, 2006, pg. 299. Quoting from a paper by the authors entitled *On the Unity of Compound Things: Living and Non-Living*. *Ratio* (n.s.), 11: 298-315. This paper was a continuation of a book issued the previous year where they formulated a critical concept of substance as “an entity satisfying an independence condition which could not be satisfied by insubstantial entities”. Hoffman, J., Rosenkrantz, G.S., *Substance: Its Nature and Existence*. Routledge, London, 1997.

¹¹³ Ramellini, P., *Life and Organisms*, Pontifical Council for Culture, Libreria Editrice Vaticana, 2006, pg. 313.

¹¹⁴ *Ibid.*, pg. 397.

either a living body of terrestrial type *LB*, or a living part *LP* of a living body of terrestrial type *LB*, which during *t* is biologically subordinated to itself and only to itself.

Keeping these parameters in mind, it is now possible to reasonably conclude why a skin cell or a sperm or oocyte type I (precursor of the ovum) is a living body (LB) but not an organism as such. This is because all these cells are biologically subordinate to themselves, but are also subordinate (coordinate) with other cells of the axenic¹¹⁵ human body from which they are extracted and subordinate to the distinct axenic human body from which they are extracted or into which they could be inserted.

On turning one's attention to the human zygote, one observes that this is subordinate to itself, but not coordinate with other cells of the axenic body from which extracted, not subordinate to the axenic body from which extracted or into which inserted. Therefore the human zygote is subordinate to itself and itself only. Therefore the human zygote is considered to be an organism.

It is self-evident that the different concepts of living body and organism have to be taken into account when considering the beginning of human life during fertilization. Fertilisation begins when the sperm enters an oocyte II, as explained in the chapter on the scientific considerations of fertilization. Neither the sperm nor the oocyte II is a living organism but only a living body. At the end of the process of fertilization about twenty-four hours later, there exists a human zygote which is an organism, important to add, derived from human parents and of the species *Homo sapiens*. At which stage during this process does the penetrated oocyte becomes defined as a living organism

¹¹⁵ Human body containing only cells from the successive divisions of the original human zygote, i.e. excluding symbionts and parasites.

from the definition of a living body? Does this occur on penetration, at the formation of the ootid after the second meiotic division has taken place, or at syngamy? All three possibilities need to be investigated.

With this in mind, let us examine each stage of development as per concept of subordination referred to above. First, at penetration we know that the plan of the genome has not been finalized yet. There are sixty-nine chromosomes present and the final second meiotic division producing the entity's plan of development has not yet been finalized. This needs a further two to eight hours to occur as seen previously. One must not forget that this is a random game of roulette. How can one think that a cell can be subordinate to itself when it does not yet contain its own plan of development? One can argue that the maternal m-RNA present in the cytoplasm of the oocyte II could be subordinating the cell processes of the living body to the living body itself since the maternal m-RNA now belongs to the oocyte as a separate living cell. However, even if we, for a moment were to argue that this could be so, we must still consider the problem of its being subordinated and coordinated by the other cells of the human body from which they are extracted and also to the distinct human body from which they are extracted, in this case the mother. So surely there is here no case of the existence of an organism subordinate to itself and only itself, that is not to others.

Let us now consider the formation of the ootid after the second meiotic division has occurred, and the presence of the two separate pronuclei in the cytoplasm of the ootid. Many argue that since the pronuclei are still separate, unity is still not in actual form

but only in potency. One can however reason (see *Rager*)¹¹⁶, that there is a single cellular entity enclosed in one cytoplasm and that this is now subject to itself as the genetic plan, although not united, has been singled out, and therefore this constitutes a human being or a human organism. We have already seen in the case of the sperm cell for example, that even this constitutes a living body subordinate to itself. This however does not constitute a living organism as per definition above. The same reason mentioned in the previous paragraph holds water. The ootid is still physiologically subordinate to the maternal m-RNA that the ootid has derived from the maternal DNA. Transcription is by now occurring in the separate pronuclei, but translation of proteins is still occurring under the extended control of the mechanisms determined by the mother's DNA in the absence of normal body cell form. In my view this constitutes a subordination of the living body concerned (ootid) to another distinct living body and coordination of cells by another distinct living body in this case the mother. In my opinion this does not constitute subordination to oneself and only oneself. Therefore in my opinion the ootid is not an organism.

The third consideration is that of the cell with the conjoined pronuclei, or what one may now call the zygote. For practical purposes we are considering stages thirteen and fourteen of the process of fertilization mentioned in the *Chapter I* on the scientific considerations of fertilization. There is, at this stage, one cell and conjoined nuclear material. The process of unification of the pronuclei has occurred. This is the

¹¹⁶ Although Günther Rager seems to prefer the option of defining the zygote at the pronuclear stage as seen earlier on, in my personal correspondence with him [13.12.2006], he seems to not be dogmatic about this point. "I think that it is most important to maintain that the existence of a human individual begins with fertilization and not later. I am not dogmatic, however, with respect to the precise point within the fertilization process. Usually the zygote is defined as the developmental stage when chromosomes are arranged in the metaphase plate, just before the first division of the cell. If one uses the criterion that the individual genome should be established, then one has to take the pronuclear stage. If one thinks in the line of active potentiality, i.e. the beginning of autonomous development, then one should take the moment when the cell membranes of the spermatozoon and the oocyte fuse. Then the oocyte is activated and meiosis is completed".

combined nuclear DNA form repeated in every cell of the human body until death. Some adult human cells are multi-nucleated, but even multi-nucleated cells have combined maternal and paternal components of the nuclei. This is an important step as the cell now definitely has a unified plan of development to follow. There is one combined nuclear entity (or plan) in act and one cellular entity. Now that the normal human anatomical form has been established could we consider the cell to be now subject to itself and only itself?

Should we still argue that since syngamy occurs and up to the four cell embryo translation is still mediated by the maternal m-RNA and therefore this still constitutes a subordination to another distinct living body? Maybe it is important at this stage to stop and consider referring to some comparisons from Aristotle's concepts of *substance* derived from his *Metaphysics* and one may revisit this query later. Let us look first at the definition of what a substance is.

Aristotle uses the word substance in two senses. First that which does not change in the process of change, an individual. Second, that which is a separable item, that it may not be used as a predicate of another subject or individual¹¹⁷. One may say therefore that a substance does not ontically change nor can it become a predicate to another substance whether object or individual¹¹⁸. "Substance which has an absolute quiddity, does not depend in its quiddity upon another"¹¹⁹. Sensible substance consists of uniting substantial form as act, to matter as potency, in order to constitute

¹¹⁷ Barnes, J., *Aristotle – A Very Short Introduction*, Oxford University Press, 2000, pg. 71. See also Aristotle, *Metaphysics*, Book Z 1029a 1-28.

¹¹⁸ Friggieri, J., *In-Nisga Tal-Hsieb – Storja Tal-Filosofija*, Vol. I, Media Centre, Malta, 2006, pg. 85-86.

¹¹⁹ Conway, P., edited by Spangler, M.M., *Metaphysics Of Aquinas – A Summary of Aquinas's Exposition of Aristotle's Metaphysics*, University Press of America, Maryland, 1996, pg. 195.

a unity of the composite of both¹²⁰. One can observe in Aristotle's Book H¹²¹ that matter can exist as a substance in its own right, as a composite by a substantial form. However in Aristotle's Book Z¹²² we see, that if this same matter is acted on by a different substantial form, it makes sense to cease calling it a substance (as it is changing under the influence of the new substantial form as act and becomes a predicate to substance) and to better consider it as a potential matter or prime matter for the new composite as a new substance¹²³.

For example, Sodium (Na) as an atom is a composite substantial matter as act, of atomic sub-particles through its substantial form. So is the Chlorine (Cl) atom. However if the Na and Cl atoms had to come together, something they easily do, then a new substantial form causes the Na and Cl atoms to form a new composite matter called Sodium Chloride (NaCl – common salt). In this case it is no longer sensible to call the Na and the Cl atoms a substance but potential prime matter, because they are acted upon and changed by the stuff of a new formal substance (that of NaCl) to form a new composite substance called NaCl which is inorganic matter. If the NaCl had to be acted on by a human substantial form to be incorporated as matter into the substantial composite called the human living body, then it no longer makes sense to speak of the matter of NaCl as a substance, but only as matter as potency. It is substantial form plus matter which produces a composite substance. One cannot really speak of substantial form plus substantial matter forming a substantial composite as matter, as this would be a contradiction in terms since there is change

¹²⁰ *Ibid.*, pg. 204.

¹²¹ Aristotle, *Metaphysics*, Book H, 1042a 24, 1042a 32.

¹²² *Ibid.*, Book Z, 1029a 20, 1029a 27.

¹²³ De Lacy, P.H., 'Greek, Roman and Byzantine Monographs', Number 2, in Buchanan, E., *Aristotle's Theory of Being*, University, Mississippi : Cambridge, Massachusetts, 1962, pg. 56.

and transformation of the former matter and the definition of substance is its persistence through change. Put in a nutshell, one could say,

that the potentiality of the matter for entertaining the form, which, in combination with it, makes up the concrete Being (*ousia*), may itself be called Being (*ousia*) - not, however, in the sense of actual Being, but in the sense of potential Being. The bricks, as bricks, are actual Being; regarded however, under the aspect for their potentiality for being the material of a house, they are potential Being. Applying this to prime matter, we may say that prime matter is Being in the sense that it is the potentiality for all physical Being¹²⁴.

It is to be understood here that prime matter refers to universal transformability and is simply the potential present in all material things to become any other material thing¹²⁵.

When a sperm enters the ovum, there is a change of composite as substance, so a new form of this composite must now exist. The same occurs when there is the second meiotic division and the number and composition of the chromosomes changes. Again here, there is a change of composite, therefore of substance and also of form as act. At syngamy, there again is a change of composite substance and form, to produce a cell of conjoined paternal and maternal chromosomes, which is the same anatomical ontic cell form repeated in every cell of the same individual human body through all development till death. Perhaps this last substantial change is the most difficult to discern. These conclusions can be verified by closely studying each stage with the definitions of substance given above, which is continuity with change and separability. When a particular substance loses these necessary attributes, it ceases to remain the same substance it was before and a new substance emerges. As seen

¹²⁴ De Lacy, P.H., 'Greek, Roman and Byzantine Monographs', Number 2, in Buchanan, E., *Aristotle's Theory of Being*, University, Mississippi : Cambridge, Massachusetts, 1962, pg. 29.

¹²⁵ *Ibid.*, pg. 29.

earlier, this last composite found after syngamy, sets off a series of unique changes in the cell that was not present in the earlier composites.

This last composite is the one which remains an anatomical constant throughout the existence of the individual human being. It is also capable of a separable existence. There is always a cell with the same conjoined maternal and paternal nucleic derivatives present within the same nucleus. There occurs a repetition of this same conjoined genetic nuclear (within a cell) composite in all cells throughout the life of the adult human individual. There may exist cells with multiples of the nuclear material which is however the same genetic plan (multinucleated cells). The cellular nuclear composite remains essentially the same under the influence of the same formal substance. This implies that the formal substance as act in the human individual, must remain the same from the moment that syngamy occurs. It is clear from this that although the form of man is always the same, in a compound or complex, which Aristotle considers a substance in his hylomorphic theory, it is the matter which individuates the substance or better the form is predicated of matter of a certain kind¹²⁶. In Book Z.11 of his *Metaphysics*, Aristotle refers to just this issue. One can observe that,

[t]he point is not just that each particular man must be made of matter, but that each one must be made of matter of a particular kind – flesh and bones, etc. ‘Some things’, (Aristotle) continues, ‘surely are a particular form in a particular matter’ (1036b23), so that it is not possible to define them without reference to their material parts (1036b28)¹²⁷.

¹²⁶ Aristotle, *Metaphysics*, Book Z.11, 1036b30.

¹²⁷ Marc Cohen, S., ‘Aristotle’s *Metaphysics*’, *Stanford Encyclopedia of Philosophy*, first published Sunday October 8, 2000, substantive revision Monday June 9, 2008, Chapter 9. <http://plato.stanford.edu/entries/aristotle-metaphysics/> [12.03.2008].

Is it possible to accept that matter containing two separated pronuclei of different chromosomal content, is the same matter as that containing the conjoined chromosomes or those in one nucleus or is it a different substance?

One can answer this question by taking a closer look at Aristotle's book on metaphysics. Although, in Book Z.13 particularly, Aristotle claims that the universal is not substance and that substantial forms are in the particulars¹²⁸, in other sections he seems to make the different claim that the form as a universal can be considered as a substance too, rather than just the form in a particular individual substance, which should be distinguished by the presence of matter¹²⁹. This is one of the most highly disputed interpretive academic tensions in Aristotle's *Metaphysics*¹³⁰. Bertrand Russell states that the fact that the game of football, in order to exist, needs to have football-players in order to play it, it can exist without this or that particular football-player and the fact that redness in some subject can exist without this or that particular subject, tends to blur the distinction between things and qualities¹³¹. He goes on to say,

[t]he view that forms are substances, which exist independently of the matter in which they are exemplified, seems to expose Aristotle to his own arguments against Platonic ideas¹³².

One should not be surprised at this because there are different academic interpretations on Aristotle's work also considering that Aristotle has come down to us through the notes of his students which are open to different academic interpretations.

¹²⁸ Aristotle, *Metaphysics*, Z.3 1029a27; Z.13 1038b6; Z.13 1038b9.

¹²⁹ Marc Cohen, S., 'Aristotle's Metaphysics', *Stanford Encyclopedia of Philosophy*, Chapter 10. See also Aristotle, *Metaphysics*, Book Z.4 whereby substances are the definable entities 1030b4 and Z.13, 1039a19; Z.11 whereby definition is of the universal 1037a24, and Z.15 whereby it is impossible to define particulars 1039b27.

¹³⁰ *Ibid.*, pg. 17.

¹³¹ Russell, B., *History of Western Philosophy*, Folio Society, London, 2004, pg. 159.

Other authorities such as Emerson Buchanan lay the claim that the substantial form is only to be found in the individual man¹³³ although even he himself admits that the distinction between these two interpretations of form as substance as a universal and that in the particular, is not easy and he only hazards an interpretation “which Aristotle might have sanctioned”¹³⁴. He goes on to say that,

[i]t must be admitted, however, that the existence of each man is numerically distinct from the existence of all other men, while ‘the being of a man’, or ‘what it is for a man to be’, expresses something which they all have in common. Furthermore, one may think of the definition of man without thinking of the existence of any individual, so that the object of the definition as it is in the mind seems to be universal, or at least not individuated¹³⁵.

Therefore whatever the interpretation considered from any of these two possibilities, it remains clear that one can perceive of the form alone as a universal (whether substance or not) and the substantial form (form in the individual being for Aristotle is definitely a substance)¹³⁶ present in the individuated particular composite of form and matter. In this latter case, form defines the specification of the species as essence

¹³² *Ibid.*

¹³³ De Lacy, P.H., *Greek, Roman and Byzantine Monographs*, Number 2, by Buchanan, E., *Aristotle's Theory of Being*, University, Mississippi : Cambridge, Massachusetts, 1962, pg. 50.

¹³⁴ *Ibid.*, pg. 50. “I propose to make a distinction which Aristotle might have sanctioned. I propose that ‘what it is for man to be’, or the ‘being of man’, when it is used to express what is common to all men, means the *mode* of being or existing exhibited in the being or existence of each man. On the other hand, when ‘what it is to be’ expresses the Being (*ousia*) of an individual man, it means his being or existing in a certain mode. The distinction, then, is between a way, or pattern, of being or existing, and an act of being or existing in accordance with that pattern. It is in the latter sense that it is most properly called Being (*ousia*) and in this sense it is individual”.

¹³⁵ *Ibid.*, pg. 49.

¹³⁶ Aristotle, *Metaphysics – A revised Text With Introduction And Commentary*, Vol. II, by Ross, W. D., Clarendon Press, Oxford. 1924, Book Z.17 1041b4, “One really asks, ‘Why is this material a certain thing?’ ‘Why are these things a house?’ Because the essence of house is present in them. Thus we are looking for the cause by reason of which the matter is something, i.e. the form; and this is substance”.

in being, rather than its individuation by matter in the particular hylomorphic complex as existent¹³⁷.

The form considered as a universal, as distinct from the human composite of form and matter as substance in the particular individual human being, are not the same. This allows us later on in this study, to make a very important distinction between a doubt of form as a universal and a doubt of form and matter as the composite individual particular substance. In order to maintain the principle of unity between matter and form, in the case that one considers substantial form to be a universal, Aristotle conveniently comes up with the concept of *intelligible matter* in union with the concept of substantial form as a universal, rather than sensible matter and substantial form in the particular¹³⁸.

Aristotle asserts that the definition of a sensible substance in the individual as particular, should follow the prior definition of the form as a universal. He does this by giving the example of a circle as a universal, itself not being defined by two semicircles in the individual particulate, but rather the other way round, the semicircles are *a posteriori* to the circle as a defining idea, as form in the universal, not prior. He goes on to say,

[s]o too with the circle and the semicircle, the man and his finger. The parts which are matter are posterior to the whole; the parts of the substance as defined are prior¹³⁹.

¹³⁷ Aristotle, *Metaphysics – A revised Text With Introduction And Commentary*, Vol. II, by Ross, W. D., Clarendon Press, Oxford. 1924, Book H.2 1044a9, “Formal substance, like number, does not admit of degree; if any substance does so, it is concrete substance”.

¹³⁸ Marc Cohen, S., ‘Aristotle’s Metaphysics’, *Stanford Encyclopedia of Philosophy*, first published Sunday October 8, 2000, substantive revision Monday June 9, 2008, Chapter 13, <http://plato.stanford.edu/entries/aristotle-metaphysics/> [12.03.2008], and Aristotle, *Metaphysics*, Book H.6, 1045a33 .

¹³⁹ Aristotle, *Metaphysics*, Book Z.10, 1035b9. See also Book Z.10 1035b14 (b), “the parts of the soul are prior to the concrete animal, while the body and its parts are posterior to the soul and are

Also,

[w]hy is not the definition of the semicircles included in that of the circle? Not because they are sensible objects, for they are not. But in truth some non-sensible things have matter; every individual thing has matter, intelligible if not sensible. The semicircles are not part of the universal circle, though they are of the particular circles¹⁴⁰.

This means that a particular substance of any species as defined by the form of that species as a universal, needs to conform to that very same defining universal and not the other way round. The semicircles are defined in terms of the circle as a universal and not in the obverse way.

The same argument holds for the problem of the separate pronuclei in the ootid and the conjoined nuclei in the zygote replicated in the nucleus of every cell of the living body till death has occurred. The form of man as *such* a species, as a universal, is ideally represented as a cell with conjoint maternal and paternal chromosomes. The particular substance of a man, i.e. *this* man, that is form and matter as composite, must conform to the defining form as an *a priori* universal, in order to be defined as a single particulate of that specific species, the species *Homo sapiens*.

The substantial form that is predicated of matter with two separate totally different pronuclei, is not the same as the substantial form that is predicated of matter with conjoined chromosomes. The ootid with its separate pronuclei does not conform to the form of man as a universal, and only begins to do so at and after syngamy. The ootid stage represents a different separable substantial material composite than does a cell at and after syngamy, which only now (i.e. at syngamy) conforms as a concrete

constituents not of it but of the concrete whole”. Again in Book Z.10 1035b31 he states, “There are parts of the form, parts of the concrete thing, and parts of the matter; only the first are parts of the definition, which is of the universal”.

¹⁴⁰ *Ibid.*, Z.11, 1036b32.

substance in the particular, to the defining form of man in the universal, thereby representing a particular of the human species. Aristotle reminds us that any definition of man must mention the parts of the body. It is however not enough to mention the parts of the body without specifying that they are in a certain condition, so that he goes on to say that,

[w]e must not forget the matter; but we must equally not forget the form¹⁴¹. Although Aristotle is here specifically referring to the principle of vitality, of life, it also holds true for the considerations presently under revue.

There is however a problem because even after this single conjoined chromosomal stage at syngamy, the cell development and translation is still subjected to the maternal m-RNA till the four cell stage of development of the morula and therefore the zygote is *arguably* subordinate to another distinct living body. We know scientifically from the chapter dealing with scientific aspects of fertilization, that the maternal to embryonic transfer of the process of translation (MET) with zygotic genome activation (ZGA) occurs from the four to eight cell stage in the human embryo and from the two cell stage in the mouse embryo. It is at this stage that the m-RNA becomes the embryo's own programme from the embryo's own DNA and one can truly say that the embryo is really subordinate to itself and only itself. Does this constitute the possible argument that human life as organism therefore must start at the four cell stage of the human morula? One may possibly come to this conclusion, but on examining the application of Aristotelian philosophy of act and potency, one can find a way out of this impasse.

2.8 The Argument from Aristotle's Theory of Being as Applied to the Zygote

One can draw an analogy between the discussion about first and second act to the matter under review. If human form (as act) exists at syngamy, then this should be considered as first act and need not manifestly exhibit function, in this case translation¹⁴² at the four cell stage, which is considered to be second act. The main query here would be if second act occurs at the four cell stage, why should first act be identified at syngamy and not at the earlier pronuclear stage, after the second meiotic division for example, or even at penetration? Doing so earlier than syngamy would however entail that the cell is not yet subordinated to itself as it has no final genetic plan yet. Again this is not an easy question to conclude, except for two considerations.

The first consideration is that syngamy is the last organizational change in anatomical form and therefore sensible substance as a composite, which occurs in the individual cell before translation actually occurs at the four cell stage, the cells of which, are a multiple of, and have an anatomical form with conjoined chromosomes similar to the one-cell stage at syngamy. Thereby the substantial form of the zygote must be the same as that of the four cell morula. There is no new principle of organization between this stage and implantation.

The second reason which we have already come across earlier, is that this anatomical form and substance as composite of the cell nucleus containing conjoined DNA, is the anatomical form that is repeated in every cell of the maturing and mature body as a

¹⁴¹ Aristotle, *Metaphysics – A revised Text With Introduction And Commentary*, Vol. II, by Ross, W. D., Clarendon Press, Oxford. 1924, Z.11 1036b, pg. 203,

¹⁴² Dawkins, R., *The Blind Watchmaker*, Folio, London, 2007, pg. 57. “Genes only start to mean something when they are translated, via protein synthesis, into growing rules for a developing embryo”.

universal till death. The chromosomes are not separated even during asexual reproduction. Since all the cells in the body are similar to the one cell zygote, and develop from it, then the substantial form of the growing human body should be the same as that of the zygote, and therefore the zygote is the first substantial composite to reflect and conform to the form as the universal. At the four cell stage the morula exhibits active potency as a whole, the individual cells together in the morula, which are cloned anatomical copies of each other and of the one cell zygote, do not exhibit this active potency but only a passive potency. Each cell is coordinated by each of the other four (the whole is greater than the sum of the parts) and therefore each is not subject to itself alone. As seen above, active potency is equivalent to the canalizing capacity subject only to itself. Passive potency is equivalent to the canalizing capacity not subject only to itself. Therefore, the substantial composite of the one cell zygote, which is alone, and anatomically similar to them as representing the universal form, must be the one that contains the human form (metaphysical) in the particular composite which is therefore the first to impart the active potency! The one cell containing both maternal and paternal chromosomal components combined together.

The Kantian maxim in the *Critique of Judgement* mentioned by Ramellini above, can now apply. A cell, where the teleological end of all the organelles, also becomes at the same time a *means* to further development, so that essential defining activities such as translation, may now take place.

It would be fair, at this stage, to revisit the charge of those who hold that the human being starts at penetration, because they hold that since after sperm entry, there is only one cell membrane and cell, the cellular entity is one and since the maternal mRNA which is derived from the mother's genes now belongs to this cell, then the cell

at this stage is not subordinate to any other distinct living entity. Again the problem with this view is that the cellular entity's final plan is not yet established at penetration and therefore it is difficult to consider how it could be subordinate to itself, if the 'itself' has not yet been established. There is also a change of substance. As seen above, there is a change of metaphysical substance three times between penetration of the ovum by the sperm and the final zygotic anatomical form at the end of fertilization.

After the second meiotic division at the pronuclear stage, one can again argue that not only is the cell not subordinate to any other living entity, as the maternal m-RNA now belongs to itself, but it now has its own plan for subordination to itself *only* and therefore this could very well be the point where the organism begins and therefore where the human being starts. Again the problem here is the fact that the anatomical form of the entity is still constantly changing and the final anatomical form consonant with the acknowledged human anatomy and therefore associated with the human composite as substance, has not yet been established.

There is also a problem here with the principle of unity. The two pronuclei represent the extension of the parents' selected genetic information that is about to be passed to the potential offspring, but the actual *unity* of this *information* has not been forthcoming and unless there is the unity of the genetic information, it is difficult to speak of the generation of a new individual organism with a human anatomical form and therefore subordination to self. The end in this case is yet separate from the means, to go back to Kant's definition in the *Critique of Judgement*. Ends and means become equal in an organism, when translation, for example, becomes a possibility in a unified nucleus. At this time this is not yet functionally discernible, but the potency

of becoming second act in the single combined nuclei of the individual cells of the morula, is already extant or active.

We have seen in previous chapters, and will meet with the argument in later chapters, that the argument of actively occurring pronuclear *transcription* is resurrected at this stage. However, as also mentioned in a previous pages, it is the fundamental natural potency of DNA as a chemical material substance, to transcribe chemical bases into chains of nucleic acids, even if these are in solution ‘*in vitro*’ outside the cellular setting¹⁴³, in a solution of free bases, and therefore one may consider transcription by DNA molecules, as the natural (passive) potency of substantive matter as act¹⁴⁴ and not that of human form as act and which therefore imparts to human act a passive potency! We have already considered previously that human form is act which together with the potential matter (matter as act becomes potential prime matter when combined to a new form) imparts to the composite substance an *active* potency. It is form as act that imparts to a living being its canalizing capacity¹⁴⁵ or potency. It is the active potency of the human composite substance which is consonant with distinguishing a living being from a living organism which is analogous to a living individual entity subject to itself and only to itself or one whose potency is active.

¹⁴³ That this can be accomplished easily *in vitro* by adding the enzyme *RNA polymerase* to bacterial gene DNA, is well documented. In eukaryotes this can be done by adding distinct initiation factors to the *in vitro* solution. Usually we use the reverse process in the laboratory to produce c-DNA strands from RNA by using the enzyme *reverse transcriptase*. See Cooper, G.M., Hausman, R.E., *The Cell: A Molecular Approach* (3rd ed.), ASM Press, Washington DC, 2004, pg. 115-116 and 240-244.

¹⁴⁴ Aristotle, *Metaphysics*, Book Θ 1050b 2. “Thus substance or form is actuality, and therefore actuality is prior in substance to potency...”

¹⁴⁵ Ramellini, P., *Life and Organisms*, Pontifical Council for Culture, Libreria Editrice Vaticana, 2006, pg. 273. “Living body of terrestrial type = macroscopic body possessing a canalizing capacity largely determined by those carbon polymers which largely compose it (above all, its proteins and its deoxyribonucleic acids, whose sequence almost completely determine the sequence of its proteins)”. “Life of a living body of terrestrial type = possession of the canalizing capacity by that body”. “Death of a living body of terrestrial type = irreversible cessation of the life of that body”. See also pg. 395 “A living body of terrestrial type (afterwards : living body) is a macroscopic body which possesses a canalizing capacity largely determined by those carbon polymers which largely compose it (above all, its proteins and its deoxyribonucleic acids, whose sequences almost completely determine the sequence of its proteins).

The human act now has a potency or power that arises from within, an active one, and this makes it subject to itself alone.

The argument put forward by Aquinas that matter must be commensurate with the form in order for an organism to develop to maturity can now be better understood. It is evident from scientific inquiry that the complete conjoined genome within the one cell zygote, is the sufficient matter needed for the development of the human being or person. It is this complete form of the genome in the cell, which liberates the zygote to attain its active potency and therefore the exercise of its rationality¹⁴⁶ which is interchangeable with the modern used term of consciousness. One may argue from the Aquinal concept of rationality as active potency resulting from form as act being present in the zygote after syngamy, that there is a rationality existing in its own right. Jerome Bracken sums it up quite succinctly by declaring that,

[f]irst, the material conditions of which we speak do not have to be apt (relevant) for rational functioning since these functions occur when the soul moves from first act to second act. All that is needed for the soul to fulfill its first act function of giving life and organization is present in the early embryo. The embryo with its genetic and self directing properties is all that is needed. With these the soul can function as the life principle and go on to develop those organs by which the soul can eventually perform its second act operations¹⁴⁷.

Having weighed all these matters, I can only conclude that the parameters for describing the essence of a new human organism are only in act when syngamy has occurred. It is only after syngamy that unity is fully fledged, that there is subordination of all parts to the unified genetic information, that there is a reciprocal

¹⁴⁶ Aquinas, T., *Summa Theol.*, Ia. 29, 1. “[H]ave control over their own actions and are not only acted upon as are all other beings, but act of their own initiative”.

subordination and coordination of each part to another and above all that every part is reciprocally both end and means. Syngamy represents the point where the entity concerned, which no one objects to calling a living cell, now becomes an organism which is subordinate to itself and only to itself. The passive potency in the ootid is converted to a new form as act which imparts an active potency to the organism. It is the watershed where entelechy points out that it is in virtue of this form that it can perform its functions and by its functions, one can know its form. We have now a living organism that is derived from two members of the species *Homo sapiens* and itself belonging to the species *Homo sapiens*. This, for me, clearly represents the beginning of human life.

I must now turn my attention to another problem that needs to be addressed in determining the beginning of human life. Often people talk about the need of respecting human life from the beginning of the process of fertilization, that is at sperm penetration of the ovum, because this itself represents a physical process of fertilization, a process that has started, and therefore since the process leading towards human life has begun, then that process has to be respected as consonant with human life as well. It is to this dilemma that I now turn my attention.

¹⁴⁷ Bracken, J.K., 'Is The Early Embryo A Person? *Linacre Quarterly*, Feb. 2001, 68:1:49-70.

4

CHAPTER FOUR

ARGUMENTS IN FAVOUR AND AGAINST SYNGAMY

Man was matter....Drop him out a window and he'll fall. Set fire to him and he'll burn.

Bury him and he'll rot, like other kinds of garbage. The spirit gone, man is garbage.

Joseph Heller *Catch-22*

4.1 *The Human Individual or Being*

Aristotle defined an *individual* as being that which is undivided in itself and distinct from others. Norman Ford has given a profoundly detailed analysis in his book *When Did I Begin?* and defined an individual in two similar ways. In these definitions he uses the terms person and human being as being synonymous.

1) A human person (*being - my italics*) is a living individual with a human nature, i.e. a living ontological individual that has within itself the active capacity to maintain, or at least to begin, the process of the human life-cycle without loss of identity¹.

¹ Ford, N.M., *When Did I Begin*, Cambridge University Press, Cambridge, 1988, Pg. 84.

2) A human person (*being – my italics*) begins as a living individual with the inherent active potential to develop towards human adulthood without ceasing to be the same ontological individual².

Although these two definitions look the same, there is a slight difference which I will point out later. One may say that a human being is a subject that expresses the ‘being’ activities of the human individual. It is evident here that three conditions are necessary for the definition of a human being. First, it must have a *human nature*. It must not be a plant or bacterium or a virus, but must have the properties of an animal cell which properties have been observed specifically in the human being by simple observation. This is a simple process of biological observation. That is the material cause specific to human beings. Secondly, it must be living not dead, that is it must have formal causality. Because it is human matter containing a material and formal cause, it must contain the *inherent active potential* to develop towards human adulthood. Thirdly, because it is the same individual, it must retain the same *ontological continuity*, that is it must remain the same individual without loss of material or formal identity. Considering both these definitions, I have composed a definition which includes both of them. Therefore one may say that, a human being is a living individual with a *human nature*, who has the *inherent active potential* to develop towards human adulthood without ceasing to be the *same ontological individual*.

These three factors must be present together if one is to determine the starting point of human life. It is the determination of the confluence of all these three factors that must determine where this point lies. We will now pass on to examine certain features of embryological development particularly considering pathology in these cases which will

² *Ibid.*, pg. 85

throw much light in determining points for the normative consideration of the human being. It is also important to keep in mind that although life itself is a cycle, there comes a point where the mainly maternal and some paternal functions which facilitate conception and growth of the foetus become distinct from the purely foetal active potential for self-development and growth.

Teleology within living individuals must not be confused with teleology between living individuals³.

Let us now consider a case where two embryos which have distinct genetic and ontological individuality come together to form a new entity which is called a *mosaic*. Serra and Colombo⁴ say this is a new ontological individual human being and needs to be respected as such.

thus the epigenetic process continues with the contribution of the various cell sets, terminating in the production of a new being whose phenotype is the expression of the two or more original phenotypes⁵.

Does this mean that the prior embryos are *not* to be respected as human ontological individuals? The answer is obviously no as although different individuals, they are still human beings of an individual ontological nature which needs to be respected as such. Ford⁶ disagrees with this and says that one of the embryos absorbs cells from the other without loss of its own original ontological identity.

The problem regarding the beginning of human life has to overcome this obstacle mentioned above. The problem is only philosophical. There is no problem scientifically.

³ N.M., *When Did I Begin*, Cambridge University Press, Cambridge, 1988, pg. 95.

⁴ Serra, Angelo, Colombo, Roberto, *Identity and Status of the Human Embryo: the Contribution of Biology*, proceedings of the Pontifical Academy of Life, Feb. 1997, pg. 128 – 177.

⁵ *Ibid.*, pg. 174

⁶ Ford, N.M., *When Did I Begin*, Cambridge University Press, Cambridge, 1988, Pg.114.

I have discussed previously in chapter one, that four distinct gametes that are all genetically different, are produced from every primary (1°) spermatocyte and each primary oocyte. The products of one 1° spermatocyte are four sperms. The products of one 1° oocyte is *one mature ovum* produced after the second meiotic division, *one second polar body* and *two derivatives of the 1st polar bodies* which are all genetically different. One cannot speak of a mature ovum with a distinct genetic nature *prior* to the second meiotic decision, where the oocyte is said to be a secondary oocyte. Besides, the nucleus of the secondary oocyte although nominally haploid is irregular in that the two chromatids are genetically completely different as a result of crossing over during the 1st meiotic division. For genetic fusion with the sperm nucleus to occur, one of these genomes must be extruded as the second polar body, while the other remains as the female pro-nucleus. This process is completely haphazard.

Ford⁷ says that sperm and ovum lose their distinct individuality during the process of fertilisation to give origin to a new individual, the zygote. He does not consider that the sperm penetrating the 2° oocyte creates a new ontological individual cell but maintains that as a foetus lies in a mother's womb but retains a separate ontology, even a virus or bacterium inside a host cell or a person retain ontological individuality, so the sperm maintains its ontological individuality inside the ovum until there is fusion of the two pro-nuclei and the beginning of a new ontological human individual⁸ Therefore according to this model of thought one ought not to give the respect due to the human being to the penetrated 2° oocyte until there is a new diploid genome after syngamy (karyogamy) although Ford himself does not come to this conclusion in the referred

⁷ Ford, N.M., *When Did I Begin*, Cambridge University Press, Cambridge, 1988, pg.125.

publication as a logical consequence of this. The ovum too maintains its individuality until syngamy (karyogamy). Here Ford is overlooking the fact that when the mature ovum is formed, there would be a change of ontological individuality of the 2^o oocyte itself. Serra and Colombo do not share this opinion. They believe that although at penetration the final genome of the individual has not yet been established, since the 2nd meiotic decision is not yet extant, they believe that organismal identity refers directly to the *phenotype* and only indirectly to the *genotype* and therefore so does individuality. They go on to say that,

organismal identity refers *directly* to the phenotype and only *indirectly* (via epigenetic pathways and environmental interactions) to the genotype⁹,

and,

[t]here is no way to distinguish between *genetic individuality* and *developmental individuality*, since individuality belongs to the organism's dynamic diachronic form (*phenotype*) and not to the conservative organism's genome (*genotype*, *i.e.* the genetic informational content of its cells". The individuality of each organism rests on the uniqueness of its life cycle and not on the oneness of its genome. Nevertheless, one must admit that the singularity of a life cycle largely depends on the differing informational contents of each organism's genome, which is established at fertilisation¹⁰.

Therefore they consider that although the final genome is established at syngamy, there is an ontological human individual at penetration and since there is developmental ontology, this stage of embryology has to be respected as a human being. There is also a contradiction in terms in their last statement in that on one hand they are stating that it is

⁸ *Ibid.*, pg. 93, 94, 95, 96.

⁹ Serra, A., Colombo, R., *Identity and Status of the Human Embryo: the Contribution of Biology*, proceedings of the Pontifical Academy of Life, 1997, pg. 138.

¹⁰ *Ibid.*, pg. 140.

the phenotype that determines the individuality of each organism, while on the other they are admitting that the singularity of the life cycle of this same phenotypic organism depends on the genotype obtained at fertilization. So it is the newly determined genotype within the embryo leading to the zygote which together contain the active potency for individuality not the phenotype which is pure act and may contain only a passive potency. The new genotype does not exist in a vacuum, but has itself a physical cellular matrix obtained from the ootid. It is the establishment of the new genome that inserted into this cellular matrix brings about the active potency for growth and development of the new organism. There are other contradictions in the same document¹¹. One must keep in mind that their definition of syngamy¹², which is taken as the penetration of the sperm into the ovum not the fusion of the two pronuclei which they term karyogamy. On the same page they claim that the zygote is descriptively present from penetration. Now this definition of zygote is a new one and is very difficult to come by in any serious book on embryology as I explained in the first chapter. This seems like an effort to bend facts to fit their conclusion. The same inconsistency is committed by Maureen Condic in her scientific review of the beginning of human life¹³. They also refer to the ionic cascade precipitated by the sperm entry into the oocyte by generating a calcium wave. The potential for the ionic cascade is in effect a passive one and cannot be considered an active potential as the changes invoked are released by the sperm entry itself which is not the first opportunity of chemical contact between the

¹¹ *Ibid.*

¹² *Ibid.*, pg. 151.

¹³ Condic, M.L., *When Does Human Life begin? A Scientific Perspective*, Westchester Institute White Paper Series, Volume1, Number1, Oct. 2008, The Westchester Institute for Ethics & the Human Person, New York. On page 12 she states that “[h]uman development is an *ongoing process* that begins with the zygote and continues seamlessly through embryogenesis, birth, maturation and ageing ending only in death”. Her concept of the formation of the zygote is set at the penetration stage of fertilisation (pg. 3). This flies in the face of the current accepted scientific embryological nomenclatura and is a purely personal opinion which only serves to create confusion.

sperm and the ovum, the ovum having released chemotactic factors previously to attract the sperm.

There are other several points here that stick out as incoherent. First, if this stage (after sperm and ovum fusion) is accorded individual entity status, can we consider it as a human being at this stage? Human nature, as observed, does not contain a triploid set of chromosomes. Triploidy is not compatible with life (human) although some embryos do carry to term and die soon after. In a triploid genetic combination, there is no inherent capacity for full human development. Human nature also does not contain a single set of nuclei in different pro-nuclei at different poles of a cell, but a set of homologous chromosomes together in one nucleus. So there is no analogy to human nature and if it is acceptable to describe it as an ontological individual *entity*, it is one which does not correspond to the observed nature of a human being both histologically and morphologically.

A second question is whether one can consider the entity formed at penetration as *undivided* (definition of individual). This is because as soon as the sperm enter the egg, the second meiotic decision is set off which changes the genetic information in the oocyte nucleus completely and therefore it is not exactly the attribute of an individual with the same ontological continuity. They have to accept that if a new ontological individual entity is formed at penetration, at the second meiotic decision another new ontological individual entity is formed in a haphazard manner, entirely due to chance. We are here dealing with a completely new genome in a single totipotent cell. They state,

[i]t is now certain that the *new genome* , established in the zygote, *assumes control of the whole morphogenetic process* from the earliest stages of embryonic development¹⁴.

Again they say;

the new genome established at fertilisation, is the *basis and steady support of the structural and functional unity of the embryo* which develops along the trajectory that maintains a constant direction¹⁵.

They continue to write;

there is an evidently coordinated sequence and interaction of molecular and cellular activities, under the control of the new genome¹⁶,

and

from syngamy (*which they take to mean penetration- my italics*) it is always *the same identical human individual who is being autonomously built up* according to a strictly defined plan¹⁷,

they also reiterate that

“the ontogenetic law requires a *gradual* organisation of the whole body and, therefore, of the nervous and brain structures as well, and where the *unity* and the *individuality* are preserved because of the intrinsic law of development written in the genome”¹⁸.

The big question is, which genome are they talking about? Is it the one before the second meiotic division, which still exists two to eight hours after penetration of the oocyte by the sperm, or is it the genome after the second meiotic division which will eventually come together at amphimixis? They are both completely different and there

¹⁴ *Ibid.*, pg. 159.

¹⁵ *Ibid.*, pg. 161.

¹⁶ *Ibid.*

¹⁷ *Ibid.*

¹⁸ *Ibid.*, pg. 163, 164, 175.

is no way that it is possible to tell *a priori* what the genetic result of the second meiotic division will be, because of crossing over and the haphazard process of the event! This stage is one of the important determinants of genetic variation in sexual reproduction. Maureen Condic makes the same assertions as Serra and Colombo without being able to point out which genome is responsible for the translation of the zygotic proteins¹⁹

Third, they themselves state, that the phenotype depends on the informational content of the genotype.

The second feature is that the zygote is *intrinsically oriented and determined to a definite development*. Both *identity* and *orientation* are due essentially to the genetic information with which it is endowed²⁰.

The phenotype of the mature ovum or ootid up to the stage of its final formation, is not dependant on the new genome inside it but on the mother's genome as that of the penetrating sperm does not depend on the sperm genome but depends on the father's genome. There is no such definite genotype until pronuclear syngamy, and they fail to mention that all the ootid's activities till the four cell stage after syngamy, is controlled by maternal m-RNA translated proteins and there is still maternal genetic control of the process before syngamy and not embryonic genetic control. For example they state that,

[z]ygotic gene activation is absolutely essential for continued development, although a stockpile of both maternal gene transcripts (mRNA) and translation products (proteins), accumulated as the oocyte grows and matures, are used to support the very initial stages of development, and are gradually replaced and

¹⁹ Condic, M.L., *When Does Human Life begin? A Scientific Perspective*, Westchester Institute White Paper Series, Volume1, Number1, Oct. 2008, The Westchester Institute for Ethics & the Human Person, New York, pg. 2.

²⁰ Serra, Angelo, Colombo, Roberto, *Identity and Status of the Human Embryo: the Contribution of Biology*, proceedings of the Pontifical Academy of Life, 1997, pg. 153.

superseded by new gene products derived by transcription and translation from the new embryonic genome²¹

What they fail to mention here is that we know from *Chapter one*, that up to the four cell stage after syngamy, it is the maternal transcripts and translated proteins that control development, and that in the human zygote, it is at the four cell stage embryo that zygotic genome proteins are first translated. They themselves accept that,

they were able to show that at least from the transition from four to eight cells the new genome becomes active in controlling the production of the new proteins²².

Fourth, as mentioned in the quotation above, the new genome of the zygote is not translationally actuated until the four to eight cell stage of the morula, at a much later stage of zygotic development (Zygotic Genome Actuation or ZGA).

Fifth, also as seen above, it is at the four to eight cell morula that the zygote is seen to start to direct its own growth as previously this has been proven to be guided by the mother's genome in the egg (by maternal – RNA). This is the so called maternal to embryonic transfer (MET) of development. This capacity for development cannot be actualised before the two male and female haploid genomes come together at syngamy (karyogamy). Once the form is established, then function follows.

[P]rimary conditions of existence are the preservation of structuro-functional wholeness or normality....Structuro-functional wholeness or integrity, and

²¹ Serra, Angelo, Colombo, Roberto, *Identity and Status of the Human Embryo: the Contribution of Biology*, proceedings of the Pontifical Academy of Life, 1997.

²² *Ibid.*

specific structure, are actively built up and maintained in the course of development²³.

Condic also tends to mix up the concept of the male pronucleus transcripts blocking and therefore affecting the female pronuclear transcripts with the inexistant blocking of the maternally derived m-RNA that is actively being transcribed and translated up to the four cell stage of embryonic development²⁴. She also makes an incomplete assertion in defining what an organism is. She states in her paper that,

[a]n organism is defined as '(1) a complex structure of interdependent and subordinate elements whose relations and properties are largely determined by their function in the whole and (2) an individual constituted to carry out the activities of life by means of organs separate in function but mutually dependent: a living being²⁵.

This definition is incomplete as it leaves out one of the most essential concepts of organism which is its *independence* from other living things including other cells from the same species. As referred to earlier in the definition of an organism, one must perforce add to the above definition the condition that it should be subject to itself and only to itself.

In another article on the matter by one who supports penetration rather than syngamy as the point of ontogeny for the commencement of human life, Adriano Bompiani, a doctor of obstetrics and gynaecology in an article entitled *Il Processo della Fecondazione*

²³ Ford, N.M., *When Did I Begin*, Cambridge University Press, Cambridge, 1988, pg.96, quoting E.S. Russel

²⁴ Condic, M.L., *When Does Human Life begin? A Scientific Perspective*, Westchester Institute White Paper Series, Volume1, Number1, Oct. 2008, The Westchester Institute for Ethics & the Human Person, New York, pg. 4 and 8 footnote 26.

²⁵ *Ibid.*, pg. 6.

*Umana: Considerazioni a margine del Dibattito sul c.d. "Ootide"*²⁶, makes certain assertions that are fundamentally wrong, and in their proper contextual meaning, should have led him to a different conclusion. In the quoted article he makes a profoundly wrong assertion,

[i] cromosomi si sono portati nella piastra metafisica della meiosi I, poi rapidamente l'ovocita è passato nella anaphase e nella telofase e finalmente ha espulso il *primo globule polare*, il cui patrimonio genetico – per l'appunto – è identico al patrimonio genetico dell'ovocita²⁷.

He is here saying that the genetic patrimony of the 1st polar body is identical to that of the 2^o oocyte. Because of the process of meiosis the genetic component of the 1st polar body and the oocyte are completely different, as is the genetic patrimony of the ootid and the second polar body and it might well mean that here he has made a serious logical mistake. In the same article he also rightly claims that the transcripts in the cell of the pronuclear ootid are maternal in origin (as are the translated proteins),

[i] diversi trascritti proteici sono in gran parte d'origine maternale²⁸.

How is it in that case that since the controlling factors in the cell are maternal, the pronuclear genomes in the ootid are considered to be ordering the development of the ootid itself? There is no scientific evidence of this at all, and although there are pronuclear *transcripts* in the ootid, they are *not translated* yet, and therefore they do not seem to be complete and allow translation unless the maternal and paternal genomes come together in the same nucleus and start ZGA with its newly translated proteins which occurs only after syngamy. Bompiani also refers to the zygote as existing from penetration, which is not the anatomical embryological normal nomenclatura. In fact he

²⁶ *Medicina e Morale*, Settembre/Ottobre 2005/5, pg. 927– 967.

²⁷ *Ibid.*, pg. 944.

²⁸ *Ibid.*, pg. 945.

admits tongue in cheek²⁹, that although there is transcription prior to syngamy there is no translation, and that this might be a significant biological mechanism which protects the unicellular pronuclear ootid, which he refers to as a zygote, from the promiscuous expression of the pronuclear genes before the maternal and paternal genomes actually come together to be sculptured in the structure of the chromatin at the two cell stage. Now one wonders why this mechanism exists, unless it was that the normal process necessitates the actual physical presence of homologous chromosomes together in the same nucleus!

He also states³⁰, that the pronuclear ootid retains the pronuclear transcriptional factors of both male and female pronuclei and that this constitutes an important component of molecular memory. This may be so, but it is important to remember that if this memory exists, it seems to be as yet incomplete and not yet in a final form to initiate the active potentiality of a human being, as we have seen that it seems that both genomes must come together for translation to begin,. The complete functional memory only exists after syngamy occurs. The memory he refers to, also exists in a state of formation of the ootid where the nature of the cell cannot yet be considered to have the active potency and act of a human being, although it is by all means a human cell. It is an ootid, not an embryo.

Bompiani also declares³¹ that the fused maternal and paternal pronuclei on the spindle, is essential for the development of the proper genetic destiny of the developing entity.

²⁹ *Ibid.*, pg. 953.

³⁰ *Ibid.*

³¹ *Ibid.*, pg. 960.

So what if fusion does not yet occur or it occurs badly (aneuploidy) resulting in a genome that does not have the nature or capacity of a human being? The final assertion that in the pronuclear ootid stage, the taxonomy of pre-embryo would be incorrect is also misplaced, as the pre-embryo is usually wrongly referred to in the Anglo-Saxon sphere of influence as the period between syngamy and the formation of the primitive streak on the twelfth (12th) day of development. If anything it could be termed pre-zygote.

Sixth, just because a sperm enters an ovum, that does not mean that the male pro-nucleus will automatically fuse with the female pro-nucleus of the ootid. Many things may happen at this stage which rule out human individuality being established. One of the pro-nuclei may die to produce a parthenogenetic embryo male or female³². These are called parthogenones (androgenones or gynogenones) and here the single pronuclear genome doubles itself to form two replicas of the same genome from only one parent. Although the genome is diploid, these are not compatible with leading to the inherent development of a human life as the genetic code does not provide the active potency to maintain or finish development as they produce a lethal genetic constitution or lethal genes.

Another possibility occurs if two sperms enter concurrently, one of them fuses to the female pronucleus, while the other might fuse with the second polar body to form unovular non-identical twins³³. The second polar body may itself fuse to the female pro-

³²Larsen, William J., *Human Embryology*, Churchill Livingstone, 2001, pg. 44 - 50

³³ See *Chapter One*.

nucleus to form a parthenogenetic female. As seen above, all human parthenogenones do not have the intrinsic capacity to develop normally as both male and female genomes together are important for normal development in eutherian mammals including man. Anomalies with male parthenogenesis can also lead to a hydatidiform mole or a teratoma which can never be described as a human being, not ever having the nature of a human being! So how can one speak of an individual human ontological identity, if the two genomes have not yet come together and if the possibility of the formation of a human zygote is not yet assured at penetration? Professor of ethics, Margaret Hogan, in fact says that once the sperm enters the oocyte, the process could end there and therefore,

unless the pronuclei unite, there is no new human life³⁴.

It is important to point out that although I am not implying that it is the genome itself and not the whole organism that makes up the individual human being, however the genome is an essential component part of the cell and there may be no human cell without an established genome. It is also important to remember, as seen in *Chapter I*, that the genome is an essential part of the identity of a human individual and that at the *one cell totipotent stage*, a change of genetic identity necessarily implies a change of ontological individuality. This may not necessarily be so in the human adult (or embryo morula), where due to the presence of the brain, the genome may be wholly or partly changed (we have seen however in *Chapter I* that the physiology of the genetic process is geared to stop this happening), in certain cells of the body, without loss of ontological development. The principle of totality would apply here. Such is the case with gene

therapy or with cancerous mutations also keeping in mind that the genetic changes concerned here often occur at only specific sites in the body of the individual human.

However it must be remembered that in the single cell organism, the cell genome in the nucleus, acts as the organising centre (or brain) of that cell! This is where certain people³⁵ are wrong in their assertions that in the adult a genetic change would imply a change in ontological continuity if the final genome in the single cell embryo is taken to be the ontogenetic zero point of development, as in a unicellular organism a change in genetic constitution implies change in ontology, not so in a multicellular organism, especially adults with a developed brain³⁶.

They would be also wrong in the matter of stating that in the human race, it is possible to have individuals with more than forty-six (46) chromosomes. While this is true such as in Down's Syndrome where the total number is forty-seven (47), as there is trisomy in *one chromosome set only*, chromosome number twenty-one (21), as a whole set of chromosomes, they are still *double*, i.e. two homologous chromosomes within the whole set of double chromosomes, while number twenty-one (21) is a triploid exception. But at the beginning of fertilisation after penetration, there are *complete sets* of three different homologous chromosomes present. This is not the normal human chromosomal complement set of two. Complete triploidy (set of three) or aneuploidy with a set of one,

³⁴ Monahan Hogan, M., Professor of Philosophy, University of Portland, Oregon, article entitled *Abortion (I)*, International Catholic University, course number 41, 2004, <http://home.comcast.net/~icuwweb/> [16.02.2006].

³⁵ Bezzina Wettinger, S., article on *The Sunday Times*, Allied Malta Newspapers, June 12, 2005.

³⁶ Each individual cell within a cell mass whole such as a blastomere with an active potency, is not itself containing an active potency but a passive one – see *Epilogue*.

are not compatible with human life³⁷. All such embryos die, or are born alive with multiple deformities, to die soon after delivery.

At penetration the chromosomes concerned are also not together within the same nucleus and this too is *not* considered normal for a human being. Man is a eukaryote not a prokaryote with a full set of double chromosomes in one nucleus, not separated genomes from the father and the mother. Sexual union in man as a species implies that the chromosomes must come together and work together in one nucleus, which does not evidently occur before syngamy. The conclusions on cancer mutations not changing the ontological status of the affected human being, does not throw any light on the problem of ontological development at the one cell stage.

It is essential to point out that the development of the human being is a process but the process must have a subject and not the other way round with the process being the subject itself. That subject is the individual human being. In process philosophy, the individual subject is identified when there is '*something*' which knows that things have passed away by preserving in memory at least something of what it had been before. In memory, past happenings are still somehow with us. Memory embraces the past and preserves something of the character of the individual. In the one-celled human zygote or embryo, the only permanent container of memory is the DNA of the chromosomes which are composed when the homologous chromosomes come together at syngamy. In perception past happenings linger on in present experience. Perception need not be only due to sensory input, but it may be also intrinsic to an organism and it may arise without

³⁷ Larsen, W. J., *Human Embryology*, Churchill Livingstone, 2001, pg. 44-50

sensory input. There is perception which is cognitive or of which one is aware, and perception that is non-cognitive. The DNA in the chromosome represents a form of intrinsic, non-cognitive perception which exists in the one-cell organism including the one cell embryo after syngamy. Memory and perception both embrace the past and preserve something of its character as we shall see in the next chapter on the philosophy of process³⁸. Therefore we may conclude that in the *one-celled embryo* individuality is established after the coming together of the maternal and paternal genomes at syngamy. They have to both come together as they are unable to work to produce proteins otherwise, and proteins are necessary to build an independent human being.

One reads in one of Ford's conclusions³⁹ that at syngamy the zygote is a *living ontological individual*, but not a true *actual human individual* rather a *potential human individual* because it has not yet started to lay down new human protein at that stage. As seen above, this not a valid argument. Therefore Ford considers that the sperm and ovum retain their individual ontology up to syngamy when a new living ontological individual or entity is produced but he does not credit this individual with a *human nature* and therefore as such should not be respected as a human being or a potential human person. He goes on to list the reasons why. One may not agree with *Ford* on these specific reasons, but one can now construct a new philosophical sequence of events based on a synthesis of both points of view expressed above. It is also important

³⁸ See Hartshorne, C., in Cousins, E. H. *et al*, *Process Theology-basic writings*, Newman Press, New York, 1971, pg. 58.

³⁹ Ford, N.M., *When Did I Begin*, Cambridge University Press, Cambridge, 1988, pg. 118.

to keep in mind that a cell may be a human cell, but *not* have a nature, that give it the qualities of a human being⁴⁰.

There is a better way to explain what is happening at this level of development, which is consistent with the philosophical principles expressed above. In my opinion the best way to explain this is as follows: First, sperm and 2° oocyte are individual ontological *entities* which are human biologically i.e. belonging to the human body but lacking the true nature of a living human being. Second, when the sperm enters the 2° oocyte (penetration) a new ontological entity or individual cell comes into existence that is biologically human but lacking the nature of a living human being. Third, when the 2° oocyte goes through the 2nd meiotic division, the ootid formed is again a new ontological individual which is again biologically human but lacking the proper nature of a human being. Fourth, it is only at syngamy (pro-nuclear fusion or amphimixis) when the two pronuclei from both parents come together to form one nucleus in the cell containing both sets of chromosomes, that the new ontological individual entity thus formed, assumes the true nature of a human being as derived from scientific and philosophical observation of other human beings.

One must keep in mind that in human beings, both the mother's and the father's genome is essential for the formation of a viable zygote or embryo, which is when the mother's genetic heritage meets the father's genetic heritage. It is here that the new ontological individual entity formed at step number three mentioned above, assumes the *nature of a*

⁴⁰ Ford, N.M., *The Prenatal Person-Ethics from Conception to Birth*, Blackwell Publishers Limited, Oxford, 2002, pg. 8.

human being that as per original definition has within itself the *active capacity* to maintain or to begin, the process of the human life cycle *without loss of identity*. This therefore correlates the philosophical position with the scientific position both pointing to syngamy (karyogamy) as the start of human life.

Regarding the position taken by Serra and Colombo and also by certain authors such as Pierre Schembri Wismayer in one of his articles⁴¹, wherein they described the *zygote* as occurring at penetration of the secondary oocyte by the sperm, one would be hard put to accept this version of events as fact, when keeping in mind that very few if any, *eminent* embryologists would say that a zygote is produced when there is penetration. The great majority state that a zygote is the last phase of fertilisation, stage fourteen [14] according to O’Rahilly and Muller⁴². These latter go on to specify that,

[a]lthough life is a continuous process, fertilization (which incidentally is not a moment) is a critical landmark because, under ordinary circumstances, a new genetically distinct human organism is formed when the chromosomes of the male and female pronuclei blend in the oocyte⁴³.

Another author Corliss goes on to state,

[i]t is the penetration of the ovum by a spermatozoan and resultant mingling of the nuclear material each brings to the union that constitutes the culmination of

⁴¹ Schembri Wismayer, P., ‘Scientific understanding of the beginning of life’, *The Sunday Times*, Allied Malta Newspapers, Malta, 26 June 2005, pg. 14.

⁴² O’Rahilly, R., Muller, F., *Human Embryology and Teratology*, 3rd edition, Wiley-Liss, New York, 2001, pg. 33.

⁴³ O’Rahilly, R., Muller, F., *Human Embryology and Teratology*, 3rd edition, Wiley-Liss, New York, 2001, pg. 8.

the process of fertilization and marks the initiation of the life of a new individual⁴⁴.

Greenhill and Friedman add,

[t]he term conception refers to the union of the male and female pronuclear elements of procreation from which a new living being develops....The zygote thus formed represents the beginning of a new life⁴⁵.

In a relatively recent issue of the *National Geographic* magazine one finds that,

[t]he two cells gradually and gracefully become one. This is the moment of conception, when an individual's unique set of DNA is created, a human signature that never existed before and will never be repeated⁴⁶.

Larsen and Rager place the zygote at the stage when the 2nd meiotic division is finalised and the 2nd polar body ejected⁴⁷, but this is confuted by others who do not consider the cell at this stage, with separate male and female pronuclei, to have the nature of a human being. One must here consider the fact that there is a possibility of both non-union and parthenogenesis occurring with the formation of a non-viable embryo or also the formation of a hydatidiform mole which does not have the nature of a human being although the cells are biologically human in nature, as all types of hydatidiform moles, are incapable of developing into the human species, resulting in death and early abortion.

⁴⁴ Corliss, C.E., *Patten's Human Embryology: Elements of Clinical Development*, McGraw Hill, New York, 1976, Pg.30.

⁴⁵ Greenhill, J.P., Friedman, E.A., *Biological Principles and Modern Practice of Obstetrics*. W.B. Saunders, Philadelphia, 1974, pg. 17, 23. The term conception here is analogous to Ford's definition of active conception.

⁴⁶ 'In the Womb', *National Geographic*, 2005.

⁴⁷ *Vide infra*.

The frequently arising argument that once penetration occurs, this if left alone, would result in the formation of a human embryo and zygote are fallacious. The percentages of parthenogenesis (cleavage of an unfertilised oocyte or one where the male pro-nucleus disintegrates before pro-nuclear fusion) is believed to be relatively common⁴⁸. There could also be the fusion of a mature oocyte with the second polar body resulting in a parthenogenetic embryo containing a visibly normal double (XX) diploid set of chromosomes but which contain lethal genes that result in death and early abortion. Both sets of chromosomes (paternal and maternal) are essential for normal development compatible with human life. Some people would consider these embryos as demanding respect due to human life until natural death, while others do not share this view. It is interesting to keep in mind that in animals (lower) such as in ants, bees and frogs, this is a not uncommon form of reproduction which is completely asexual. I find it hard to contemplate a naturally asexually produced human embryo with genes from the same parent ovum as having the nature of a human being, when it does not contain the genetic information necessary from both parents. This is opposed to the situation found in cloning, where although there is asexual reproduction due to somatic cell nuclear transfer into the enucleated ovum obtained from one individual, obtained from another cell of the somites of a different individual, the original information still comes from two different sexes which had originally led to the formation of the second particular individual when sexual reproduction had taken place to form that same particular human being.

⁴⁸ O'Rahilly, R., Muller, F., *Human Embryology and Teratology*, Wiley-Liss, Inc., New York, 2001, pg. 33.

In the case of the complete hydatidiform moles produced, there is no embryo at all and there definitely is not the nature of a human being. These are diploid in karyotype and can occur either by dispermy or by monospermy with normal mitosis occurring. There are also partial hydatidiform moles that are triploid in character and may contain an embryo which is always abnormal and spontaneously aborted in the second trimester. These moles result from insemination of a mature 2° oocyte containing a female nucleus by two spermatozoa or possibly by a single abnormal diploid sperm (sex chromosome number 23 karyotype XXX, XXY, XYY). Triploidy is not compatible with human life. In all these cases, there is no genetically inherent active potential to develop towards human adulthood. Moles can also give rise to tumours. Tumours from partial hydatidiform moles are usually benign. Tumours arising from complete moles become malignant (invasive mole, choriocarcinoma, teratomas are also thought to arise from parthenogenesis in the gonads). These last two forms are potentially lethal to the mother and would need urgent removal from or treatment to the mother to save her life. No one would consider this as a form of abortion, as there is no ontological being with a human nature here.

From all this I would most prefer Ford's second definition above of human person (being), as the more exact of the two and although as defined it is sufficient, this could be adapted and the two combined to spell out as follows;

A human being is a living individual with a *human nature* with the *inherent active potential* to develop towards human adulthood without ceasing to be the *same ontological individual*.

Applying Ford's first definition discussed previously, would mean that one might have to respect even parthenogenetic embryos and *incomplete* hydatidiform moles, as human beings even though there is not inherent capacity to develop towards adulthood, because he includes the term "or at least to begin to develop". This of course would still not apply for complete moles as here, there is no conceptus (or embryo) at all, as it is derived completely from the father's genome, responsible only for placental trophoblastic cells. One may however add that since the genetic composition is not from both parents, and therefore lethal genes are present to inhibit proper development, one may still argue that development towards human adulthood, may not even teleologically have the possibility to be initiated, as there is no intrinsic capacity to do so. In that case, once that point would be cleared, *Ford's* first definition could actually also be valid.

The start of human life is not a gradual process but an instant beginning. We are not here considering a gradualist opinion. The question is whether this instant beginning of individual human life commences at penetration of the ovum by the sperm or at syngamy of the pronuclei containing the father's and mother's genetic material respectively! In fact the German Catholic Bishops' Conference reaction accepts this position as defined by German civil law⁴⁹. The American Catholic Bishops' Conference on the other hand, contains both definitions on its web-site⁵⁰. Other websites such as that of the Italian National Bioethics Committee, is split on the issue, with a majority

⁴⁹ Personal correspondence on *Gesetz zum Schutz von Embryonen (Embryonenschutzgesetz – EschG)* of 13 December 1990, [04.03.2005].

⁵⁰ United States Conference of Catholic Bishops, Secretariat for Pro-Life Activities, 3211 4th Street, N.E., Washington, DC 20017-1194 (202) 541-3070, 1998. <http://www.usccb.org/prolife/issues/bioethic/fact298.htm> [05.02.2006].

favouring penetration over syngamy⁵¹. On the other hand, the website of the Irish Catholic Bishops' Conference contains the definition as at penetration. Although they refer to there being a human being after the process of fertilization is complete, and ascribe to its having a genetically unique body, they are not sure which of the two positions is correct and therefore apply the principle of tutorism saying that,

In the final analysis where doubt exists on the level of fact, the integrity of conscience requires that the presumption be in favour of life...he must assume it is a human being until such time as he can establish that it is not.. Similarly, we may accept the argument that there is scientific uncertainty as to the precise moment when an individual human life begins. That uncertainty however, does not remove the obligation of care and respect for what certainly has the potential to become, and may already be, a distinct human individual⁵².

There are however some wrong assumptions put forward in this website, both in the scientific and also the philosophical aspects.

First, if the “The pronuclear embryo development...is biologically human”, the question arises whether one should extend moral respect to all material that is biologically human? The answer of course is no! The sperm cell is also biologically human but it does not deserve any moral respect. This fact also applies to the philosophical reasoning they use. Sowing respect and care to what already may be a human being is fine, but showing respect and care to something that has only the passive potential to become a human being does not make sense. Using the same example, a

⁵¹ Comitato Nazionale Per La Bioetica, *Considerazioni Bioetiche In Merito Al C.D. “Ootide”*, Presidenza Del Consiglio Dei Ministri Dello Stato Italiano, September 2005.

⁵² Bishops' Committee for Bioethics, *Assisted Human Reproduction: Facts and Ethical Issues*, originally published in 2000, by Veritas Publications, Dublin, for the, text revised by the Bishops' Committee for Bioethics, April 3rd. 2003, <http://www.catholiccommunications.ie/pastlet/ahr.html> [20.01.2006].

sperm cell has the passive potential to become a human being in the right circumstances, but one does not afford any moral respect to a sperm cell. There must be potency in act with the active potential to develop into an organism, not just any potency!

Second, if as they declare, “The pro-nuclear embryo has an organic unity and is oriented towards on-going development” i.e. what one would call continuous ontological development, does ontological development of a biological entity such as the penetrated ovum automatically confer upon it the moral respect due to a human individual being? The answer is again no! The development of the sperm cell in the testis of an adult male, also produces an ontological entity, a sperm cell, which merits no moral respect.

Third, in referring to “The pro-nuclear embryo”, the question arises automatically whether this term actually exists embryologically. The answer is no! According to the International Embryological Terminology as seen in *Chapter One*, the embryo does not exist terminologically before syngamy or amphimixis leading to the zygote. At this stage it is called an ootid. As referred to in chapter one, there is also misuse of the word ‘zygote’. As we have seen above, the zygote is not referred to at the penetration, but at the end of fertilization. *Dorland’s Illustrated Medical Dictionary*, defines zygote as ‘the cell after synapsis at the completion of fertilization’⁵³.

Fourth, in the term used “The pronuclear embryo” would one consider that this exists at penetration? The answer is no! The penetration by the sperm of the secondary oocyte

⁵³ Ford, N.M., *When Did I Begin*, Cambridge University Press, Cambridge, 1988, pg.129.

only produces a pronuclear ootid two to eight hours after penetration after the 2nd meiotic division has occurred and the second polar body extruded.

The fifth question. Once the 2nd meiotic genetic division takes place after penetration and a completely different set of albeit separate genes, from those in the preceding penetrated secondary oocyte, now exist in the ootid, does this qualify as a change in ontological continuity? Here the answer should be a resounding yes! In a single cell organism a drastic change in the genetic content of the cell, would change its identity and therefore its ontological continuity. The ontological identity of the cell before the second meiotic division is not the same as that of the same cell after its ontological continuity has been interrupted. The composition of the genetic information is a necessary condition for cellular identity.

The sixth question is whether a human zygote with the inherent capacity to develop towards the mature adult form always develops just after penetration. Again the answer is no! A large percentage of penetrated ova develop into other entities which do not have a human nature e.g. parthenogenesis (*Hira* gene), hydatidiform mole, choriocarcinoma, invasive carcinoma. If simple penetration of the ovum established human form, then according to Aristotle's hylomorphic theory, as long as that matter is still alive it should only form a human being⁵⁴. After syngamy, one always gets a human being even if things go developmentally wrong. Norman Ford asserts that,

[o]nce an individual with a true human nature begins to exist and develop it continues to be a human individual while it is alive, even if severe congenital malformations occur subsequently during development. Nobody questions the

⁵⁴ Ford, N.M., *When Did I Begin*, Cambridge University Press, Cambridge, 1988, pg. 82.

humanity of a Down's syndrome fetus or child. A fetus or child with severe open *spina bifida* is nonetheless a human being. The same should be said of the live anencephalic fetus or infant with only brain stem functions: it is a human individual even if it lacks a complete brain and usually survives birth by only a few hours or a day.

and that,

“[a]s long as it lives, an organic individual unceasingly actualizes its potential to remain in being without loss of ontological identity....What is needed to remain the same ontological individual is to stay alive, sustained by the functioning of one's vital organs all the time⁵⁵”.

Royce declares that,

“[f]orm is cause in a very analogous sense. Made present in matter by the efficient cause, it causes only by uniting with matter to form this being. Not being a thing, it does not come and go. It simply begins and ceases accordingly as the being is or is not this kind of being, just as the lap does not go anywhere when you stand up, nor the light when it goes out⁵⁶”.

This means that when human formal causality ceases to exist in an individual organismic living matter, that matter becomes dead matter and that as long as the same ontologically individual matter remains alive then it must have the same rational form. It should be qualified, that this is only true assuming that human individual ontogeny is maintained, and as long as the living organism still functions as one whole. This therefore means that when the genesis of a mole occurs, it is that of a non-organismically living entity of *Homo sapiens* and will remain in that form as act till death⁵⁷.

⁵⁵ *Ibid.*, pg. 93.

⁵⁶ Royce, J. E., *Man and Meaning*, McGraw Hill Book Company, New York, 1969, pg. 243.

There are however others who argue that once a human living organism has died, although there is the death of the whole human organism, and therefore the rational soul according to Aristotelian terms, the individual cells of the organism remain alive for a further short period of time. Some believe this to be a reversion to the vegetative life form although here one can no longer think of it as one coordinated organism but an aggregate of several human living cells. Organismic unity has been lost and metaphysical form has changed! According to this viewpoint, the original unicellular organism of human form belongs to the biological species *Homo sapiens*. This cell starts life as a human organism and form but after a short time, the organismicity of this life form ceases and transforms into a non-organismically living body of *Homo sapiens*. The form of the living body changes from an organismic one into a non-organismic one as its organismic life ceases and incurs death but remains a non-organismic living body. This conflicts with earlier view expressed above and shows that form can change without actual death of the living body cells⁵⁸.

Another viewpoint that can be put forward in the case of moles is that the cell could be the form of an organism of human origin but not belonging to the species *Homo sapiens*. Therefore one cannot say that it ever has a form of an organism belonging to *Homo sapiens*⁵⁹. The bottom line arising from this confusing varied viewpoint situation, is that the molar paradigm does not really help us to throw light on the question of when human life begins especially since there is no answer to the possibility that one early

⁵⁷ Ramellini, Pietro, *Life and Organisms*, Pontifical Council for Culture, Libreria Editrice Vaticana, 2006, pg. 376.

⁵⁸ *Ibid.*, pg. 373.

⁵⁹ *Ibid.*, pg. 378.

individual life could have ceased to exist and another one began. Intuitively however, I very much tend to lean toward the first option followed by the third.

The seventh final question revolves around the fact whether one can consider the secondary oocyte at penetration or the pronuclear ootid as exhibiting the nature of a human being. I should think that the answer is again no! Does one know of human beings with complete twenty-three (23) triploid sets of chromosomes, or those with half sets, that is haploid sets, of chromosomes in different parts of the cell cytoplasm as a constant feature? As Royce himself asserts,

“[t]he soul is created and infused when this matter is appropriately disposed to receive it and form a man⁶⁰”.

In order to qualify for moral consideration due to a human being, a human cell must contain the *inherent active capacity* to develop into a mature human being, it has to have *ontological developmental continuity*, and it must have the *nature of a human individual being*. In the single cell embryo, the formation of a coalesced diploid genome is a necessary condition for all these three conditions. The process of a human individual subject begins when process actually has a subject with the nature of a human being, not before. Process philosophy requires memory to establish individual identity. In the single cell human embryo, memory can be said to be represented by the coalesced diploid genome leading to a complete human cell.

⁶⁰ Royce, J. E., S.J., *Man and Meaning*, McGraw Hill Book Company, New York, 1969, pg. 282.

4.2 *The Metaphysics of Aquinas*

The metaphysics of Aquinas may actually also help to throw significant light on this issue. First of all for Aquinas, human souls are individuated through configuring matter⁶¹, as with all material substantial composites, but once such a soul is individuated then it may no longer depend on matter for its individuation which may explain why the human form survives the death of the composite⁶². Aquinas also believed that living substances have functional integral parts that are not substances in themselves but only potential substances while they are parts of such wholes. One could think of hands, feet, all organs and the head as falling in this category, so why not the whole nuclear DNA complement itself? Once the integral part is released from its whole, then it can become a substance within its own right or an aggregate of substances such as the human body after death⁶³. Although Aquinas believes that all living organisms as substances may survive the loss of some integral parts such as the

⁶¹ Aquinas, T., ST Ia. q. 85, a. 7, ob. 3, from *The Summa Theologica*, Benziger Bros. edition, 1947, translated by Fathers of the English Dominican Province. “Further, the intellect is the most formal of all that is in man. But different forms cause different species. Therefore if one man understands better than another, it would seem that they do not belong to the same species”. ; ST Ia. q. 85, a. 7, ad3. “The difference of form which is due only to the different disposition of matter, causes not a specific but only a numerical difference: for different individuals have different forms, diversified according to the difference of matter”. <http://www.ccel.org/a/aquinas/summa/FP.html> [24.04.2009] ; SCG II ch.83 (34), from An Annotated Translation of the *Summa Contra Gentiles* by Joseph Rickaby, S.J., M.A. Lond: B.Sc. Oxon., author of *Aquinas Ethicus* (London: Burns and Oates, 1905). “It is natural to every form to be united to its own proper matter: otherwise the compound of matter and form would be something unnatural. Now that which belongs to a thing according to its nature is assigned to it before that which belongs to it against its nature: for what belongs to a thing against its nature attaches to it incidentally, but what belongs to it according to its nature attaches to it ordinarily; and the incidental is always posterior to the ordinary. It belongs to the soul therefore to be united to the body before being apart from the body”. <http://www2.nd.edu/Departments/Maritain/etext/gc.htm> [24.04.2009].

⁶² Aquinas, T., ST Ia. q. 76, a.2, ad2, from *The Summa Theologica*, Benziger Bros. edition, 1947, translated by Fathers of the English Dominican Province. “Everything has unity in the same way that it has being; consequently we must judge of the multiplicity of a thing as we judge of its being. Now it is clear that the intellectual soul, by virtue of its very being, is united to the body as its form; yet, after the dissolution of the body, the intellectual soul retains its own being. In like manner the multiplicity of souls is in proportion to the multiplicity of the bodies; yet, after the dissolution of the bodies, the souls retain their multiplied being”. <http://www.ccel.org/a/aquinas/summa/FP.html> [24.04.2009].

⁶³ Brown, C.M., *Aquinas and the Ship of Theseus – Solving Puzzles about material Objects*, Continuum, New York, 2005, pg. 89.

leg or a hand, there are other integral parts such as the head, which if lost would cause the particular living substance to cease to exist. The same could be thought of in respect of the single cell zygote which needs the combined nuclear DNA set as an essential integral part of its composite existence without which the single cell zygote cannot maintain its substantial form and therefore exist as a composite organism⁶⁴. The DNA gene set would then be a necessary but not sufficient condition for the existence of the single cell human organism as a substance.

Incidentally, it is interesting to note that when Thomas Aquinas alluded to the concept of *anima mea non est ego*, he alluded to the potential that a paradox could be created in that if the form was in effect the soul (particular) of the human body which united to prime matter forming the composite of body and soul, then one could understand that praying to a soul separated from the body at death would not be the same as praying to the same person before his death! My soul would then not be the same substance as myself⁶⁵! However he goes on to offer a solution by saying that since in the human being an exception ensues in that the soul lives on after the body

⁶⁴ *Ibid.*, pg. 118.

⁶⁵ *In I Cor.* 151.2: “Alio modo quia constat quod homo naturaliter desiderat salutem sui ipsius, anima autem cum sit pars corporis hominis, non est totus homo, et anima mea non est ego; unde licet anima consequatur salutem in alia vita, non tamen ego vel quilibet homo”, from Martin, C., in ‘Is there identity of person between a living human being and a separated soul?’, *Studia Theologica*, VI, 4/2008, 248-253. Also in *Summa Theologiae*, 2a2a, q. 83 a. 11 obj. 5, “Praetera, anima Petri non est Petrus. Si ergo animae sanctorum pro nobis orarent, quamdiu sunt a corpore separatae, non deberemus interpellare sanctum Petrum ad orandum pro nobis, sed animam ejus; cujus contrarium Ecclesia facit. Non ergo sancti, ad minus ante resurrectionem, orant pro nobis”. In the same article by Christopher Martin, we see that although both St. Thomas and the Council of Vienne, teach that the rational soul is the form of the body, in 1979 the Sacred Congregation for the Doctrine of the Faith issued a letter saying that “the Church affirms the survival and subsistence after death of a spiritual element which is endowed with consciousness and will, so that the human ‘self’ subsists. The Church uses the word ‘soul’, consecrated by Scripture and Tradition, to designate this element”. Although these two declarations may lead to a position that seems to be a contradiction in terms, we can see in the chapter above, that this need not be so. God is both eternal (beyond time and space) and infinite (within all time and space) and so the paradox in our relationship while living and after earthly death, as composite (form and matter) living substance in relation with God as one living substance, does not arise.

has died, then once the human form has been individuated by matter to form a human composite, then even after death has occurred, when the human body becomes an aggregate of substances rather than one single substance, then the human soul or form is still sufficient alone to maintain the same previous human identity⁶⁶.

Another important concept to consider is that of an *emergent property*. John Searle believes that an emergent property,

is not a property of any individual elements [in the system] and it cannot be explained simply as a summation of the properties of those elements [in the system]⁶⁷.

Aquinas, agrees with this concept of emergent properties when he points out that compound material substances have powers that are not caused by the powers of things such as the integral parts which compose those compound material substances⁶⁸. Taking

⁶⁶ Aquinas, T., ST Ia. Q.76, a. 2, ad2, “Everything has unity in the same way that it has being; consequently we must judge of the multiplicity of a thing as we judge of its being. Now it is clear that the intellectual soul, by virtue of its very being, is united to the body as its form; yet, after the dissolution of the body, the intellectual soul retains its own being. In like manner the multiplicity of souls is in proportion to the multiplicity of the bodies; yet, after the dissolution of the bodies, the souls retain their multiplied being”. From Second and Revised Edition, 1920, literally translated by Fathers of the English Dominican Province, Online Edition Copyright © 2008 by Kevin Knight. <http://www.newadvent.org/summa/1076.htm> [02.07.09]. Also DEE ch. 6 (93); SCG II ch. 75 (6); QDA q. un., a. 1, ad2. See also Brown, C.M., *Aquinas and the Ship of Theseus – Solving Puzzles about Material Objects*, Continuum, New York, 2005, pg. 129. “The soul is indeed individuated by matter, since the soul is created by God as a substantial form that configures matter by its nature; but once the soul is individuated by matter in its origins, it no longer depends on matter for its individuation”.

⁶⁷ Searle, J., in Brown, C.M., *Aquinas and the Ship of Theseus – Solving Puzzles about Material Objects*, Continuum, New York, 2005, pg. 173.

⁶⁸ Aquinas, T., ST Ia. q. 76, a.1, c., from *The Summa Theologica*, Benziger Bros. edition, 1947, translated by Fathers of the English Dominican Province. “But if anyone says that the intellectual soul is not the form of the body he must first explain how it is that this action of understanding is the action of this particular man; for each one is conscious that it is himself who understands. Now an action may be attributed to anyone in three ways, as is clear from the Philosopher (Phys. v, 1); for a thing is said to move or act, either by virtue of its whole self, for instance, as a physician heals; or by virtue of a part, as a man sees by his eye; or through an accidental quality, as when we say that something that is white builds, because it is accidental to the builder to be white. So when we say that Socrates or Plato understands, it is clear that this is not attributed to him accidentally; since it is ascribed to him as man, which is predicated of him essentially. We must therefore say either that Socrates understands by virtue of his whole self, as Plato maintained, holding that man is an

the concept of an emergent property and combining it with the principle that “if x constitutes y , then y has whole classes of causal properties that x would not have had if x had not constituted anything”⁶⁹ would clearly explain away the fact that the functional transcriptional powers alone of the two separate pronuclear DNA components early in the ootid stage of development is the same property of the DNA itself as a substance when existing separated from the cell. It is the emergent translational properties of the whole zygote with the combined nuclear DNA, at zygote genome activation (ZGA) at the four to eight cell morula stage, which can be considered as a new emergent property of the zygote itself as a whole and not the simple transcriptional powers of the DNA pronuclei. Translation of the zygotic genome at ZGA is therefore an emergent property of the whole zygote as a cell with the anatomical form of its combined nuclear DNA. The zygote therefore represents the human substantial form as a product of fertilization because,

[t]he x s compose a substance y if, and only if, (a) there is a z that has whole classes of intrinsic causal properties that the x s, whether taken *singillatim* or as a sum, do not have, (b) z and the x s are spatially co-incident, (c) the x s have their being and species in virtue of z 's substantial form, and (d) z is numerically identical to y ⁷⁰.

intellectual soul; or that intelligence is a part of Socrates. The first cannot stand, as was shown above, (q. 75, a. 4) for this reason, that it is one and the same man who is conscious both that he understands, and that he senses. But one cannot sense without a body: therefore the body must be some part of man. It follows therefore that the intellect by which Socrates understands is a part of Socrates, so that in some way it is united to the body of Socrates”. <http://www.ccel.org/a/aquinas/summa/FP.html> [26.04.2009].

⁶⁹ Brown, C.M., *Aquinas and the Ship of Theseus – Solving Puzzles about material Objects*, Continuum, New York, 2005, pg. 174.

⁷⁰ Brown, C.M., *Aquinas and the Ship of Theseus – Solving Puzzles about material Objects*, Continuum, New York, 2005, pg. 174.

Therefore since the translation comprising the ZGA is a new emergent property of cells similar in anatomical content to the one cell zygote, then the zygote should represent a new substantial form during fertilization as elaborated in the previous chapter.

4.3 Arguments in favour of syngamy being the beginning of human life

I shall not be discussing authors who believe that the beginning of human life starts much after the formation of the zygote such as those who subscribe to the *Warnock Report* by the British Parliament, or other authors who point to the formation of the trilaminar germ disc (*Norman Ford* in his first book) or even uterine implantation⁷¹ as the point when human life begins. Many authors however, refer to the point of composition of the genome as the moment when a new human life begins. In light of the above, it must be understood that by the genome, one understands the meaning as pertaining to the mature ovum, that is the one formed after the second meiotic division, prior to which the maternal genome is not yet composed in a normal and final way. All those who refer to the formation of the genome as being the point marker for a new human life and a new teleological human development, should surely be alluding to syngamy. The only other point plausible would be the point after the second meiotic division, when the ootid would have been formed but the two pronuclei, male and female not yet coalesced. Prior to this point, the ovum would not yet have a definitive genetic make up as seen in chapter one, and the ovum is not yet mature. We in fact refer to this as the 2° oocyte and not the ovum. The word ootid has in fact been composed to signify the presence of a mature as opposed to an immature ovum. All those who

⁷¹ Alonso, C., 'An ontological view of the human embryo, a paradigm', *European Journal of Endocrinology*, (2004) 151, pg. 17-24. In this article, Alonso asserts that human life should be considered to begin at uterine implantation, because the life of the embryo is completely dependent on

recognize the unified genome in the cell as the point of commencement of the new human being must scientifically and absolutely not be referring to the period (it is a period not a point) of the penetration of the sperm into the ovum but at least the point after the second meiotic division has taken place which occurs two to eight hours after the penetration of the sperm.

I have listed the reasons why I do not consider the ootid in the pronuclear phase as constituting a human being, within this chapter and also the previous one. I do not intend to repeat my arguments here but only to mention authors and authorities who point to the genetic complement or specifically to syngamy, as the point of the start of human life.

In an article written by Günther Rager entitled *The Concept of the Individual in the Debate about the Status of the Embryo*, he specifically states that;

“[t]he embryo is from the zygote stage onwards characterized by its individual genetic information. It steers its own vital functions and proves itself as a unitary, self organizing system”⁷².

One ought to add here that in the term zygote, *Rager* also includes the phase of fertilization which incorporates the pronuclear stage after the 2nd meiotic division. This is corroborated by Larsen’s definition below.

the life of the mother at that stage and would not be able to develop at all without implantation due to epigenetic factors produced by the mother.

⁷² Wils, J.P., Zahner, M., ‘Der Begriff “Individuum” in der Debatte um den Status des Embryos’, *Theologische Ethik zwischen Tradition und Modernitätsanspruch*, Academic Press Fribourg, Schweiz, 2005, pg. 145-154.

Human embryos begin development following the fusion of definitive male and female gametes during fertilization...This moment of zygote formation may be taken as the beginning or zero time point of embryonic development⁷³.

In another article written by Professor Karl Golser, he specifically declares that;

“mi sembra che la posizione che sostiene che una vita umana individuale possa darsi soltanto quando si è formata una nuova identità genetica, abbia dietro di sé una forte probabilità, una grande autorevolezza....La finalità e senz’altro la fusione dei due gamete per formare una nuova identità genetica, ma sembra possibile che a volte non si sviluppa un vero embrione, ma che si formino processi cancerogeni (questo si dovrebbe approfondire dal punto di vista biologico). Quindi l’irreversibilità significa soltanto che non si può più andare indietro, mentre è sempre possibile che il processo si sblocchi o che non vada nella giusta direzione. Inoltre, interazione fra gli spermatozoi e l’ovulo ci sono anche prima della penetrazione dello sperma. L’argomento della sola interazione mi sembra perciò debole”⁷⁴.

In a letter by German bioethicist Michael Fuchs on the position of the German Catholic Church and quoting the then Presidency of the German Catholic Bishops’ Conference, Cardinal Karl Lehmann, on the problem in hand, he states that;

[w]ithin the meaning of the law (German) the fertilized, viable human egg is considered to be an embryo already from the moment of nuclear fusion (Fuchs)....With the completion of fertilization and the forming of the zygote, an individual human genome and thus a human embryo has evolved (Lehmann)⁷⁵.

⁷³ Larsen, W.J., *Essentials of Human Embryology*, Churchill Livingstone, New York, 1998, pg. 1, 14. Note here that Larsen’s use of the word ‘definitive’ would probably refer to the ootid after the second meiotic division which is the combined definitive ovum and sperm. Prior to this point the 2° oocyte is not yet considered as the definitive female gamete.

⁷⁴ Istituto per la Giustizia, la Pace e la Salvaguardia del Creato, Bressanone, Italy, personal correspondence, [November 2005].

⁷⁵ Personal correspondence, [04.03.2005].

In a letter by Australian bioethicist Norman Ford, he states that Australian legislation declares the embryo to begin from the appearance of the two pronuclei, but that he himself thinks that it is syngamy, the joining together of the pronuclei, continuing,

I do not think we have an embryo prior to syngamy, but it is human life in development...In reality what the German law says is about as good as you can expect from a Parliament⁷⁶.

In personal correspondence with Professor Güenther Virt, professor of moral theology at the University of Vienna, he concluded,

[f]irst of all fertilization is not a moment but a process...In my view the position of the German 'Embryonenschutzgesetz' (law for the protection of the embryo) is a good and plausible one⁷⁷.

It is important to note here that Professor Virt's opinion refers to an opinion which he believes would be practically acceptable to an international scientific and ethical dialogue and he also states that this position would be in this case the lesser evil. Professor Virt then seems to believe that it could be a possibility that an embryo would be present from penetration but is ready to accept a position from syngamy! He confirmed this in a verbal conversation which I had with him in Vienna in March 2006.

In a book published as a form of dialogue between Church and State, Cardinal Joseph Ratzinger, emphasizing the importance of establishing a moral minimum accessible to the ethic of reason and repeating the instruction found in *Donum Vitae*, he stresses,

ricorda come, in base alle conoscenze della genetica moderna, 'dal primo istante si trova fissato il programma di ciò che sarà questo vivente: un uomo, quest'uomo individuo con le sue note caratteristiche già ben determinate'. O, in

⁷⁶ Director, Caroline Chisholm Centre for Health Ethics, 7th Floor, 166 Gipps Street, East Melbourne, Victoria 3002, Australia, personal correspondence, [03.05.2005].

altre parole: ‘nello zygote derivante dalla fecondazione si è già costituita l’identità biologica di un nuovo individuo umano’⁷⁸.

and,

si può constatare empiricamente che c’è un nuovo individuo: ‘individuo’ è un termine empirico in quanto si tratta di un organismo che, pur essendo completamente dipendente da quello della madre, tuttavia è un organismo nuovo, con un suo proprio programma genetico⁷⁹.

The future Pope chooses his words very carefully here, and this merits some deeper analysis. He refers to “the empirical information provided by modern genetics”. Now it seems that the author is here pointing to the genome as the point of determination of human individuality. He specifies “a new organism with its specific genetic program”. So it is clear here that he is empirically considering the establishment of the genome as the point at which the new individual is generated by the parents. Now we empirically know that a new genome is not yet available at the penetration of the 2° oocyte by the sperm and before the second meiotic division has taken place. So that effectively rules out penetration as the point of human individuation and the beginning of a new human life. We also know that at this stage, the development of the fertilization process is fully dependent on the maternal transcripts and translations in the 2° oocyte! We know that the zygotic genome is not activated until after syngamy when the old maternal direction is replaced by a new foetal one. New human protein is only laid down by the zygotic genome after syngamy. The fact that it does not happen before syngamy is a very strong empirical indicator in this direction! We also empirically know, as seen in *Chapter one*, that in a cell, everything points to the genome having to actually come and be together to function normally. All this occurs only at syngamy and cannot occur before! It is

⁷⁷ Virt, Güenter, Institute of Moral Theology, University of Vienna, A-1010 Vienna – Schottenring 21 Austria. Personal correspondence, [14.11.2005].

⁷⁸ Pera, M., Ratzinger J., *Senza Radici-Europa Relativismo Cristianesimo Islam*, Mondadori, Milano, VII edition, 2005, pg. 119.

therefore rational to point out that Ratzinger's and *Donum Vitae's* conclusions seem to strongly point towards syngamy as being the point of the existence of a new human individual "in the zygote derived from fertilization, there is already constituted the biological identity of a new individual human being". Here he seems to be pointing out to the fact that *Donum Vitae* is applying the existence of the human individual in the zygote as *a posteriori* to the process of fertilization and not *a priori*!

It is important to point out that in the English version of *Donum Vitae*, the zygote is defined as being the point of fusion of the male and female pronucleus;

The zygote is the cell produced when the nuclei of the two gametes have fused⁸⁰.

I pointed this out to the then Rector of the Pontifical Academy for Life, Ignacio Carrasco de Paula⁸¹ who replied that this was a wrong translation of the original Latin text which stated "*Zygoticum est cellula orta a fusione duorum gametum*" which states that the zygote is the cell born from the fusion of the two gametes. However this is open to interpretation as clearly laid out by Professor Dianne Irving, there can in fact be four definitions of fusion,

I see at least four definitions of 'fusion'...

- (1) the fusion of the outer cell membranes of the sperm and the oocyte at the beginning of the process of fertilization = penetration.
- (2) the fusion of the membranes of the male and female nuclei.
- (3) the fusion (or crossing-over) of the male and female chromosomes = syngamy.

⁷⁹ *Ibid.*

⁸⁰ Sacred Congregation for the Doctrine of the Faith, *Donum Vitae*, 1987, Chapter I, para. 1, footnote.

⁸¹ Personal correspondence, [01.07.2005].

(4) the final formation (not ‘evolution’!) of the single–cell human zygote at the end of the process of fertilization⁸².

I find it difficult to believe that such a glaring misinterpretation of facts could have occurred in the English translation of *Donum Vitae* without there having been a red flag raised at the time that it was written. I would rather believe, given the alternatives, that the translation in English stood, as it was deemed to be the more correctly scientific detailed one, since the Latin original text was so vague as to the meaning of the word ‘fusion’. It also transpires, that the original versions of these documents are not written in Latin but in Italian. The Italian version states the same as does the English version and the Spanish, Portuguese, German and other languages! I do not consider these multiple mistakes to be a co-incidence but more likely a faithful translation of the original intention in Italian of the writers of the text. In fact the Latin text of *Donum Vitae*, appeared later than the Italian original in 1987, and was published in the *Acta Apostolicae Sedis*⁸³.

In a Consistory of Cardinals, held at the Vatican City on April 4-7, 1991 as a key preparatory moment for the preparation of the Encyclical letter *Evangelium Vitae*, in the summary on *Threats to Human Life*⁸⁴, in the text presented by Cardinal Joseph Ratzinger one finds the following ,

Now as *Donum Vitae* (I, 1) has confirmed, modern genetics show that ‘from the time that the ovum is fertilized, a new life is begun which is neither that of the father nor of the mother; it is rather the life of a new human being with his own

⁸² Personal correspondence, [15.06.2005].

⁸³ AAS, 80, No. 1, pg. 70-102 in 1988.

⁸⁴ Teachings of the Magisterium on Life, *Priests for Life*, Staten Island, New York, on www.priestsforlife.org/magisterium/threatstohumanlife.htm#ratzinger [05.06.08].

growth⁸⁵. Science has shown ‘that from the first instant, the program is fixed as to what this living being will be; a man, this individual man with his characteristic aspects already well determined. Right from fertilization is begun the adventure of human life, and each of its great capacities require time to develop, and to be in a position to act’. The recent discoveries of human biology recognize that ‘in the zygote resulting from fertilization the biological identity of a new human individual is already constituted’...the conclusions of science regarding the human embryo provide a valuable indication for discerning by the use of reason a personal presence at the moment of the first appearance of a human life...although the Magisterium has not expressed itself in a binding way by a philosophical affirmation, it has still taught constantly that from the first moment of its existence, as the product of human generation, the embryo must be guaranteed the unconditional respect which is morally due to a human being. It is interesting here to observe precisely the choice of Ratzinger’s words. “*Modern genetics shows; the time that the ovum is fertilized; the life neither that of the father nor of the mother; a new human being with his own growth; the program is fixed as to what this living being will be; the zygote resulting from fertilization; the conclusions of science; by the use of reason*”. All these sentences point to the fact that genetics is the pivot point of the issue, that the product of fertilization is considered in the past tense, that the zygote is considered as the after product of conception, that science and human reason should lead us to the correct answer to this question. These points should lead us to the conclusion that the starting point of human life is syngamy after examining the scientific facts in *Chapter one*. In fact this is found stated in *Evangelium Vitae* which also adds,

⁸⁵ See also Sacred Congregation For The Doctrine Of The Faith, *Declaration On Procured Abortion*, 18 November 1974, para. 12.

from the standpoint of moral obligation, the mere probability that a human person is involved would suffice to justify an absolutely clear prohibition of any intervention aimed at killing a human embryo⁸⁶.

In a book written by Peter Seewald, of an extensive interview given to Cardinal Ratzinger, he answers the question of what life is by stating that life can exist at different levels of meaning. In the first place he mentions the biological level,

In the first place life is biological. It ultimately comes from inorganic matter and establishes a new level of being. The capacity for reproducing itself and that of self-contained functioning are among the principle indications of the presence of life, so that what we have is no longer a machine but an organism⁸⁷.

It is interesting here that Ratzinger chooses to define what biological (human) life is by means of two important physical criteria, the first being internally oriented (active potential) for functioning that include growth and development. The second criterion is very important being the capacity for reproducing itself. Now we have seen that there are two methods whereby a cell may reproduce itself. The first is sexual reproduction. The single cell human embryo is not in a development stage to be able to actuate sexual development. Many years of growth must pass before that is possible. However, there is another form of reproduction and that is asexual reproduction. Asexual reproduction in this case, would be used by the cell for normal mitotic division and growth. One cell becomes two, two become four, the four then become eight and so on. A cell at that level would be ready for asexual reproduction at a certain stage.

⁸⁶ Paragraph 60.

That stage would constitute the embryo, because it becomes a human embryo by virtue of acquiring in its material substance, its active potency to reproduce. That capacity is attained only after syngamy. Before syngamy, the ootid is not yet in a state of being able to undergo asexual reproduction. It is physically impossible. The pronuclei must first come together before the actual pairing of homologous chromosomes may occur with their internally oriented doubling and also the formation of the spindle. Thereby mitosis has commenced. All this is not possible before syngamy. It only becomes actively possible after syngamy. The occurrence of syngamy marks a locus of simultaneous *convergence* and *divergence*. The convergence is that of the parents' genetic patrimony which comes together in a new genome, while the divergence is represented by the cell's possibility to grow and develop into the adult organism, which is to reproduce asexually to reach this aim. Therefore the actual coming together of the homologous chromosomes at syngamy is what confers on the cell itself, the potency to reproduce and grow.

Due to the open question arising from the query of the time of existence of the zygote during fertilisation in *Donum Vitae*, Monsigneur Manning, secretary of the Australian Catholic Bishops' Conference, in September 1987, wrote to ask the *Congregatio Pro Doctrina Fidei*, for an official clarification of the meaning of the text⁸⁷. In November 1988, Cardinal Joseph Ratzinger replied by stating that the Latin text quoted earlier on above, was the official version. Since this text refrains from pinpointing the exact time in fertilization that the zygote begins to exist, but simply asserts generically that it arises

⁸⁷ Ratzinger, J., Cardinal, *God and the World-A Conversation with Peter Seewald*, Ignatius Press, San Francisco, 2002, pg. 277.

from the fusion of the gametes which is a process, it seems that the Church is here refusing to specify when the zygote arises and is leaving this open to further scientific and philosophical evaluation⁸⁹.

I was looking forward to the update to *Donum Vitae*, issued by the Sacred Congregation for the Doctrine of the Faith in December 2008, to see whether the air would be cleared on this issue. In fact there was no substantial change from that put forward by the previous instruction and it simply repeats what the previous instruction had already established basically that human life has to be respected from the moment the zygote has formed⁹⁰

This definition of syngamy as the beginning of human life finds an echo of acceptance in a declaration on behalf of the Florida Council of Catholic Women which points to the final genetic make up as the sexually intended beginning of human life as opposed to asexual reproduction.

The reason why gametes only have 23 chromosomes is so that when a sperm unites with an egg during fertilization, the resulting cell will have the full 23 pairs of chromosomes needed for normal development. This fertilized cell is called a **zygote**, which in Greek means “tiny being.” Each one of us began our individual existence as zygotes, on our way to our mothers’ wombs, nine months before we were born....this one-celled being is the **first stage** of our embryonic development. We all began as a single cell zygote. The zygote is never an “it”

⁸⁸ Ford, N. M., *Pacifica*, Vol. 1 No. 3, 1988, ‘When Does Human Life Begin? Science, Government, Church’, Pacifica Theological Studies Association, Australia, pg. 314.

⁸⁹ *Ibid.*, pg. 315.

⁹⁰ Congregation for the Doctrine of the Faith, Instruction *Dignitas Personae*, 2008, paragraph 4.

because the final 23rd pair of the 23 chromosomes will be either XX (female) or XY (male). To call the zygote, or embryo, or fetus an “it” is to totally depersonalize him or her and deny the scientific existence of a singular being⁹¹.

In a series of articles published by *The Tablet* in 1990, there is a constant reference to fertilisation bringing about a new and unique combination of genes. The final genetic identity is singled out as the point of commencement of individual human life.

It is the new entity which comes into being at fertilisation which provides the basis for a new and unique human person....The unique genetic code, the blueprint, governing the development of one or more primitive streaks is laid down at the time of fertilisation....the human embryo is alive and already developing along its own unique genetically determined line⁹².

The long time serving secretary of the Maltese Bioethics Consultative Committee, the late Dr Lino German, also had strong opinions as syngamy being the point of beginning of human life. In a paper written and presented to the bioethics committee in 1999 he asserts,

[w]e know that a substantial change occurs at the end of the fertilisation process when the male and female gametes (each carrying 23 chromosomes) transform themselves into a completely different entity (with 46 chromosomes) – the human zygote. Beyond this stage, substantial change does not occur and what follows, as embryological development continues, is a series of accidental changes without any corresponding alteration in the *nature* of the entity itself. We know that the human zygote has a complement of 46 chromosomes which complement the human species *Homo sapiens*. We know that the new genetic identity established in the zygote, besides being unique, remains basically

⁹¹ Cioffi, A., BS, STD, *Call To Ban Human Cloning*, 2003, Florida Council of Catholic Women www.flaccw.catholicweb.com [05.04.2006]. The Florida Catholic Conference P.O.Box 1677, Tallahassee, Florida 32302-1677

⁹² Marshall, J., ‘Unique from the Start’, *The Tablet*, The Embryo Debate: 5, 24 March 1990, pg. 378-379.

unchanged through subsequent embryological development and indeed throughout its entire life span. The changes that do occur represent the ‘switching on’ and ‘switching off’ of various genes as embryological development occurs⁹³.

In his submissions to a hearing on biotechnology carried out by the Social Affairs Committee of the Maltese House of Representatives in November of 2004, he says in Maltese that it is only after the formation of the new genome which is unique and irreproducible, that one can say that a new human life exists. He insists that,

[h]uwa biss wara li jiffirma l-*genome* ġdid (li hu uniku u irrepitibli għall-kull bniedem...) li wieħed jista’ jgħid li bdiet teżisti ħajja umana ġdida⁹⁴.

In a report to the Philosophical Society Meeting of the University of Malta in May 2005, he again states,

Scientifically, the prevalent view appears to be that individual human life has its origin with the formation of the new genome that gives each particular embryo an individual identity....perhaps the most convincing argument against this claim (that of penetration) came from Prof. Emm. Agius who recently observed that after sperm penetration of the ovum but before extrusion of the second polar body, the fertilised egg is actually triploid rather than diploid – (69 rather than 46 chromosomes) – definitely not the number that characterises the species *Homo sapiens*! I subscribe to the view that a more logical landmark for the beginning of individual human life would be the end-stage of the fertilisation process when the genetic material actually merges to form the unique genome of the zygote.

As stated above, since the Italian law on medically assisted procreation⁹⁵ states in article one that the law concerned applies to the ‘conceived one’ that is the embryo from

⁹³ German, L.J., *Fundamental Issues in Assisted Procreation*, personal correspondence, [05.11.2004].

⁹⁴ German, L.J., Report of the Standing Committee on Social Affairs of the House of Representatives on Biotechnology, Malta, 15 November 2004.

conception; “che assicura i diritti di tutti i soggetti coinvolti, compreso il concepito”. There followed a debate in the Italian National Bioethics Committee where the nature of ‘concepito’ had to be resolved as whether meaning penetration or syngamy⁹⁶. There was no agreement on this issue, but the majority, about sixty percent (60%) were in favour of penetration for the reasons quoted by Bompiani and Colombo above, while about forty percent (40%) issued a minority report led by Professor Carlo Flamigni, which pinpointed syngamy as the starting point of human life. This report states that,

In conclusione, la transizione oocita-embrione risulta da un successione di eventi che si susseguono nel tempo con larghe sovrapposizioni funzionali e temporali. In tale transizione un evento peculiare sul quale basare la criticità del passaggio generazionale e quindi l’inizio di un nuovo essere umano, è rappresentato dalla costituzione del nuovo assetto cromosomico diploide e dal successivo inizio della segmentazione⁹⁷.

He also concludes that this is his personal opinion without there being any prejudice to his opinion on personhood which he believed to be different from that of the existence of the human being. This is a reflection of the personal opinion posted on his website⁹⁸ where he also criticises Adriano Bompiani who also had this opinion but was now recanting and he is charging him with inconsistency. He quotes Bompiani in a book saying the very opposite of what he now says above and affirming syngamy as the point of human individuation,

Mi sembra dunque evidente che, anche per il Prof. Bompiani, l’inizio della vita si colloca nel momento finale della fecondazione (l’amfimissi)...Se per definire l’individuo umano è necessario appellarsi alla determinazione della ‘sostanza’,

⁹⁵ Parlamento Italiano, *Norme in Materia di Procreazione Medicalmente Assistita*, Legge, 19 Febbraio 2004, n. 40.

⁹⁶ Comitato Nazionale Per La Bioetica, “*Considerazioni Bioetiche In Merito Al C.D. ‘Ootide’*”, 2005.

⁹⁷ *Ibid.*, pg. 13-16.

⁹⁸ Flamigni, C., *Fecondazione Assistita e Momento del Concepimento*, <http://www.carloflamigni.it/default.asp> [18.12.2004].

questa può ricondursi – prevalentemente – al patrimonio informativo genetico, e cioè all’assetto genico del tutto singolare e irripetibile che si realizza all’amfimissi. Se è necessario la coincidenza di sostanza e forma, questa si determina (anche nella specie umana) di regola nello stesso momento...la genetica consentedi far risalire l’attribuzione di persona sino allo stadio dello zygote⁹⁹.

In an important article published in a Maltese Newspaper¹⁰⁰, Professor Emmanuel Agius, then head of the Department of Moral Theology at the University of Malta, wrote that scientific evidence pointed strongly to syngamy as being the point of commencement of a new human life, and he gave a list of academic colleagues who in fact supported this view including a Cardinal of the Roman Church. He further supported this position in a consequent article refuting the position of penetration, by Edgar Busuttil¹⁰¹, in reply to his first article.

In short, the biological facts demonstrate that at syngamy we have a truly human nature. The zygote does not become a human being – he or she already *is* a human being....Thus a human zygote or embryo is not a *possible* human being, nor is he or she *potentially* a human being: he or she *is* a human being. A human zygote embryo or foetus does not have the potency to *become* a human being, but already possesses the potency or capacity to *be* at that moment a human being. And that potency will direct the accidental development, i.e. the embryological development of his or her own self from the most immature stage of a human being to the most mature stage of a human being....It is a biological fact that this hypothesis cannot be maintained...prior to this point (second meiotic division) in human development, the total complement of genes (sets)

⁹⁹ *Ibid.*, pg. 13, regarding Bompiani A., ‘Fecondazione assistita e statuto ontologico dell’embrione. I primi sette giorni’, in Busnelli, F.D., Genazzani, A.R., Ripepe, E., *Fecondazione Assistita. Una proposta di legge a discutere*, CIC Edizioni Internazionali, Roma, 1997, pg. 19-32.

¹⁰⁰ Agius, E., ‘When precisely does human life begin?’, *The Sunday Times*, 10 April 2005, Allied Malta Newspapers, Malta, pg. 50-51.

¹⁰¹ Busuttil, E., ‘Human life begins immediately!’ *The Sunday Times*, 24 April 2005, Allied Malta Newspapers, Malta, pg. 17.

between male and female (nuclei), is triploid, that is containing three sets of chromosomes (69 in number)¹⁰².

It is also important to point out that in his first article, Professor Agius reminds his readers that in the English version (1987) of *Donum Vitae*, there is a very clear definition of what zygote means:

This teaching remains valid, and is further confirmed, if confirmation were needed, by recent finding of human biological science which recognize that in the zygote resulting from fertilisation the biological identity of a new human individual is already constituted....*the zygote is the cell produced when the nuclei of the two gametes have fused* (my italics)....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”¹⁰³.

In two interesting articles, Professor Maurice Cauchi, former Chair of the Maltese Bioethics Consultative Committee wrote from Australia,

If an individual is defined biologically by the uniqueness of his/her DNA, then it would be difficult to deny the fact that such individuality is defined at syngamy, i.e. when sperm and ovum DNA have become one unit....The dignity due to a human embryo should be extended to the very earliest time when syngamy has occurred, but not necessarily earlier, i.e. not to the very first few hours after sperm meets ovum and prior to syngamy¹⁰⁴.

In another interesting article he went on to say,

The carefully worked out plan that nature prepared can be short circuited or dispensed with entirely....The fact is that human embryos can be started without the use of sperm at all....(the female ovum) nucleus which can be replaced by by

¹⁰² Agius, E., ‘The individual human being begins at syngamy’ *The Sunday Times*, 22 May 2005, Allied Malta Newspapers, Malta, pg. 17.

¹⁰³ Sacred Congregation of the Doctrine of the Faith, *Donum Vitae*, February 22 1987, 1, No. 1.

that from practically any cell in the body and still produce a normal embryo (cloning)...What is certainly essential is having the normal component of chromosomes (46 in number) irrespective of whether they come from sperm/ovum combination, or from any other cell...(even in an unfertilised ovum), as the (electric) shock is given when the ovum still has its full complement of 46 chromosomes, the resulting embryo can get started on its road to development....What appears to be the most surprising (find is) that the only special component which is required to start a new life...is the presence, not of a special nucleus, but of a cytoplasm which is unique to the ovum and found in no other cell of the body¹⁰⁵.

An interesting article¹⁰⁶ by the late Professor Alfred Cuschieri, then clinical geneticist in the Department of Anatomy at the University of Malta in fact adopts the position of giving up completely in trying to define the exact point of commencement of individual human life and adopts the position that everyone should be allowed to apply this point as per the consequentialist motives regarding specific illnesses and conditions. That is, this point will vary according to the subject and the specific conditions of illnesses pertaining to that individual.

Bernard Häring, moral theologian, seems to point to the structure of the genetic makeup in the embryo as being the determining feature which establishes human individuality and *esse*,

At this moment (fertilization), a new life distinct from that of the father and that of the mother is given, with a unique never-to-be-repeated genetic code....A virtually infinite number of combinations of paternal and maternal traits are excluded in favour of those which will determine the individuality of the new

¹⁰⁴ Cauchi, M., 'Essentially Human', *The Times*, 7 June 2005, Allied Malta Newspapers, Malta, pg. 12.

¹⁰⁵ Cauchi, M., 'The making of a human being – a minimalist view', *The Times*, 27 September 2005, Allied Malta Newspapers, Malta, pg. 11.

¹⁰⁶ Cuschieri, A., 'Ethical issues in reproductive biotechnology', *The Sunday Times*, 24 April 2005, Allied Malta Newspapers, Malta, pg. 50.

life....The genotype has been determined....The most astonishing feature of this stage is the self reproducing power of the cells, each marked by the same genotype and the most marvellous entelechy¹⁰⁷.

However although by this statement he invariably points to the formation of the genome and therefore syngamy as being the point of human individuation, later on in the same book he seems to be contradicting himself by going for impregnation or penetration by saying,

neither the scientific data nor philosophical reflection enable us to determine a specific moment of hominization or of ensoulment of the zygote-blastocyst-embryo with an immortal soul. We are faced with a unique uninterrupted process of development that begins with the moment of impregnation¹⁰⁸.

I disagree with the last statement as I believe that the scientific situation is now clear enough for one to be able to point to the moment that this individuation occurs as I have already explained at length.

During a symposium on the nature and status of the human embryo held by the Council of Europe, Ludger Honnefelder, representing the Institute für Wissenschaft und Ethik of Germany presented an interesting paper where he concludes quite clearly,

[b]ut if moral status belongs to human beings as such, then this must apply from that point in time when the human being begins to exist as a human being, i.e., as a separate living being. According to modern embryology, this is the point at which the fusion of ovum and sperm nuclei form a new genome which from then on determines the unique development of the new living being. Since all characteristics of human nature belong to the human being according to its actual potential as from this point in time, there are no grounds for making its value

¹⁰⁷ Häring, B., *Medical Ethics*, St. Pauls, C.I., reprint 1995, of third edition 1991, pg. 72-73.

¹⁰⁸ *Ibid.* pg. 93.

dependent on particular breaks in that development, for example by ascribing value to a newly born human being, but denying it to the unborn¹⁰⁹.

John Mahoney, a renowned bioethicist states in one of his books,

“[a] further positive consideration derives from the science of genetics and from the recognition that from the genetic material contributed by mother and father a new and quite unique genetic package results at conception, which contains within it the full genetic blueprint of a new individual of the human species which will, barring accidents, and without further addition, immediately begin to develop all the latent potentialities of a maturing human person without any radical discontinuity in that development”¹¹⁰.

and,

[f]or it can be argued that the characteristically biological substratum which the infusion of the soul requires is none other than the human conceptus itself, composed as this is of cells which are genetically human through and through, and which in its turn requires, as we have argued above, only irrevocable stability in the human genetic material to constitute a developing individual sufficiently predisposed to receive the infusion of its human and rational soul¹¹¹.

He particularly warns against fixed attitudes of

drawing unwarranted conclusions about the status of early life in order to present an unbreachable bulwark to be defended at all points, and that of forfeiting credibility at such an early stage to the detriment of its much more defensible position concerning later stages¹¹².

With that last quotation in mind, one has to be careful that the people who are advocating the position of penetration are not doing so with the sole intention of fending

¹⁰⁹ Council of Europe, III rd Symposium On Bioethics – *Medically Assisted Procreation and the Protection of the Human Embryo and Foetuses*, Part Seven, Honnefelder, Ludger, ‘Nature and Status of the Embryo: Scientific, Philosophical and Legal aspects’. 1996, pg. 37.

¹¹⁰ Mahoney, J., S.J., *Bio-ethics and Belief - Religion and Medicine in Dialogue*, Sheed and Ward, London, 1984. pg. 61

¹¹¹ *Ibid.* pg. 66.

off any future developments which may occur in the scientific field in a precautionary and blind manner. Definitely this is not the way of science and neither the way of philosophy, particularly one that should be based on deontology and objective truth rather than one based on the consequentialist ethic of a negativistic utilitarian nature. I think I have presented enough proof that the position of syngamy is not only a laudible alternative, but rather than penetration, more likely to be possible, probable beyond a reasonable doubt. The only factor which now can raise its head to counter the arguments above is that of the much quoted fact that the process has begun at penetration, which I have answered in the previous chapter to this.

In an article in the Italian magazine *L'Espresso*, Professor of Medicine Ignazio Marino in a reported dialogue with Cardinal Carlo Maria Martini, explains how in the ootid stage, there is yet no embryo because there is yet no new genetic patrimony and therefore no new individual. He specifically mentions that at that level, the cells have not yet been irreversibly directed to a specific development and it would be beneficial to be able to freeze ootids in this stage since they are not yet embryos. Cardinal Martini made it very clear that since it seems to be possible to define moments where there does not appear any sign of any definable singular human life such as the stage of the pronuclear ootid, the general ethic rule for respect may lie side by side with the need to freezing it. He even went so far as to state that this solution could actually find a way out for the condemnation of all types of *in vitro* fertilisation thereby,

[m]a ciò non vuol dire che non si possano individuare momenti in cui non appare ancora alcun segno di vita umana singolarmente definibile. Mi pare questo il caso che lei propone dell'ovocita allo stadio dei due protonuclei. In questo caso

¹¹² *Ibid.* pg. 70.

mi sembra che la regola generale del rispetto può coniugarsi con quell trattamento tecnico che lei suggerisce....Nella proposta che lei illustra tale problema potrebbe trovare un superamento¹¹³.

There is here an opinion from a very high authority in the church which is willing to be open to the advances of science and new ways to solve problems without at the same time negating the dignity of the human embryo.

¹¹³ Minerva, D., *L'Espresso*, 27 April 2006.

3

CHAPTER THREE

The Philosophy of Process

Man still bears in his bodily frame the indelible stamp of his lowly origin

Charles Darwin, *The Descent of Man*

The consciousness of each of us is evolution looking at itself and reflecting upon itself

Pierre Teilhard De Chardin, *The Phenomenon of Man*

3.1 Process

It has been evident to all mankind from the earliest of times, that life itself is a process. When one observes the images left for us by Neolithic man in the temple culture found in Malta for example, one is immediately struck by the red ochre drawings and stone carvings denoting the tree of life, consisting in circular whorls which circumvent each other in circular fashion. So life is a cycle. It does not end but continues from one generation to the other.

However, although life itself is a continuous cycle, the life of individual members in a particular species are not physically eternally continuous. Each individual human life, has a beginning and an end! So in establishing the point where individual human life

begins, necessitates identifying the point in the aforementioned process where an individual entity exhibits a new physical identity which has human form. In the case of the human species, the point where the *esse* of the new human being is initially established.

In the previous two chapters, we have taken a look at the scientific and the philosophical background to establishing such a point in time. However, process in itself does not determine that any moral value, should be imbued onto the entity or series of entities undergoing the process at every point in time, but on the individual entity within the process which merits this moral recognition. Some entity must not be just human to merit moral worth, but it must express the qualities which are considered to be synonymous with that of a human being. A blood cell, a sperm cell and an ovum, are all entities which are human and involved in a process, but none of them are entities worthy of moral respect. It has to be a human entity which is an individual capable of an intrinsically oriented capacity and potential for development into an adult human being. This is what should merit moral consideration.

3.1.1 Bernard Lonergan

Although he is not considered a process philosopher as such, Bernard Lonergan (1904-1984), a Canadian philosopher, put forward a philosophy of the person as a dynamic being in a state of flux, not a static concept of person¹. He throws some light on the issue before us, by stating clearly that “what is to be, becomes determinate only through its own becoming....so also present reality is not just present reality but

¹ Bernard Lonergan was the first contemporary moral philosopher to incorporate in his *Grace and Freedom*, the dynamic thoughts of Odon Lottin on the possible change of moral certitude with time on the discovery of previously held erroneous conclusions or that of something new. See Keenan,

also a moment in process to fuller reality”². That is to say that being is becoming, which is the major tenet of process. This is an essential point in process philosophy. He asserts that together with form, act and potency are all needed to constitute a unity³. In any living organism including man, there is an individual existing unity. One can deduce this from the following quotations.

For potency, form, and act constitute a unity; potency is presupposed and complemented by form; form is presupposed and complemented by act; and these relations of presupposition and complementation involve some directing of potency towards form and of form towards act⁴.

And,

[b]y central potency, it is individual; by central form it is a unity, identity, whole; by central act it is existent⁵.

Lonergan asserts that central potency, form and act are the constants throughout the development of the individual living being. There is sameness in the individuality and the existing unity, which develops organically, psychically and intellectually. Development itself is then couched in terms of conjugate potency, form and act⁶.

It is important that Lonergan introduces this new concept into the debate on being and becoming and therefore personhood. He makes a distinction between *Central* act and potency and between *Conjugate* act and potency⁷. Act implies being, while potency implies becoming. Something which exists is in central act but is in potency to a further becoming. What is in central act is in conjugate potency to conjugate act, that

J.F., *History of Catholic Moral Theology in the Twentieth Century: From Confessing Sins to Liberating Consciences*, Continuum, London, 2010, pg. 39-40

² Lonergan, B. J.F., *Insight – A Study of Human Understanding*, Longmans, Green and Co Ltd, London, 1967, pg. 445.

³ *Ibid.*, pg. 447.

⁴ *Ibid.*, pg. 459.

⁵ *Ibid.*, pg. 459.

⁶ *Ibid.*, pg. 459.

⁷ *Ibid.*, pg. 434 *et seq.*

is, being is not isolated to potency towards several other developmental options. In Lonergan's own words,

[s]ince one and the same thing is both perfectible and perfected, we have the fundamental theorem of metaphysical composition, namely that the very same thing is in first potency by potency and in first act by form; the same thing is in second potency by form and in second act by act; and the very same thing is in potency by substance and in act by its accidents⁸.

And,

[f]inality is the dynamic aspect of the real. To affirm finality is to affirm movement, fluidity, tension, approximateness, incompleteness⁹.

Being includes the process of becoming more completely what one already is¹⁰!

Lonergan also goes on to describe the concept of *emergence*, therefore,

the higher integration is dynamic when it is not content to systemize the underlying manifold but keeps adding to it and modifying it until, by the principle of correspondence, the existing integration is eliminated and, by the principle of emergence, a new integration is introduced¹¹.

He goes on to state an important fact, that in an organism, it is anatomy that is laid down first and that it is only after anatomy or physical form, that physiology or function is derived. So in an organism as an entity, physical form precedes function¹².

In describing the law of effect, he contends that development takes place along lines of successful functioning¹³. This concept is corroborated by Diane Irving in an article she wrote where she states that biology textbooks always insist that,

[t]he research biologist first observes the actions, reactions, functions of a biological entity and reasons from these specific kinds of actions back to the

⁸ Doran, K. P., 'Person – A Key Concept for Ethics', *Linacre Quarterly*, November 1989.

⁹ *Ibid.*

¹⁰ *Ibid.*

¹¹ See Lonergan in *Insight*, op. cit., pg. 452.

¹² *Ibid.*, pg. 464.

¹³ *Ibid.*, pg. 467.

specific kind of nature it possesses. It is this nature which *directs and causes* such characteristic actions. As biology texts themselves discuss it: *function follows form*¹⁴.

These are just some useful insights into the subject of organism and entity that will be useful at a later stage when considering process in more detail. It also clarifies the concept whereby it was previously stated that in the zygote, there is no translation before there is syngamy (karyogamy) but only transcription. Transcription in the ootid, being a passive potential and function of the separate strands of DNA, while transcription and translation in the zygote, or the production of proteins to build the new organism derived from the zygote would be akin to part of the active potential not of single DNA strands, but of two chromosomes of DNA within a cell working synergistically together.

At syngamy, form has been established. It is only after syngamy has occurred which establishes the continuous form of the nucleus in the human cell, that physiological function comes into its own to kick off translation, the products of which appear at the four to eight cell stage of the morula. The fact that translation does not occur in the ootid stage when the DNA components are not yet together, contributes to the conclusion that form has not yet been established in the ootid stage, but is established at syngamy whereby it is followed by the functional physiological act, which is the act of physically building the human body itself. Many authors look at the expression of the information contained in the DNA making up the genes of an organism into the proteins needed for the body structure and function, as making up the blueprint for life. This process of the expression of genes into proteins consists of two steps. The

¹⁴ Irving, D. N., 'Scientific and Philosophical Expertise: An Evaluation of the arguments on

first step we have seen is transcription, whereby the information in DNA is converted into RNA, and the second step, translation, whereby the information in the RNA is converted into the synthesis of proteins based on the instructions in the RNA. It is essential that the capacity for both steps, that is both transcription and translation, is present in the cell before this potential for the transfer of the genetic information, may be in fact, actualized. The first step is not enough, the second step is also mandatory, and as we have seen, the second step of translation is (and can be) only achieved after syngamy has occurred¹⁵!

It is interesting that Lonergan states in one of his assertions that,

[i]nitial single cells of different organisms admit material differences, for example in the number of chromosomes, but their functioning does not exhibit the differences that are comparable to the later differences in functioning¹⁶.

This seems to give the impression, that independent of the number of chromosomes, once a human cell exists, then that cell would constitute central act with the rest of the adult form and its functions. This would point to a human being present at penetration of the ova with the sperm. It is not clear in this quotation whether Lonergan is referring to the difference in the number of chromosomes that occur within early organisms of the same species or whether he is referring to early cells of different species, which function similarly physiologically although belonging to the same species.

Personhood', *Linacre quarterly*, February 1993, pg. 4.

¹⁵ Salgado, P. S., *And in the beginning was RNA*, Universidade do Porto, <http://www.cienjahoje.pt/1455> [08.01.2007].

¹⁶ See Lonergan, op. cit., pg. 453.

However it seems highly to be the latter interpretation he is giving, as when Lonergan discusses development, he calls the higher system of conjugate forms as *integrator*. When this higher system changes to encompass a transition from one set of forms to another, it becomes an *operator*. He asserts that it is the operator that is geared towards finality, and that it is the operator that needs to be studied by learning its data and verifying it¹⁷. This studying of the complex data involved, includes, (1) the inspecting and the describing of the dissected parts of the organism, (2) the grasping of the functions of the parts, (3) the interrelating of the functions of different parts, (4) reducing the organs to their underlying physical and chemical manifolds. He holds that the proper development of man begins in all its phases when a new scheme of recurrence is established¹⁸, including the organic basis of his action. This is called the law of integration. Lonergan says that if there is some apprehension as to the starting point, one way of pointing to this is to observe all the components of development. If one is correct, all the components of development operate from the same base along the route to the same goal. On the other hand if one is wrong, the components of development operate at cross purposes, resulting in a conflict¹⁹. Thus the successful conscious development of an organism needs the “correct apprehensions of its starting point, its process and its goals”²⁰.

Although a subject in development is both integrator and operator, it is as operator that the system is on the move and in development and to which an individual is subject and where there is the unity of potency, form and act. Man, as a proportionate being, ultimately depends on the understanding, affirmation, and experience of the

¹⁷ *Ibid.*, pg. 464-466.

¹⁸ *Ibid.*, pg. 472.

¹⁹ *Ibid.*, pg. 475.

²⁰ *Ibid.*, pg. 476.

same being as a structure resulting in a complete explanation of such a being, including that of the scientific explanation of the empirical contents. As he himself states, “What holds for the activities, also holds for their contents”²¹.

3.1.2 *Henri Bergson*

While considering the philosophy of process, I have taken into account, the works of four masters of process philosophy. First the work of Henri Bergson (1859-1941), a French philosopher who held that physical reality was a system of unchanging substances in regular motion. Bergson held that the world was a flowing stream of vital impulse that was not divided into fixed and determinate parts but flowed as an indivisible continuity as is clear in this quotation.

Life, then, is a continuous process....It has no goal...in the sense that...no one can anticipate its future course, which is more similar to an artistic creation than to a machine²².

The real nature of time was *duration* and the world was as an indivisible process of *becoming*. Evolution was creative like the work of an artist. So he asserts,

[p]ure duration, is the form which our conscious states assume when our ego lets itself *live*, when it refrains from separating its present state from its former states²³,

and,

[i]t is a ‘transition’, of a ‘change, a *becoming*, but it is a becoming that endures, a change that is substance itself²⁴.

He held that it was the *intellect* that carved time up into segments, such as those photos framed in a cine-camera film reel. It was intellect that contributed to this view

²¹ *Ibid.*, pg. 486.

²² Kolakowski, L., *Bergson.-(Past Masters)*, Oxford University Press, Oxford, 1985, pg. 53-71

²³ Russel, B., *History of Western Philosophy*, Folio Society, London, 2004, pg. 753-762.

of time, whereas in reality, time was a continuous process. Over and above intellect, Bergson set *intuition* synonymous with instinct, which was capable of grasping the real nature of *durée*. Bergson was fundamental in establishing the ideas of Darwin's process and change into philosophy but it is notable to keep in mind, that he was still a dualist. He espoused a dualism, where the consistency of the world for him was divided into two opposite motions,

life which climbed upwards and matter which falls downwards. Life is one great force, one vast vital impulse, given once for all from the beginning of the world, meeting with resistance of matter, struggling to break away through matter, learning gradually to use matter by means of organization; divided by the obstacles it encounters into diverging currents, like the wind in a street corner; partly subdued by matter through the very adaptations which matter forces upon it; yet retaining always its capacity for free activity, struggling always to find new outlets, seeking always for greater liberty of movement amid the opposing walls of matter²⁵.

Bergson also asserts that duration is effectively exhibited in memory where the past survives in the present²⁶. He claims that memory is absolutely independent of matter and it is in memory that one comes into touch with something akin to the spirit. Again an evident manifestation of his dualism.

Memory must be, in principle, a power absolutely independent of matter. Things remembered survive in memory, and thus interpenetrate present things²⁷.

This is brought out clearly in the following statement,

²⁴ Deleuze, G., *Bergsonism*, Zone Books, New York, 1988, pg. 37.

²⁵ Russel, B., *History of Western Philosophy*, Folio Society, London, 2004, pg. 753-762.

²⁶ *Ibid.*

²⁷ See also Anscombe, G.E.M., 'Memory, Experience and Causation', from *The Collected Philosophical Papers of G.E.M. Anscombe – Vol. II: Metaphysics and the Philosophy of Mind*, Basil Blackwell, Oxford, 1981, pg. 128-129, "Similarly the memory experience is supposed to be actually a memory if it has a certain causal relation to a past event." "Experience, being present, cannot succeed in actual past reference; the 'past' which is in it is only something present, something to be seen in its own content".

[d]uration is essentially memory, consciousness and freedom. It is consciousness and freedom because it is primarily memory. Now Bergson always presents this identity of memory in two ways: ‘the conservation *and* preservation of the past in the present...We do not move from the present to the past, from perception to recollection, but from the past to the present, from recollection to perception²⁸.

Bergson’s insights into process were innovative and in line with a dynamic view of the universe rather than a static one. His exposition of duration as one continuous process similar to a reel in a film, set the stage for a more profound analysis of process. Also helpful is his hermeneutic of memory as being essential to duration. Memory, being the basis from the past to the present, of duration itself. Not much besides this can be deduced to help us in our present quest as regards the point in fertilization when a human being becomes act. Bergson’s philosophical treatment of process was however, the beginning of a more in debt scientific and philosophical evaluation of process itself which throws substantial light on the resolution of the problem in hand. This in depth analysis of process has to be attributed to the Australian Samuel Alexander (1859-1938) and the Englishman Alfred North Whitehead (1861-1947) who combined Bergson’s idea of continuous duration in physical reality with the realist theory of knowledge to produce imposing metaphysical systems of process. The last master of process is the Frenchman Pierre Teilhard de Chardin (1881-1955) also a follower of Bergson, who came out with a view that process is versed towards a particular unitary teleological end, as opposed to the previous mentioned two authors, whose process theories were undirected and open ended.

It is to these first two authors that I will now turn my attention and apply the philosophy of process which they expounded, as a solution to the penetration/syngamy dilemma to establish the point of the beginning of human life,

²⁸ Deleuze, G., *Bergsonism*, Zone Books, New York, 1988, pg. 51-63.

the active definition of conception. I will refer to the third author of process to drive home the question of consciousness in directed process.

3.2 *Whiteheadian Process*

Before attempting to eek out any argumentation from the discourse of Whiteheadian process, it is essential to familiarize one self with the concepts and neologisms that A.N.Whitehead, a mathematician at heart, uses in trying to describe process and its consequences. I will limit myself to the main concepts necessary for our particular considerations, otherwise we might risk getting lost in an unnavigable sea of words in Whitehead's rich neovocabulary. The fundamental elements of reality to Whitehead are called actual occasions or actual entities. This frees us from static considerations of philosophical thought when considering matter, which is better thought of as *moments of experience*. This consideration makes us conscious that reality always has a temporal consideration to it and that it is always in a state of becoming²⁹.

All of reality, from God to the most trivial puff of existence, is explainable in terms of actual entities, and only in these terms³⁰.

Another important type of entity in Whiteheadian philosophy is what is referred to as the *eternal object*. This is a pure abstract possibility but differs from what we understand by Plato's forms or Aristotelian universals, because they really exist within actual entities.

Examples of eternal objects are colours, sounds, scents and geometric characters....However, they do not have an independent or ideal existence apart from the actualities in which they are manifested. They are merely

²⁹ Mellert, R. B., *What is Process Theology?* Paulist Press, New Jersey, 1975, pg. 20-30.

³⁰ *Ibid.*, pg. 22.

possibilities available for actualization....pure potentials for the specific determination of fact³¹.

Prehension is the way in which every actual occasion as a subject, perceives an object which is a previous actual entity. As a new actual entity emerges, it *feels* or *prehends* all the data available to it. Prehensions can be physical or conceptual depending on whether in the former case, they refer to actual entities in the immediate past or in the latter case to the relevant eternal object. A *nexus*, (plural *nexūs*) is a set of actual occasions which are related to each other, or a so-called *society* of occasions. The human body would be a society of this type thus,

the actual occasions of each part of the body are experienced as being spatially connected in the formation of a single body....Man is in addition a serial nexus, i.e., a series of actual occasions, or a stream of personal experiences that can be traced through a definite period of history. A serial nexus might be described as a 'motion picture' film, in which a rapid series of individual occasions of experience project movement.³²

As each actual occasion emerges, it has its own *subjective aim*, which controls the becoming of that subject. The particular achievement of an actual entity with a subjective aim is called the *satisfaction* of that actual occasion. Satisfaction is achieved by an emerging occasion prehending its particular data according to the subjective aim. The *subjective form* is how an actual entity as a prehending subject of the data consisting of past occasions as objects and/or of eternal objects, becomes that particular active entity as a subject.

While an actual occasion can have only one subjective aim, the subjective form depends upon its prehension. One occasion therefore can have a number of subjective forms....Every act of prehending has its subjective form, but not

³¹ *Ibid.*, pg. 23.

³² *Ibid.*, pg. 25.

every prehension contributes its data to the actual occasion.... A prehension whose datum is included as a constitutive aspect of the occasion is a positive prehension; one in which the datum is eliminated is called a negative prehension³³.

This means that while nothing of the past is really lost, each new actual occasion is free to become whatever it is to become. This frees subjective actual entities from being priorly determined and granting them the freedom to become. So,

[a]fter the actual occasion achieves its subjective aim and reaches its own particular satisfaction, it perishes. That is, it can experience no longer. But it is not lost or annihilated, because it can still *be* experienced. It becomes an objective datum for future occasions to take account of, positively or negatively, in the continuance of process. As it is prehended it is immortalized as a constitutive element of the nexūs of occasions that continue to ‘feel’ its impact on history³⁴.

Creativity, is the principle by which the multiplicity of relevant data becomes one new actual entity. According to process philosophy then, man is also a series of actual entities. The *enduring object* of man is what is called individual substance in traditional philosophy. This society of actual entities will be a linear succession of actual occasions forming a well mapped out route wherein each occasion inherits from its predecessors some characteristic which defines it. In man,

there is a unique coordination of many such (actual) occasions over a particular area called the body, and a unique inheritance of past occasions that is able consciously to identify a self through history. These coordinating occasions constitute the personal living nexus of occasions by which a person is defined.... a coordinated nexus of actual occasions in space and time³⁵.

³³ *Ibid.*, pg. 27.

³⁴ *Ibid.*, pg. 27.

³⁵ *Ibid.*, pg. 66.

According to this model, the complex unity composed of the billions of cells that make up a human body are coordinated and unified by a *central* or *coordinating* occasion or experiencing subject³⁶. In fully grown man, the central occasion is located in the brain, but in the single cell or zygote, the central occasion must be located in the totality of the coordinating DNA present in the united nucleus. Whitehead refers to the soul as the coordinated stream of personal experiences and also as the thread of life. This soul exists in any enduring object where a *single* centre of experience coordinates the functioning of the organism as a whole. The conjoint chromosomes in an embryo or zygote can be termed the single centre of coordinating experience for that particular cell, but in the ootid, there are two separate centres of experience, the pronuclei, and therefore two separate different central occasions which are not synonymous with unity and not synonymous with the only existence of one nexial series of occasions!

In fact, after syngamy has occurred, the nucleus, in all the cells of the body after that momentous point in time or occasion, is never found to be in a separated state. The genes inherited from the mother and the father, are no longer two entities but one, even during the process of cellular asexual reproduction or mitosis. We have seen in the chapter on the scientific considerations of fertilization, that during mitosis, before there is cellular division, the chromosomes in the nucleus are duplicated before there is division and separation into two complete nuclei and cells. There is never any separation of the two sets of chromosomes, which after the point of syngamy, maintain the unitary form and full human complement repeated in every cell of the organism from then onwards till death. At the unicellular level, the complete set of united forty-six chromosomes is the central occasion defining the serial nexus of that

³⁶ *Ibid.*, pg. 66.

particular group of cells, which if totipotent will lead to the full development of a man with a brain.

In a man, the main coordinating occasion passes on from the nucleus to the brain as a man develops, but even in a fully grown man, the presence of the nucleus with its specific DNA complement, remains for the body as an organism, the first and continuous coordinating occasion of a serial nexus of actual occasions in space and time. This may seem to imply that man has more than one coordinating or central occasion. One has to keep in mind that when defining an actual entity, Whitehead clearly postulates that any actual entity in time and space such as man in his/her mature form, is composed of several other actual entities as seen in the following quotation.

In the actual world we discern four grades of actual occasions, grades which are not to be sharply distinguished from each other. First, and lowest,, there are the actual occasions in so-called ‘empty space’; secondly, there are the actual occasions which are moments in the life-histories of enduring non-living objects, such as electrons or other primitive organisms; thirdly, there are the actual occasions which are moments in the life-histories of enduring living objects; fourthly, there are the actual occasions which are moments in the life-histories of enduring objects with conscious knowledge³⁷.

Man, in his developed whole state within space and time, his span of life, is a living organism whose central occasion is his brain. But the body of man, as an organism is made up of other actual entities such as the living cells which form a serial nexus which contains a constant inheritable datum in the form of the nuclear genetic material functioning within the ambit of a whole nucleus, and it is this genetic datum

³⁷ Whitehead, A. N., *Process and Reality*, Free Press, New York, 1985, first printed in 1929, pg. 177.

in its whole form, that for this particular organism becomes the central occasion³⁸. Coordinating or central occasions do give way to other higher central or presiding occasions as the new actual entity formed from previous actual entities becomes the new subject³⁹. That is why Whitehead refers to the subject becoming the superject⁴⁰, where the becoming becomes a being with the potential for every becoming!

In other words, just as for some purposes, one atomic actuality can be treated as though it were many co-ordinate actualities, in the same way, for other purposes, a nexus of many actualities can be treated as though it were one actuality. This is what we habitually do in the case of the span of life of a molecule, or of a piece of rock or of a human body⁴¹.

Likewise the central occasion of the brain may revert back to the 'lesser' central occasions of the body, if there is pathology and the body loses the functioning of the brain as the central occasion⁴². At death of the human organism, not all cells of the body die at once. Some remain alive long after the organism has expired.

One of the main exposition of Whiteheadian process, is by one of his students by the name of Charles Hartshorne. Hartshorne clearly points to a number of tenets that constitute process philosophy. He states that the soul or the self-identical ego, is the relatedness of experiences to their predecessors through memory and the persistence of personal qualities or traits⁴³. Individuality is in effect, the actual history of the individual or its reality through time, the succession of states including experiences.

The sole way to distinguish the individual from the happenings making up his history is in terms of possibility versus actuality, with the states constituting

³⁸ *Ibid.*, pg. 110

³⁹ *Ibid.*, pg. 119.

⁴⁰ *Ibid.*, pg. 45.

⁴¹ *Ibid.*, pg. 287.

⁴² *Ibid.*, pg. 109.

⁴³ Cousins, E. H. *et al*, *Process Theology-basic writings*, Newman Press, New York, 1971, pg. 50.

the entire actuality...each new state fits onto the one series which started with a certain embryo state⁴⁴.

Hartshorne says that while a man lives, it is the same series of actual entities with something new at each actual occasion. Personal identity would be a property of the actual experiences, and to view a man as the same entity would mean having to abstract what is new in him at every moment. Hartshorne identifies *memory and perception* as embracing the past, to preserve something of the original character in a series of actual entities. In a single cell, the identity of that cell in any future conglomerate of cells forming a single entity, would be essentially memory, a cell being unable to perceive things in a way that a grown man may perceive through his sensory input. However, a cell may still have other means of perceiving its immediate environment and relate it with its own form of memory.

Commenting on Whitehead's method of empirical analysis, Bernard Loomer acknowledges that for Whitehead, the denoting of the inheritance of the past in the present is conceived as *memory*.

It is the causal efficaciousness of the past making the present conform to it. It is inheritance of the present from the past whereby the present re-enacts the feelings of the immediate past. It is the immediate feeling of power driving us on to further activity⁴⁵.

He specifies that as human beings, we conform to what we inherit, but we control what we project into the contemporary world around us. This means that we conform to the inherited data of our past bodily functionings and the feelings inherent in these functionings.

⁴⁴ *Ibid.*, pg. 54.

⁴⁵ *Ibid.*, pg. 67-82.

Each occasion is a process of becoming which is controlled by its own immanent ideals. The present occasion, is a limited, finite, and indefinite something which prehends or feels some elements and excludes (negatively prehends) other elements.... Thus each occasion is an aesthetic achievement and an aesthetic synthesis of diverse elements (i.e., feelings) inherited from past actual occasions of experience⁴⁶.

It is perhaps better to take a look again at Whitehead's own writings to get the proper feel of his philosophy of organism, of being and becoming. I will first take a look at Whitehead's *The Concept of Nature*, before turning to his more seminal work, *Process and Reality*. In *The Concept of Nature*⁴⁷, Whitehead places his physical objects within the proper context of the space-time continuum. All matter is in space and time. Both space and time are necessary to provide the dimensions of any matter which occupies them, the three dimensions of space and the fourth one being time itself. Any space occupying volume of matter also needs the dimension of time to complete its existing dimensions or its extension, otherwise one conceives of a static concept of matter, rather than a dynamic one as is necessary with process as a context. He again states that in memory, the past is present and therefore memory is in fact an escape from transient nature. He also, like Bergson, refers to the concept of *duration*, where he clearly states that although it may comprise change within itself, it may not change in the quality of its identity of station. He calls this unchanging quality of identity, *congruence*. He further defines a *physical object* as being a chunk of a continuous stream of events which is unique and continuous. One cannot recognize an event once it is past, but the character of an event can be recognized. Thereby one calls events with a recognizable character an object, which can be both

⁴⁶ *Ibid.*, pg. 67-82.

⁴⁷ Whitehead, A. N., *The Concept of Nature*, Cambridge University Press, Cambridge, first edition 1920, reprint 1971.

of a material physical nature such as a human body and also of rather immaterial descriptive emotive nature which at this stage he called *sense objects*, or *simple objects* such as the colour green. This could have been the fore-runner of what he later termed and which later assumed the title of an *eternal object*. As we have seen, eternal objects are synonymous with Aristotelian formal causes. Physical objects were also termed *enduring objects*.

Whitehead's most complete and recognized work is of course *Process and Reality*⁴⁸. It is in this book, collected as a number of lectures given by Whitehead to the *University of Edinburgh* between 1927-1928, that we can most assuage the gist of a language that is very often, not simple, quite confusing and difficult to follow. It is in this book, that he clearly delineates many of the meanings and definitions enunciated above. Such as his concept of *nexus* and series of actual occasions and eternal objects, as seen above. He has the most illuminating definitions and concepts, which can throw light on the dilemma of whether life starts at penetration or syngamy. Whitehead states that a *nexus* which enjoys social order is called a society. What he previously called a physical object, he now calls an enduring object or an *enduring creature*. A *nexus* enjoys social order where,

“(i) there is a common element of form, illustrated in the definiteness, of each of its included actual entities, and (ii) this common element of form arises in each member of the *nexus* by reason of the conditions imposed upon it by its prehensions of some other members of the *nexus*, and (iii) these prehensions impose that condition of reproduction by reason of their inclusion of positive feelings of that common form”⁴⁹.

⁴⁸ Whitehead, A. N., *Process and Reality*, Free Press, New York, 1985, first printed in 1929.

⁴⁹ *Ibid.*, pg. 34.

The common form is the defining characteristic of the society similar to the Aristotelian notion of substantial form. The social order of the nexus, is then due to feelings of the common form in each member inherited from each antecedent member to the other resulting in a *concrecence*. Thus this single line of inheritance, with special genetic relations between the members, forms a nexus which is called an enduring object. A human body would be such an enduring object. There is always a 'cut' between the first member and the last member of a specific nexus from previous occasions. The members in between these 'cuts' sustain a specific character which can be analogous to that of a human person.

Order, in Whitehead's view, would exemplify the 'cut' I referred to above, and could be boiled down to the objective specific data for individual actual entities thus constituting the subjective aim of a particular nexus of actual entities which forms a society. Thus in a society, each member must conform to an element of order which constitute certain 'laws' for that particular society. So a society of cells which form an animal body, must have some law or order directing the subjective aim of that nexial development towards the subjective form to constitute the prehensions and satisfaction of that particular nexus which would form structured enduring objects or the physical object in the case of a body. One must not forget that such a nexus itself, may be considered as one actual entity. An actual entity may thus be composed of either one occasion, or a society of occasions forming a single nexus.

When a nexial society persists within a changing environment, it is said to be *stabilized*. It is the data in the nexial order which must provide this stability. Structured societies can be both organic (or living), or inorganic. A living nexus

contains a thread of personal order or a form of mutual conformity along the route of its members, although each new subjective occasion is free to explore new ground. In an animal body where there are millions of centres of life, in order not to have a dissociation of the personality, one needs a consciousness of a unified experience or unified control. We have seen that in an animal body there is such a concept as a *presiding occasion* which is inherited and responsible for the general character and organization of that body. This presiding occasion, can be inherited from previous presiding occasions and eventually may change with new prehensions to form a new presiding occasion in one enduring object. For example in the same animal body, the organizing presiding occasion forming order and character at the single cell stage would be the functional DNA complex in the cell, while as the organism develops and a brain forms, this presiding occasion could change into neurones and eventually the brain. So character and order in the body would be maintained by different presiding occasions.

It is interesting to point out, that in the first single and first couple of cells in the human body, the mainly important element of order, memory and character is the *unified* DNA in the nucleus. This changes later when neurones and the brain develops. It is obvious to any close observer of cell physiology as we have seen in Chapters I and II, that unless the nucleus of the cell, the anatomy of the first cell is complete, that cell cannot start to function properly, as Lonergan also clearly pointed out above. Before syngamy, form is not yet complete and therefore function as borne out by the lack of translation before syngamy, cannot be carried out. It is only after syngamy occurs, that a presiding occasion is first created which injects character into the serial nexus of the enduring object. This does not mean, since the nexus is living,

that the new prehensions in the new occasions will not be subjectively free to interpret the data in the DNA differently such as in epigenesis, but the actual ordered data has to be there for any concerted development to occur. Thus the subjective aim of the subjective occasion is free to introduce novelty into its concrescence or growth! That is why although DNA is important for order, as the character of a nexial actual entity is covered by its datum, it is not a question of reducing all life to a matter of genetic reductionism due to the transference of freedom from the actual occasion as an object to its subjective aim whereby the object becomes the new subject within the process! The subject in the human body is alive and free.

It is the datum of the operations of an actual entity which constitute its process. It is through the datum that the potential becomes a realized and individualized unity, laying down the individualized essence of a pattern. In the single human cell of the zygote, the datum is contained in its entirety in the information of the conjoint DNA together in the zygote. This is the form repeated in all the subsequent cells of the organism save the germ cells and ootid. We have seen that translation in the embryo from zygote genome activation (ZGA), does not occur before syngamy and this is a reliable sign that the DNA datum needs to be together as a whole for it to function *in toto*. It is good to see what Whitehead says about the human body itself.

The various actual entities which compose the body, are so coordinated that the experiences of any part of the body are transmitted to one or more actual occasions to be inherited with enhancements accruing upon the way, or finally added by reason of the final integration. The enduring personality is the historic route of living occasions which are severally dominant in the body at successive instants. The human body is thus achieving on a scale of concentrated efficiency a type of social organization, which with every

gradation of efficiency constitutes the orderliness whereby a cosmic epoch shelters in itself intensity of satisfaction⁵⁰.

A very interesting conclusion by Whitehead is where he states that, “a cell gives no evidence whatever of a single unified mentality, guided in each of its occasions by inheritance from its own past⁵¹”. It would not have been possible for Whitehead in the 1920’s to have known of the structure and function of the DNA in the chromosomes of the cell. At that time, there was no knowledge of the function of the nucleus and its DNA. This was discovered much later in the 1950’s. Had he known this, Whitehead would have probably stated the opposite, whereby the datum in the cell DNA would serve as a coordinated plan and therefore as the order necessary for future coordinated development necessary to form one human body.

One may keep abstracting future details from Whitehead’s neologisms, but I believe that it is now quite obvious that enough has been secured from his writings to form our own conclusions. First, that a series of actual occasions can be tied together into a nexus by common data. This data would have to run throughout the length of the individual occasions in that particular nexus forming the enduring object of a body. We know this data to lie within the nucleus containing joint DNA in every cell of the body, even those which are multi-nucleated. It would form the common thread through the nexus but would not be the restraining factor if every new actual entity were to subjectively interpret this data in a different manner than before. In fact we know that as a human body grows, different epigenetic methylation patterns of the DNA molecule and different environmental conditions which determine different inputs, may lead to different genomic imprinting of the same DNA. This means that

⁵⁰ *Ibid.*, pg. 119.

the same coded information, may be read differently when a new occasion subjectly presents itself, but the same joint DNA complement within the nucleus, still forms the basis of the datum in the historic past of the same actual entity.

There is no doubt to me that the datum and memory needed to form a human being in the one cell stage are only acquired upon the formation of the embryo with its unified maternal and paternal DNA as the form repeated throughout the whole body. Unless there is a unity of the data with a repeated form, a meeting of form and function, there can be no individual actual entity present. While actual entities will continue in one form or another outside the limits of a serial nexus, the memory of the original datum contained in the first member of the occasions forming a whole nexus lies in the physical structure of the nuclear DNA. Where it not for the actual physical memory of the presence of this complete physical structure which as we have seen, may be interpreted differently by future occasions of the same nexus, one could not talk about the ontological development of an individual human being. One could neither cut off the stream of actual entities forming that particular individual from the stream of previous or later actual occasions. It is the complete DNA datum in two homologous sets of DNA together within the same nucleus, which constitute the memory of the datum for the individual. A pair of combined chromosomes, which is the form repeated in the serial nexus and in which the memory datum is thus able to function by repeating itself according to its own plan. Without this datum as repeated memory, together with the repeated form of the conjoined nuclear chromosomes in the cell, there would be no individual. It is this unity of repeated programme of information and joint DNA form that ultimately leads to the unity of form and function in man

⁵¹ *Ibid.*, pg. 104.

from the zygote till death. There cannot be two equal presiding occasions (pronuclei) in an organismic cell, but only one.

3.3 Samuel Alexander

Samuel Alexander's major work, is the two volumes of *Space, Time and Deity*⁵². Like Bergson, Alexander developed the idea of a physical reality as a process, a continuous evolving stream of activity. However unlike Bergson, Alexander was not a Cartesian dualist, and more in line with the Aristotelian view of the world. For Alexander, all matter was made out of space-time. Each material object has consistencies made of the three dimensional volume of matter in space but this is not enough, as every volume of matter needs to be extended in time. All materials in time need to also be described in terms of the three dimensions of space, so that neither space, nor time alone can really describe the existence of a material object except in the substance of space-time alone. Therefore all matter is composed of space-time, and in matter, the two concepts cannot exist without each other or separate from each other. This is in accordance with Minkowski's classical description of space as having four dimensions and not three. We are used to considering volumes of physical objects as consisting of three dimensions, height, length and breadth, but science has shown us that time is not absolute and that for the real picture to be complete, the volume has to be framed within time, which is the fourth dimension of space. This is in line with the thinking propounded by Minkowski and taken up by Albert Einstein in the early nineteen hundreds. For Minkowski, describing the position of a point at rest by means of three co-ordinate numbers at right angle to each other, x , y , z , is not enough to describe a continuum for a physical phenomenon in

⁵² Alexander, S., *Space, Time and Deity*, Vol. 1 & 2, Macmillan, London, first edition 1920, reprinted 1966.

space. The dimension of a fourth co-ordinate time t , is also needed to define the dimensions of an object. In classical mechanics, time was taken to be absolute and independent of the position and condition of motion of the co-ordinates. With the advent of the theory of relativity, time is robbed of this independent condition and becomes a relative consideration, so that it must be included in the full description of a moving or continuous object⁵³.

Alexander identifies the raw material of reality as space-time and calls it *pure motion*. New levels of finite existence evolve which he calls *emergence*. First to appear in emergence is the mechanical order, with measurable or primary qualities, then perceived or secondary qualities from which would follow life and from life, follows mind, the goal of the whole process being God⁵⁴. *Alexander* believed that new qualities emerged from the patterns of organization of elements with the proper degree of complexity, resulting in a hierarchy of qualities, with the higher qualities on the scale possessing and depending on the lower qualities with each new stage being something completely new.

At the base of the whole thing is space-time differentiated by motions. Certain organized patterns of motions are bearers of the qualities we call material; organizations of matter are bearers of qualities found in physical structures and chemical syntheses; these in turn at a certain level are the bearers of life, and some living structures in turn are bearers of the quality of mind, or consciousness,...⁵⁵.

⁵³ Einstein, A., *Relativity The Special and the General Theory*, Folio Society, London, 1916, reprinted 2004, pg. 64-66.

⁵⁴ Huxley, J., Bronowski, J., Barry, G., Fisher, J., *Growth of Ideas Knowledge-Thought Imagination*, Modern Illustrated Library, Aldus Books, London, 1968, pg. 188-189.

⁵⁵ Alexander, S., *Space, Time and Deity*, Vol. 1 & 2, Macmillan, London, first edition 1920, reprinted 1966, pg. xiv.

For Alexander it is important to clear, that ‘mind’ does not mean a state of consciousness of thought, but the characteristic of a new qualitative synthesis which has emerged. Memory for him also has the significance of meaning mental space repeated in time, “that is, several events of the same sort occurring at different times but belonging to the same space⁵⁶”. Existence or determinate being is the occupation of any space-time distinct from any other space-time resulting in a being with an occupation of space-time with a self-identity which excludes other occupation of that specific space-time. An individual person also contains a substantial identity. In all changes of space and time, a particular *plan* of construction is preserved and although an individual person’s configuration varies from moment to moment, it follows the same particular plan and remains in the limits of that specific persistent plan.

Space-time admits a plan, wherein existents as patches of space-time possess a universality which is both generic and empirical material. The notion of a plan or law is commonly called a *universal*. Not all generic universals may undergo empirical repetition. They need this repetition to be known. The plan or universal, is a uniformity of space-time, wherein the predicate of an empirical material individual person becomes the plan of construction. A universal particular determined according to a plan is an individual. He states in his book that,

an individual substance or thing is the continuum of these repeated instances of its universal plan....the individual person is the continuum of different conditions of life which follow this plan⁵⁷.

As time changes, a substance may change in the relations of its characters or aggregates, but always within the limits set by the law of its *plan* of construction. A

⁵⁶ Alexander, S., *Space, Time and Deity*, Vol. 1, Macmillan, London, first edition 1920, reprinted 1966, pg. 137.

man may lose an arm, or a leg, but remains the same man because the plan of construction remains the same overall. Individual identity therefore occurs, when the repetition of a plan is found in the space-time duration of an individual. Alexander describes life as an emergent quality in a material physico-chemical complex set of processes which determine function. Life is a complex of physico-chemical processes which exhibit a vital behaviour. The constellation or mind of its character is different to the behaviour of the same chemicals under a different *mind* of the process. For life to exist, there has to be a certain *constitution* or *collocation* to indicate that the moving structure is not simply anatomical but also physiological. Alexander calls this new directing agency the *mind* which is not a separate existence to the physico-chemical processes, but exists in the plan “of the whole constellation” or new order of complex⁵⁸.

The new material life is a distinctive quality of a new material construction plan of the particular organism. As we shall see in a later part of this chapter, by material complexification of substances, an ascent in evolution is made which reflects itself in mind or consciousness in a living organism, present in each organism being a member of that particular species, the higher the species, the higher the level of consciousness.

We have seen that in the single cell organism, the constellation or plan leading to the *mind* of that organism is the particular chromosomal set within one cell and in man, this set should be joined together for it to function properly and for the constellation or plan to actuate itself. This is the plan which repeats itself as a mind during its execution. We saw previously that before syngamy occurs, the two pronuclei within

⁵⁷ *Ibid.*, pg. 235.

the ootid as a cell do not yet represent the anatomical and physiological constitution of a functioning plan for that particular cell. We know that it is only after syngamy has occurred as a paradigm shift that the morula starts the process of translation of genetic information into solid protein. Each pronucleus retains its own individual character within space-time as can be so easily observed by the possibility of its whole replacement during the process of fertilization. This holds true until syngamy occurs where each separate pronucleus, starts to participate as a combined whole, in order to attain as a whole unity, a new individual character in space-time. Fusion according to Alexander, occurs where,

two stimuli which would singly produce their corresponding sensations, produce when acting together, a sensation different from either⁵⁹.

It is precisely with fusion or amphimixis of the two pronuclei of the ootid, that the conjoined DNA of the zygote assumes a new constitution for the cell, which is different to that of either pronucleus acting singly or together. Alexander says⁶⁰ that unity of substance means belonging to one contour of space-time. The unity of the *mind* of the living organism should be the unity of one space-time. As new complexities of existence emerge, observed empirical fact shows an emergent quality. The quality of this new *constellation* shows that,

motions belonging to that level and possessing the quality appropriate to it, and this collocation possesses a new quality distinctive of the higher complex⁶¹.

⁵⁸ Alexander, S., *Space, Time and Deity*, Vol. II, Macmillan, London, first edition 1920, reprinted 1966, pg. 64.

⁵⁹ *Ibid.*, pg. 18.

⁶⁰ *Ibid.*, pg. 24.

⁶¹ *Ibid.*, pg. 45.

Life emerges as a new quality with its own constellation or specific plan of its own processes only after syngamy. It is only after syngamy, that there is irreversibility of the genetic process within the cell, not before. Adopting this formulation of things to the hylomorphic concept of form and matter, an existent matter emerges with a new quality assuming a new complexity of configuration and to this new physical pattern, corresponds the new emergent quality, which can be identified with its own peculiar form of matter. Thus form and matter are constituted. I have no doubt that syngamy within the process of fertilization represents this qualitative leap constituting the new emergent quality of a new human life!

Another interesting preposition is the fact that when considering modern versions of the definition of organisms, it is clear that this organism should be subordinated to itself and to itself only. Such interesting definitions already encountered define,

organism of terrestrial type, *qua* organismic during a time interval t short at will (provided sufficient to actualize the processes involved by the *definiens*) = df either a living body of a terrestrial type LB , or a living part of LP of a living body of terrestrial type LB , which during t is biologically subordinated to itself and only to itself⁶².

Also,

organismic life of an organism during a time interval t short at will (provided sufficient to actualize the processes involved by the *definiens*) = df possession during t of the regulatory capacity by that organism⁶³,

and,

[l]ife of a living body of terrestrial type LB during a time interval t short at will (provided sufficient to actualize the processes involved by the *definiens*) = df possession during t of the canalizing capacity by LB ⁶⁴.

⁶² Ramellini, P., *Life and Organisms*, Pontifical Council for Culture, Libreria Editrice Vaticana, Vatican City, 2006, pg. 397.

⁶³ *Ibid.*, pg. 398.

It is clear from these definitions that during the ootid stage, the organism or entity involved, is not subordinated to itself and only to itself. The canalizing capacity of the ootid is substantially derived from the m-RNA of the mother, which as we have seen in the chapter regarding the scientific considerations of fertilization, can actually continue the process of development up to the four cell stage, even in an enucleated fertilized egg! It is only after syngamy has occurred that the capacity to carry out translation is acquired, whereby the capacity for the now zygote to develop, is biologically subordinated to itself and to itself only. It is no longer under maternal control or the control of maternally derived nucleic acids (RNA, DNA) but now under the control of the embryonic derived nucleic acids. Thus occurs the so called completion of the maternal to embryonic transfer of control of development. The plan of life is wholly established only after syngamy has occurred and not before, with the formation of the zygote which has the active potency to control its development. The possession of the regulatory capacity by the organism of its own development is now extant!

3.4 *Pierre Teilhard de Chardin*

Perhaps one of the most ill understood but empirically (paleontologically) concrete of the process philosophers and who, in my opinion, has not been sufficiently philosophically validated today, is without any doubt Pierre Teilhard de Chardin. As opposed to the previous authors on process, Teilhard de Chardin's process is teleologically oriented rather than open ended, so as to reach a pinnacle at his now famously termed *Omega Point*. He was often reviled in clerical circles because his writings on process and the evolutionary concepts of living material and finally man, were often said to constitute a pantheistic theological and philosophical view of God.

⁶⁴ *Ibid.*, pg. 396.

Those who make this frequent accusation often have either not read his works properly or rather have misunderstood his fundamental drive. His major works are *The Phenomenon of Man*⁶⁵ which is a purely scientific book dealing with human evolution and his *Le Milieu Divin*⁶⁶ which concentrates on the theological and spiritual perspectives of the scientific concepts of evolution and process in his former publication. He has of course many other publications and papers most of which I have also read since I was a young adult and I must say that I often had to re-read them as more often than not, I then understood little or nothing of what was written by him. I find both his major books spellbinding and have referred to them often and the least I can deduce is very clearly versed towards clearing the charge against him of being a pantheist. Teilhard de Chardin's real positioning of deity within the evolutionary process is one of *Panentheism*, and not pantheism. Pantheism states that God is equivalent to the physical world. Panentheism asserts that God is more than, but is also immanent within the physical world. However, it is not Teilhard de Chardin's theology that I will examine here but rather some certain detailed concepts of his philosophy of process that bear the scientific weight of his vast experience as a geologist and paleontologist and which can throw much light on the problem that I am currently trying to resolve. He is after all one of the discoverers of *Sinanthropus pekinensis* or *Homo erectus* at Chou Kou Tien in China where he was practically exiled for twenty years by his recalcitrant religious superiors.

Teilhard de Chardin's teleological orientation in the evolution of the world is borne out by the sympathy of none other than one of the world's leading geneticists and

⁶⁵ Teilhard de Chardin, P., *The Phenomenon of Man*, Collins, London, 1960.

⁶⁶ Teilhard de Chardin, P., *Le Milieu Divin*, Collins, London, 1957.

theoreticians on evolution, by the name of Theodosius Dobzhansky⁶⁷ who unequivocally states that facts show the process of evolution to be oriented and not open ended, as some other authors claim. Teilhard's process metaphysics⁶⁸, like *Whitehead's* and *Alexander's* is not dualistic but seeks a unitary ontology. Mind and matter are simply two aspects of a single complex process. While Teilhard believes in a convergent cosmos, where man being a product of a physical evolution borne of complexity now continues his evolution towards an even greater complexity and consciousness. This he does through his cultural milieu as an extension of biology. For Teilhard, through evolution, there is an ascent of the psychological aspect and therefore of consciousness of the evolving world, which reaches its pinnacle in man. At this point one reaches the concept of a process of an evolving integral interthinking global network convergence, which he referred to as the *Noosphere* and which closely resembles today's concept of a *Global Society*, and is heretofore transmitted by culture and education rather than by genes. This contrasts with Whiteheadian process in not anticipating or expecting any such convergence and therefore being open ended.

In Teilhard's philosophy there is a 'within' in every occasion or entity, which is ascribable to our general understanding of consciousness or a rudimentary beginning of perception, even in elementary physical structures and simple organisms. Of course he does not use the word 'consciousness' here as understood in its self reflective meaning in man, but as a form of interiority. He ascribes 'consciousness' at higher levels to be dependent on the development of a nervous system, while at lower levels, it would be ascribed to complexity "even in the total absence of a nervous

⁶⁷ Dobzhansky, T., 'Teilhard de Chardin and the Orientation of Evolution: A Critical Essay', in Cousins, E. H., *Process Theology- basic writings*, Newman Press, New York, 1971, pg. 231-247.

system”⁶⁹. Of paramount importance, is the fact that for *Teilhard*, man, being part of nature and a product of evolution, has the roots of his being in the first cell⁷⁰, *i.e.* the zygote.

Claude Cuénot who wrote the major biography of Teilhard, states clearly in one of his books⁷¹ that in the process of an evolving convergent cosmogenesis, which is dynamic in nature, the mind/matter dichotomy is abolished in favour of a situation where mind becomes the function of the arrangement of matter. More mind evolves from the greater arrangement of matter. For *Teilhard*, the main rule that leads to greater convergence and aggregation of matter, is a rule which came about through long years of observation in the scientific subject he was versed in and which he called, the rule of *complexity-consciousness*. He emphasizes that when matter accumulates, “it concentrates if the circumstances are favourable, and this concentration involves complexification”⁷².

As for all process philosophers, for Teilhard, being is in a process of becoming, in a process of evolution. He refers to the law which completes the process of becoming as the sole vector of complexity-consciousness or the *accelerating cosmic law of increasing centro-complexity/consciousness*. For Teilhard, it is a fact that the world goes through a successive development that has led to the evolution from simple matter to more structured and ordered matter leading ultimately to living things, first of a very simple form such as prions, viruses, bacteria, protozoal eukaryotes (single-cell organisms with a double complement of DNA within a nuclear cell membrane),

⁶⁸ *Ibid.*, Barbour I. G., ‘Teilhard’s Process Metaphysics’, pg. 323-350.

⁶⁹ *Ibid.*, pg. 329.

⁷⁰ *Ibid.*, pg. 330.

⁷¹ Cuénot, C., *Science and Faith in Teilhard de Chardin*, Garnstone Press, London, 1967.

multicellular organisms, plants, then animals of the lowest order, leading ultimately to mammals and finally *Homo sapiens*. For him, the

“geological, biological and psychosocial evolution were three distinct stages of one continuous process converging and involuting towards an ultimate spiritual end of this planet in terms of humankind on the earth”⁷³.

It is clear that Teilhard thinks of the order of complexity in the universe where such order is found, as not all the universe is versed towards this order according to the law of entropy. However the world we live in, comprising the earth, is such an exceptional part of the universe or caveat where order seems to exist and thrive. Teilhard notes that the order around us in our quarter of the universe, seems to rise in complexity through a series of phases through a process of evolution. Order in the universe only exists where evolution is extant! First, the formation of atomic nuclei and electrons; second, the grouping of nuclei to form atoms; third, the grouping of atoms to form molecules; fourth, the groupings of molecules to form clusters of living material or cell:⁷⁴ Once life has evolved there is again an increasing complexity of life forms as noted above up till the evolution of man. For Teilhard, as matter becomes more complexified, it also becomes centred and interiorized, meaning it becomes endowed with consciousness. The higher the degree of complexity in a living creature is, the higher is the level of consciousness.

The complexity-consciousness mechanism acquires a new level or impulse, when a completed zoological unit, inventively builds itself into a new multi-unit organism⁷⁵. There is then a quantum leap comparable to a state of new emergence when such an

⁷² *Ibid.*, pg. 97.

⁷³ Birx, H. J., *Interpreting Evolution: Darwin and Teilhard de Chardin*, Prometheus Books, New York, 1991, pg. 201.

⁷⁴ Teilhard de Chardin, P., *The Future of Man*, Collins, London, 1959, pg. 225.

organismic unit is completed and its highest complexity reached and therein the consciousness inherent in that complexity grows with the new emergent organism. There is here a quantum leap in the formation of a new living structure of higher consciousness. Consciousness becomes detectable when out of inorganic and organic chemicals or matter, life appears first in its simplest forms, later in its higher more complex and therefore more conscious forms culminating in the neural brain with man.

When speaking about or dealing with man, there is another issue to consider. The evolution of life in all its complexity has led to the development of two forms of reproduction. One form, found in living organisms of lower complexity and consciousness, involves so called asexual reproduction. This form of reproduction, where there is no change in the genetic structure of the organism, is also employed in the human body to provide cellular body growth maintaining the ontology of the individual organism. The second and higher form of evolved reproduction is that termed sexual.

In sexual reproduction, the genetic information derived from two genetically dissimilar organisms of the same species, is channelled through special germ cells into forming an organism with a new genetic structure and therefore while still belonging to the same species, introduces variability into the species, thus making it more able as a species to withstand change in any new environmental stimulus. Thus in any sexual reproductive act, the aim is the formation of a new organism of the species by a specific act of physical sexual union, the extension and finality of which

⁷⁵ *Ibid.*, pg. 231.

leads to a new emergence or procreation of a new individual of the species⁷⁶. That is, means to achieve material procreation as a finality, have to have a process which is oriented through a unitive material cause.

Material finality, describes causal action in which ‘a concrete plurality of lower entities may be the material cause from which a higher form is educed or into which a subsistent form is infused’. The union of gametes to form a zygote or of hydrogen and oxygen to form water are instances of material finality⁷⁷.

Lonergan refers to sex as,

sex...is a bias in a large number of potencies, a typical and complementary differentiation within the species, with a material basis in a difference in the number of chromosomes....sex is a difference added to fecundity, dividing it into two complementary semifecundities bringing together on the level of sensitive attraction and local motion, what had been separated and placed into different beings on the level of physiology. Finally sex unites not only the semifecundities of spermatozoon and ovum, but also their bearers: it makes male and female complementary beings...(it) is a material end to the actuated subject...an instrument of fecundity in the (actuated subject’s) process to adult offspring...the actuation of sex involves the organistic union of a concrete plurality...(it is a) fulfilment in a mutual actuation that reabsorbs husband and wife back into the elemental rhythms of the biosphere⁷⁸.

There is much here to understand between the lines. *Lonergan* refers to the material basis in the number of chromosomes. So he is considering the difference in chromosomes as part of the difference in the material cause! A material cause incorporating a difference in ‘fecundities’ leading to two different ‘semifecundities’

⁷⁶ Monahan Hogan, M., *Finality and Marriage*, Marquette University Press, USA, 1993, pg. 3.

⁷⁷ *Ibid.*, pg.128, also quoting Bernard Lonergan. from Crowe, F.E., *Collected Works - Papers by Bernard Lonergan*, Herder and Herder, New York, 1967, pg. 43.

⁷⁸ Crowe, F.E., *Collected Works - Papers by Bernard Lonergan*, Herder and Herder, New York, 1967, pg. 43-45.

which then reunite into, what he calls 'a concrete plurality'. These semifecundities which are a material cause in the two entities we call germ cells (ova and sperm) are then materially reunited to form a whole fecundity (zygote) which in its adult potencies can in turn lead to further offspring using the same physiological criteria. It is this action of the material reunification of the semifecundities represented by the different chromosomes that form the basis of a 'concrete plurality' leading to a return to the normal 'rhythms' of biology, *i.e.* life. I do not know what depth of biological knowledge, Lonergan possessed, but he seems here to be citing the chromosomal differences as the material cause of the new organism resulting from sexual reproduction and therefore, it would be the union of the chromosomes, not only the gametes, which would form the material cause of the new human being. Therefore unless syngamy (karyogamy) would be complete, the material cause would not be fully constituted and therefore there cannot be a human being. The 'semifecundities' based in the different chromosomal patterns would still be separate and unable to function as a whole leading to the essential process of translation of proteins!

In considering being, Teilhard emphasizes, like all true process philosophers, that being means becoming. One of his favourite statements was *esse = plus a pluribus uniri* or *esse = plus plura unire* which translates, that to be, means to unite the many, more; more becoming comes into existence through union. The process of becoming is therefore one of union. When any number of elements unite, a new unique entity forms which was not contained in the original elements. There is thus an emergence of something new. The union itself produces a new reality. This new emergence is greater than the sum total of the original elements. Life in an organism does not belong to the parts but to the whole. The different parts of a union cooperate under

some form of 'direction' as a whole, so that that particular whole is said to be living. In the single cell human organism, human life can therefore only be said to be present when there exists first a union of the two extensions of the material cause, which union is only physically complete at syngamy not penetration. The extension of the material cause of the information for a new life lies in the information stored in the DNA of the two pronuclei of the ootid. When there is final union between these two different genetic elements, something new starts to direct the different parts of this union towards cooperation. We know now, that this only occurs physically after the union of the two pronuclei which leads to the commencement of the process of actual translation of proteins within the cell. One can call the principle of union, 'the soul', but this is not something that will ever be scientifically quantifiable!

Another important parameter of evolution after union and consciousness is information⁷⁹. At the atomic and molecular level, one cannot differentiate information from the intrinsic structure of the matter involved. All this changes with the appearance of life. In the lower living organisms, there are several structures that can impart information between and within single cell organisms. But the fundamental evolution of the way in which information has been transmitted in the evolution of life, is by the existence and recombination of the DNA molecule with its intrinsic code. At the cellular level, although the DNA is not the only information itself, this has to be read by the cell according to the different external stimuli and circumstances. Without the directing and coordinating information provided by the DNA one cannot speak of an integrated life.

⁷⁹ Schmitz-Moorman, K., Salmon, J. F., *Theology of Creation in an Evolutionary World*, Pilgrim Press, Ohio, 1997, pg. 72.

“All living beings continue to exist by continued processing of information. All evolved reality exists insofar as by being informed”⁸⁰.

This information is responsible for the maintenance of their individual unity. This is corroborated by the renowned geneticist Jerome Lejeune’s testimony.

Each one of us has a unique beginning, the moment of conception...As soon as the twenty three chromosomes carried by the sperm encounter the twenty-three chromosomes carried by the ovum, the *whole information* necessary and sufficient to spell out all the characteristics of the new being is gathered...When this information carried by the sperm and by the ovum has encountered each other, then a *new human being is defined* which has never occurred before and will never occur again...the zygote and the cells produced in the succeeding divisions is not just simply a non-descript cell, or a ‘population’ or loose ‘collection’ of cells, but a very specialized individual, i.e., someone who will *build himself according to his own rule*⁸¹. (emphasis added).

The totality of information at work in an organism has led some to think of this as the *soul* of that organism. Mankind is no exception. In the human being, the DNA has to be completely present in the first cell together in the nucleus, before the cell may start to correctly read the information present in the DNA code of the individual. The DNA is the main process which evolution has naturally selected to encompass the genetic information necessary for organizational unity in a one cell organism. The first human one celled organism that has this complete information present within the cell necessary for full human development, is the zygote after syngamy, and not the various stages of fertilization which occur before this stage is reached. It is the DNA completely united and present in its human form in the zygote that contains the information necessary to build the second information storage system which is the

⁸⁰ *Ibid.*, pg. 75 & 93.

more elaborate in man and which consists of his neural tissue eventually forming the brain.

Matter is thus a relative concept, defining a minimal presence of information, of spirit. Therefore, it might be better to say that the evolution of information traces the way from materiality to spirituality⁸².

3.5 Insights

Having taken a good look at these process philosophers and what the insights given by each one of them contributes to the understanding of process, it becomes very clear that one must not look at process using the eyes and mind of a static disposition. Process is continuous change, therefore it must be looked at from a dynamic point of view. However we have observed in the above headings that although process is a continuous phenomenon, there are significant units within the process itself which are clearly definable and distinguishable. Although fertilization or conception in the passive sense is itself a process continual with the other processes of life, we know that it has a particular beginning as a process, and a particular end! We have also seen, that although the physical and metaphysical life of a man, is itself a process, it has a physical end, but also has a physical (and metaphysical) beginning. The end of a human life is easier to identify, the beginning, which is active conception, is not so easy unless one realizes that within process itself, one can define particular units, such as the unit of the physical life of a man.

It has become commonplace to mix up the process encompassing fertilization with the same process which signifies the existence of a physical and metaphysical human

⁸¹ Lejeune, J., testimony in *Davis vs. Davis*, Circuit Court for Blount County, State of Tennessee at Maryville, Tennessee, 1989; as reprinted in Irving, Diane, N., 'Scientific and Philosophical Expertise: An Evaluation of the arguments on Personhood', *Linacre quarterly*, February 1993, pg.4.

⁸² *Ibid.*, pg. 92.

life. Often people perceive that once the process of fertilization has started, then the process of a human life has started. I have gone to some length to show that human life can be quantifiable as a process itself within and continuous with, other processes of life. It is a distinct process within its own parameters. Each author above has contributed individually to gaining insight from process. Bergson, with his idea of duration and memory which was further developed by Whitehead and Alexander. Lonergan with his particular ideas of form and the importance of the definition or laying down of form to precede function. For *Lonergan* the correct human form precedes function and becomes man through the functional process itself emanating from that form. Whitehead's major contribution, being his idea of a social nexus within one process, which is continuous with other processes before and giving rise to, other processes after. One such nexial process with a beginning and end, the nexus being connected by the fact that all members of the same society normally have the same DNA form in the same nuclear form within their cells, is the same organismic human being. One can define a particular beginning and end to this nexus by looking closely at the actual occasions or entities which clearly comprise one social nexus defining human life. Before and after this particular nexus comprising man, other actual occasions existed, as they exist after the termination of that particular social nexus. However the particular nexus comprising man is very well defined at syngamy and at death.

Alexander's view of a plan of life that underlies the execution of life itself and is a repeated memory or mind for the plan of life itself also contributes to the understanding of the constitution of man as a form. There is a particular beginning in time when this particularly complete form is laid down, and a particular end when

this form ends. Death ends the material form of a man, while syngamy defines the beginning of the material form of man. Some authors wait for the definition of material form till the fourteenth stage of fertilization, when the chromosomes suspend themselves on the spindle before the first mitotic division of the zygote proper, but one cannot extend this argumentation for a repeated plan of life, to the stages before syngamy has occurred⁸³.

In the essence of man's being, freedom is a basic experience. One may turn one's attention at this juncture, to the definition of man by referring also to the attainment of freedom of the will. The importance of this has been corroborated by Karl Rahner in his theological writings⁸⁴. Rahner, who although is a theologian, throws some reflective philosophical light on the concept of freedom. He calls freedom in man, "the power to determine oneself to an absolutely irreversible final state". He believes that man actually makes himself for all eternity by using his freedom and being able to choose his own ways. He calls this a burden which is creative, creating in himself the state of his final choosing. He calls freedom, the 'essence' or power of man which enables him to determine this final ultimate state. Man thus begins his existence as a completely open and incomplete being. Through man, evolution has not remained the

⁸³ Findlay, J.K., Gear, M.L., Illingworth, P.J., Junk, S.M., Kay, G., Mackerras, A.H., Pope, A., Rothenfluh, H.S., Wilton, L., 'Human embryo: a biological definition', *Human Reproduction*, Dec. 18, 2006, pg. 1-7.

"The Term 'human embryo' is not applicable before the completion of fertilization of a human oocyte by a human sperm (i.e. syngamy), because this is when the new genome of the new individual is created. Prior to syngamy the maternally and paternally inherited genomes exist as two separate genomes". After the scientific consideration of the issues, including cloning by nuclear transfer, the authors come to the conclusion, that the following biological definition of human embryo should be proposed.

"A human embryo is a discrete entity that has arisen from either:

(i) the first mitotic division when fertilization of a human oocyte by a human sperm is complete or
(ii) any other process that initiates organized development of a biological entity with a human nuclear genome or altered nuclear genome that has the potential to develop up to or beyond the stage at which the primitive streak appears".

passive process that it once was, but has been extended into an active evolution of civilisation and culture, and this itself helps him to mould his own nature. Through freedom man is "the free being who has been handed over to himself". His nature does contain essential elements which need to be respected, but it is not a permanently fixed quantity either, although as mentioned, there is an innermost factor of constancy. There is thus in man, a "variable and relative quantity within man's constant nature" which is fixed by freedom. Thus the whole essence of man, consists of a constant innermost centre, together with the essential variations and attempts to express this constant essence in a different way⁸⁵.

This concept is reflected in Aquinas' writings on the correspondence of form and matter to each other⁸⁶. As we have seen previously in the chapter on the philosophical considerations of fertilization, this is demonstrated by the attainment by the living organism of the active potential bestowed on it by form as first act. This attainment of the active potency by the organism, can be compared to the rationality such organisms whereby they are able to,

have control over their own actions and are not only acted upon as are all other beings, but act of their own initiative⁸⁷.

Thus the attainment of an active potency in man as a self-moving organism, implies the attainment of the metaphysical form even at the zygote stage, which is commensurate with the attainment of rationality by that organism and also therefore of freedom of the will as a result of the same form even if this will is not yet able to be expressed.

⁸⁴ Rahner, K., *Theological Investigations - Volume Nine*, Darton, Longman and Todd, London, 1972, pg. 212-216.

⁸⁵ *Ibid.*, pg. 217

⁸⁶ Aquinas, T., *Summa Theol.*, Ia. 90, 4.1, ad 1.

⁸⁷ Aquinas, T., *Summa Theol.*, Ia. 29, 1.

The freedom to develop for the zygote as an organism only exists when that same organism is able to freely develop without being subordinated to any other organism as seen in the discussion above, when discussing Alexander's work. In the ootid stage this freedom is not yet actualized. This freedom is only fully actualized after there has been the genetic DNA combination during syngamy which allows this freedom to be in act. If freedom of the will is an essential concept in the essence of the definition of man, then the attainment of freedom of development is important in defining the moment in time when man as an organism begins to exist and that freedom is only attained with syngamy and the formation of the zygote. It is the point in time which defines the first occasion by the organism within a process of fertilization where the potency to act freely is first realized in the establishment of a material formal substance as the basis for the actual and active potential unfolding of a continuing plan for the functional actuality as second act leading to the eventual expression of that same freedom of will so dear to the definition of man!

Teilhard de Chardin's contribution is also significant in that it comprises a teleological fallout for the epistemological and interpretative definition of the human form by looking at evolution. His concepts of union, his definition of complexity and consciousness, his emphasis on the collating and workings of biologically relevant information, all show syngamy to be the point where individual human life has its beginning.

The evidence produced above, I believe to be quite helpful to pointing at syngamy as the beginning of individual human life when considering process and therefore it is no longer possible for one to hide behind process itself to blur the issue. The

philosophy of process itself has been scientifically qualified and quantified by the above mentioned gentlemen amongst others, and its careful analysis augments the other scientific and philosophic evidence pointing to syngamy as the beginning of a human life.

I would now like to take a cursory look at the dilemma posed by those who assert that a human being does not necessarily imply a human person. Disagreeing with this concept, as we have seen above that in process all being is becoming, I will put forward a point of view to support this tenet of process, by looking at scientific evidence that has not been evaluated before and which throws considerable light on the philosophy of the whole matter.

5

CHAPTER FIVE

The Relative Nature of Space and Time

I see (in Einstein's work) not only a new physics but also, in certain respects, a new way of thinking

Henri Bergson

5.1 Introduction

When Albert Einstein was confronted by the dichotomy between the theoretical aspect of his *Theory of General Relativity* and some experiments which seemed to disprove it, he did not have the slightest doubt that his theory derived from pure mathematical formulations was correct and that the experiment carried out had some unexplained fault as in fact turned out to be the case. He is known to have exclaimed “Subtle is the Lord, but malicious He is not”¹! By this he meant that God had created a nature which was composed of subtle and not so simple laws, but since there was no trickery intended, one could find the truth in them by proper investigation.

This chapter will help to show that establishing distinctions between the concepts of the human being and the human person based simply on time intervals, can bring

about problems in the application of any civil laws based on time restraints. I stand with those who argue against a dichotomy between personhood and being. Since most of the arguments in favour of this dichotomy are derived from social and legal concepts, it would be best to first summarize what these concepts are.

5.1.1 Personhood versus Being

Some individuals argue that personhood requires a relation to other members of a social structure or society, before one can confer the label of personhood. Others argue for the presence of at least the rudiments of a nervous system by which the individual human being can communicate or even the presence of a brain. Others argue that even the presence of a brain is not enough but that it has to be a brain that is self reflective and can answer to the necessary precepts of law. Most of these people reason that there is an individual human being present before these stages, but not a human person. The presence of nervous tissue appears at the age of about four to eight weeks of pregnancy, the brain at twenty weeks of pregnancy, others argue for the actuality of physical birth, while still others argue for the actuality of self-consciousness from 2-3 years after birth.

All these systems derived for the denoting of personhood are all questionable even using scientific and philosophical arguments. One scientific argument against those that argue for birth as the point which denote the existence of personhood, is that the interface between premature labour and miscarriage is always changing and veering downwards as new medical methods emerge which make it possible for children that are born earlier than a certain date, to be labeled as miscarriages or early birth. In my

¹ “Raffiniert ist der Herr Gott, aber boshaft ist er nicht”. Pais, A., *Subtle is the Lord*, Oxford University Press, Oxford, 1982, pg. 113.

days as a medical student, the cut-off date for this dichotomous line was 28 weeks of pregnancy. Babies born before that date had no chance of survival and were termed as a miscarriage or natural abortion. Of course for those who held that birth was the cut-off date to denote personhood, this was the watershed. But with medical special care intensive baby practices and with new medical knowledge and equipment, this date has been now brought down to 23-24 weeks of pregnancy. So using birth as a baseline for the conferment of personhood, brings in a relative standard for denoting personhood from the state of a human being.

A philosophical argument against this form of reasoning is the ontological one, described in *The Prologue* to this thesis, which leads one to accept that a human being is a human person endowed with rights. I need not repeat these arguments here, particularly as one can easily refer to the aforementioned *The Prologue* for a greater in depth reading of the different arguments, but suffice it to say that using the argument of ontological development, there is no difference between the concept of human person and human being. They are both one and the same thing at any stage of development before or after birth. As long as a human being exists, there you also have a human person!

All these argumentative methods for basing a breach between physical being and personhood based on laws establishing time intervals rather than empirical facts, do not take note of a fundamental breach they may cause in being able to verify this dichotomy of being and personhood. They unknowingly use the science of yesteryear in establishing parameters of time. The measurements in time and space that these individuals take to prove their point, are measurements that use the mechanical

dynamics of Newton, which considers the passage of time and the dimensions of space to be a constant for all observers. Although for everyday use, at our slow speeds, these features seem as unalterable ones, in reality they are not constants, but in effect depend upon the relative velocities of the observers and the subject for their valuation! Why was this truth, never noted or realized earlier in time? This is because of the unreliability and deficiencies of our sense organs, as deviations from Newtonian or classical mechanics become apparent only at very high speeds although this position is also tenable at low speeds compared to the speed of light. We see that,

[v]ariations from the laws of classical mechanics are too small to make themselves evident in practice²,

and that,

the human physiological apparatus is too insensitive to record the extremely minute changes in space and time which are produced by anything less than exceptionally high speeds. In other and better known ways, the five senses have their limitations³.

We are normally used to measuring space by coordinate divisions into length, breadth and height that is a space that is a three dimensional construct. But the reality of space also depends on time, as the two are intertwined, and the relative movement of the observers of time. In effect space does not consist of three dimensions only as we are so oft given to think, but of four. *Height, breadth, length* or as they are known as the *x, y, z*, coordinates and also, *time*. The fourth dimension of space-time is therefore *time*! We therefore speak of space-time! Time very much depends on the position and relative time of the observer.

² Einstein, A., *Relativity - The Special and the General Theory*, Folio Society, London, 2004, pg. 52.

³ Clark, Ronald C., *Einstein-The Life and Times*, Avon Books, New York, 1984, pg. 122.

In Newtonian mechanics for two observers moving at a constant velocity with respect to each other or so-called ‘inertial observers’, the passage of time is the same. This is enshrined in what is called a *Galilean transformation*⁴ wherein the time lapse for two observers is the same. Thereby $t = t'$, also $y = y'$, $z = z'$ and $x = x' + vt$. Unfortunately the passage of time and space is not a constant for all observers. The only constancy involved in transferring from one inertial observer to another, is the velocity of light, but not the time intervals, meaning the passage of time or the space dimensions involved. These depend on the individual observation of different observers. An interesting riddle to ask is, which will be the ‘real’ dimension and which will be the ‘real’ time if there is more than one observer involved? The answer is a simple one as,

[t]he ‘real’ dimension and the ‘real’ time is that of the observer, and the stationary and the moving observers are each concerned with their own reality. Just as beauty lies in the eye of the beholder, so does each man carry with him his own space and his own time⁵.

In special relativity, the *Galilean transformation* is replaced by the *Lorentz transformation* which gives rise to rather non-intuitive features of space-time which we often call paradoxes but which in reality are not.

There is however a limitation to relativity. If two events had to happen at different places, in such a way that the light signal from the first event reached the second event before it took place, then the order that the events took place cannot be reversed. The principle of Causality thereby remains valid. Wherefore we see that,

⁴ D’ Inverno, R., *Introducing Einstein’s Relativity*, Oxford University Press, 2002, pg. 18.

⁵ *Ibid.*, pg. 121.

relativity does *not* claim that if a man is hit by a bullet, then it is possible for an observer somewhere else in the universe to have seen the gun being fired after the bullet landed⁶.

5.2 The Philosophical Basis of Personhood

One of the biggest problems today with the definition of personhood is of course that of *Empiricism*, which asserts that all knowledge begins from what we sensorily observe in the world. Here the only reality is one of immediate experience, where there is only the appearance of unity and identity about things in general, and these do not exist as concrete entities outside the consciousness of the observer. This also applies to the self, where continuity or personal identity would be dependent on a line of continuous self-consciousness⁷. In a recent extension of this view called *Empirical Functionalism*, human personhood would be defined by the actual presence of a set of functions or abilities⁸. This view is in fact, a form of subjectivistic elitism which as we shall shortly see, may be based on a developmentalist approach to personhood. For *Locke* a person would be just a thinking intelligent being that considers itself as itself as the same thinking thing. *Hume* extends this to just define a person as “just a train of consciousness”⁹.

Modern day empirical functionalists such as Joseph Fletcher, laid down twenty criteria for human personhood such as self-awareness and a minimum amount of intelligence. Michael Tooley¹⁰ also contributed to this idea. Fletcher later changed

⁶ Clark, R.C., *Einstein-The Life and Times*, Avon Books, New York, 1984, pg. 122.

⁷ Doran, Kevin, P., Person – A Key Concept for Ethics, *Linacre Quarterly*, Review of the American Guild of Catholic Doctors, November 1989.

⁸ Sullivan, Dennis, M., ‘The Conception View of Personhood: A Review’, *Ethics and Medicine*, 19: 1, Spring 2003.

⁹ Royce, Robert E., ‘Personhood and the Conception Event’, *The New Scholasticism*, American Catholic Philosophical Association Quarterly, Vol LII,1, Winter, 1978.

¹⁰ Tooley, M., ‘Abortion and Infanticide’, Kuhse, H., Singer, P., *Bioethics: An Anthology*, Blackwell Publishing Limited, UK, 2006, pg. 25-40.

this position to one of neo-cortical (not whole brain) functioning. Others would define personhood on the concept of whole brain functioning. One such individual would be Derek Parfit, who categorises the criteria of personal identity into a *reductionist* and *non-reductionist* distinctions. He subdivides the former into the reduction of personhood into simple physical or psychological criteria. The funny thing is that he limits the physical criterion solely to the existence of a person's brain and the non-branching of his or her physical continuity¹¹. He also mentions the subdivision of the latter non-reductionist distinction, into dualist and non-dualist modes¹². He unreservedly claims that "we ought to be reductionists"¹³ and that in his own words,

[i]f we become Reductionists, we can plausibly claim that a fertilised ovum is not a human being, and that it becomes a human being only gradually during pregnancy. This supports the claim that abortion is not wrong in the first few weeks, and it only gradually becomes wrong¹⁴.

John McCormick, came up with the principle of a relational potential, where personhood was defined by the ability to socially interact with others. Other empiricists advocated the concept of personhood as only extending to those human beings who are only able to experience themselves and others by the actual exercise of rationality. These would include people such as Peter Singer, Helga Kuhse and John Harris¹⁵. I had a particularly intense encounter on this issue with Professor Harris in 2006 at one of the EU's National Ethics Committee meetings in Vienna, where he advocated the use of embryonic stem cells for research purposes. For all

¹¹ Parfit, D., *Reasons and Persons*, Clarendon Press, Oxford, 1984, pg. 208.

¹² *Ibid.*, pg. 211-210.

¹³ *Ibid.*, pg. 347.

¹⁴ *Ibid.*

¹⁵ See also Hildt, E., Mieth, D., *In Vitro Fertilization in the 1990's: Towards a Medical, Social, and Ethical Evaluation*, Ashgate Publishing Limited, UK, 1998.

Evans, D., *Ethics, Law and Practice in Human Embryology*, Kluwer Law International, The Hague, 1996.

these people neither the foetus, nor the embryo has a right to life because they do not yet exercise the concept of self consciousness.

This view contrasts sharply and is opposed to the concept of *Ontological Personalism* which I described in *The Prologue* to this thesis, and which states that all human beings are human persons due to their ontological continuity. In ontological personalism, a human being is a substance or a distinct unity of *essence* (form) that ontologically exists prior to any of its parts. The distinction between essence and existence is analogous to potency and act¹⁶. Remove an arm or a leg from a human person, and he remains a human person. There is no doubt that his substance is not composed by his component parts. An individual as substance also exhibits continuity. Though the cells of the human body change constantly, the same individual human person remains. There is continuity from one moment to the next, the personality involved has memories that give it continuity with its present state.

In *Chapter Two*, we looked at the philosophical idea of a human being as a substance as expounded by Aristotle's hylomorphism and later largely adopted by Aquinas. The soul originates at the same time of bodily conception, as would the concept of personhood too!

As seen earlier, the application of *Functional Empiricism* may be arbitrarily extended to the moment of birth, to the acquisition of self-consciousness at two to three years after birth. This would of course exclude the mentally handicapped and most of those who are mentally ill. Others would define personhood as the attainment of

¹⁶ Nelson, T.N., 'The Revelation of Personhood', *The National Catholic Bioethics Quarterly*, Winter 2009, pg. 728.

independent viability including premature labour, but as we have seen above, this represents a moving target. Others would single out *quickening* or the moment when the mother first feels the baby's movements within her at 16 to 20 weeks of gestation. As we saw earlier, still others have proposed the development of the neural system at 4-8 weeks or the functional maturity of the cortex at 20 weeks. Others opt for human appearance at the 8th week of development, still others at the establishment of blood circulation by the 5th week. Implantation at 7 to 10 days after conception is another alternative, as is the development of the *Primitive Streak* at 14 days after conception¹⁷. Fertilisation or conception is the earliest phase of personhood described and those who hold personhood at conception¹⁸ also hold that a human being exists at the same moment as a human person. For these, human being is synonymous with human person.

Another problem in dealing with the concept of human person is that of *Utilitarianism*¹⁹. With realists, being implies moral respect, (*Is* implies *Ought*) and for some, such as the empiricists, what ought to be done is based on a functional judgement of personhood, therefore there are fixed objective criteria for defining personhood. Utilitarians on the other hand, are not prepared to allow that rights and moral respect be based on objective criteria. For these, what is good consists in the

¹⁷ Iacobelli, P.A., 'La Riflessione Filosofica sulla Persona Umana', *Bioetica E Cultura*, No. 27 Gennaio-Aprile 2005, pg. 21-42, citing Norman Ford in his first book *When Did I Begin?* quoted in the Prologue of this thesis. Norman Ford later questioned his own initial position of an ontological beginning at the Primitive Streak in his second book, *The Prenatal Person*, to an ontological beginning at fertilization. This line of reasoning becomes absurd when one keeps in mind that with the development of cloning in mammals, one can imagine a situation where a cell is taken from an adult male of say 40 years of age, to produce a clone by nuclear transfer, which biologically would be the twin of the 40 year old man. Does the appearance of the cloned twin signify in any way that the forty year old man from whom the original cell was taken did not exist prior to this procedure? That is a preposterous assertion and likewise does away with the twinning argument in the first 14 days of embryological development and therefore with the pre-embryo hypothesis.

¹⁸ Kuhse, H., Singer, P., *Bioethics: An Anthology*, Blackwell Publishing Limited, UK, 2006. Article by Finnis, J., 'Abortion and Health Care Ethics', pg. 17-24.

¹⁹ See Doran, K., *op. cit.*

creation of happiness and the avoidance of unhappiness. For these, the sentiment of justice and rights is based on expediency and subjectivity rather than on objective criteria. Personhood becomes dependent on reasons of expediency. The classical example by John Stuart Mill is that of the expediency of the rights of a slave in a society as depending on his utility versus the rights of the master. Equally, in such a view, the rights of an embryo, would simply depend on what usefulness society had for them.

With realists²⁰, one is a person not because of what one can do, but one can do something because one is a person. One subsists because of the incorporation of the notion of *separate existence*, which is then qualified by its nature or *essence*. A person would be defined as *thing* because there is the exhibition of separate existence. A thing is denoted by its completeness, its distinctness and its internal unity. The nature or essence of such a person would be the rational essence. Boethius described a person, as “an individual being of a rational nature”²¹. The focus here is not on the specific power of the actual function of rationality, but on the nature shared by all the members of that particular species. The Stoics in ancient Rome, emphasised the virtue of *philanthropia*, which in essence referred to love to fellow human beings due particularly to their being human, their humanity²². Ludger Honnefelder describes man as “...the individual of a kind whose nature it is to be a living being with the endowment of reason whereby one is bound by a value judgement”²³.

²⁰ Realism in medieval philosophy means the theory that universals exist outside the mind, as opposed to nominalism. In modern philosophy it means that the world can exist independent of an observer's mind as opposed to idealism.

²¹ Jones, D. A., *The Soul of the Embryo*, Continuum, London. 2004, pg. 242. (From Boethius, *The Consolation of Philosophy*).

²² *Ibid.*, pg. 242.

²³ Hilpert, K. Mieth, D., *Kriterien biomedizinischer Ethik-Theologische Beiträge zum gesellschaftlichen Diskurs*, Honnefelder, L., Herder, Freiburg, 2006, pg. 63. “Mit der *descriptiven* Kennzeichnung des Menschen, Individuum einer Art zu sein, zu deren Natur es gehört, ein

Aquinas defends the Boethius definition in the *Summa theologiae*²⁴ and elsewhere describes a person as “a subsistent individual of a rational nature”²⁵ which is a better definition than that by Boethius. The human being is an entity, a substance, not just a concept and constitutes a whole. Here we see that separate existence and intellectual nature are constitutive of a person. A person cannot be one who lacks his own separate existence, but a person can exist by performing all or any of the activities appropriate to a rational nature. Therefore for Aquinas, a human person exists when a human being exists²⁶. When one becomes a living individual member of the species *Homo sapiens*, one becomes a human person.

Bernard Lonergan, as we have seen in the previous chapter, contributed substantially to the concept of a dynamic, as opposed to a static personhood. Lonergan was also a realist who believed that a person was a *thing* of an intellectual *nature*. We saw in *Chapter Three*, that for Lonergan, the concept of intellectual nature operates over the whole range of being, as central form and act are intrinsically also conjugate potency for conjugate act. He observes that,

[o]n the basis of this axiom, one can assert that whenever there is a *sensibile actu* or an *intelligibile actu*, an object is known; and whenever there is a *sensus actu* or an *intellectus actu*, the subject and his act are known. On this view, the subject in act and his act are constituted and, as well they are known simultaneously and concomitantly with the knowledge of objects; for the *sensibile actu* is the *sensus actu*, and the *intelligibile actu* is the *intellectus actu*. Again on this view, the object is known as *id quod intenditur* (what is intended), the subject is known as *is qui intendit* (he who intends), and the act

Lebewesen mit dem Vermögen des Vernunftgebrauchs zu sein, ist nun zugleich ein Werturteil verbunden”.

²⁴ Aquinas, *Summa theologiae*, I,q.29, a. 1.

²⁵ Aquinas, *Commentary on the Sentences of Peter Lombard*, III, d.5, q.1, a.3 and Aquinas, *Summa theologiae*, I, q.29,a.3.

²⁶ Irving, D.N., ‘Scientific and Philosophical Expertise: An Evaluation on the Arguments on Personhood’, *Linacre Quarterly*, February 1993, 60:1 pg. 18-46.

is known both as the *intendere* (intending) of the subject and the *intendi* (being intended) that regards the subject²⁷.

So there is here the concept of immanent finality as a process of becoming more of what one is, in response to an end written into one's very essence. Man need not exhibit all his potencies to define his essence, as some potencies may become act, while others not. In fact, certain potencies being actualized, would rule out the actualization of other potencies which would never become act. I agree therefore that a human being is thus a human person. One can conclude by considering four important marks of personhood. The first is *individuality*, a person is an actually existing being, an organised whole. The second is *substantiality* a being which exists in itself subsisting, as not existing in another and substanding, as allowing accidents (eg. size) to exist in it. The third is *rationality*, in that a person cannot have an exclusive materiality, but must have also an immaterial quality of reason. We think with the aid of our material brain but our rationality itself is immaterial. The fourth mark of personhood is *incommunicability*, which refers to our "inability to be relativized in the presence of other persons"²⁸, a clear reference to infinity or spiritual capacity²⁹.

5.3 The Logic of the Special Theory of Relativity as Opposed to the Concepts of Classical Mechanics

Before one considers the application of classical mechanics as applied to the above theories of personhood, based on a mechanics of *Galileo* and *Newton*, it would be

²⁷ Crowe, F.E., 'Christ as Subject: A Reply' (*De Constitutione Christi, Ontologica et Psychologica*), in Crowe, F.E., Doran, R.M., *Collection – Papers by Bernard Lonergan*, Herder and Herder, New York, 1967, pg. 177.

²⁸ Crosby, J.F., *The Selfhood of the Human Person*, Catholic University of America Press, 1996, pg. 44, 50-51, 216.

better to spend some time on the theory of special relativity, that is how to relate the measurements of two inertial observers moving at a constant velocity with respect to each other or how to formulate the laws of transformation from one inertial system to another.

First of all, although the special theory is ascribed to Einstein, one must put the historical record straight. The specific theory of relativity had been bandied about for a couple of years before Einstein put forward the mathematics of the hypothesis in 1905. Much work had been done theoretically by Hendrick Lorentz in his theory of the electron in the 1890s and experimentally by the Albert Michaelson and Edward Morley experiments in 1881 and 1887 respectively, although Albert Einstein is reputed to have claimed that he relied on neither to reach his mathematical conclusions. This point is very much a debated issue as can be seen from the biographies and statements of his life although one can say that it was Einstein who realized the implications of the theory³⁰. One must also add that conceptually Poincare came very close to discovering special relativity. Since he was a fourteen year old boy, Einstein always had the curiosity what the world would look like if he were to observe it while he was traveling on a beam of light. Essentially, the theory states that the passage of time is not the same for all inertial observers, and that the passage of time between an observer A and an object X and that between a different observer B and the same object X, is not a constant, but depends on the relative speeds between the objects A and the object X and B and the observed object X. The only constant as far as time is concerned, relative to any observer is the speed of light in vacuum $c = 300\,000\text{ km/s}$. To put it in a colourful fashion;

²⁹ Nelson, T.N., 'The Revelation of Personhood', *The National Catholic Bioethics Quarterly*, Winter 2009, pg. 729-731.

as I approach the speed of light, I am alone in my box of time and space, which is more and more departing from the norms round me....(this) makes two things clear. An obvious one: there is no universal time. But a more subtle one: that experience runs very different for the traveler and stay-at-home – and so for each of us in his own path. My experiences within the tram are consistent: I discover the same laws, the same relations between time, distance, speed, mass and force, which every other observer discovers. But the actual values that I get for time, distance, and so on, are not the same as the man on the pavement gets....what holds his box and mine together? The passage of light: light is the carrier of information that binds us³¹.

No matter what the speed of the observer or the object observed is, the velocity of light c in vacuum is always constant at 300 000 kilometres per second. It does not add up or detract according to the speeds of the observer. It appears as an absolute quantity in the Special Theory of Relativity. That is how nature behaves, and as Einstein was once told, one must "stop telling God what to do". There is no detraction or addition in the speed of light. It acts as a limiting velocity and no physical object can actually reach or go over this speed although it can be approached at least till now. It is always a constant c . In our day to day experiences in measurement, the opposite is noticed, because the speeds we usually travel at, that is relatively slow speeds, do not lead to an appreciable difference in measurement by common methods of measurement, and so to all observed intents and purposes, Galilean and Newtonian concepts have been sufficient to meet our daily requirements. This is not however the whole truth. It is only an observation which is approximately true at slow speeds, but becomes grossly deficient as one reaches higher speeds, particularly those close to the speed of light!

³⁰ Pais, A., *Subtle is the Lord*, Oxford University Press, Oxford, 1982, pg. 121 *et seq.*

³¹ Bronowski, J., *The Ascent of Man*, British Broadcasting Corporation, Science Horizons Inc., London, 1973, pg.248.

There is no universal time for the world. In this dichotomy, something has to give. For the path of a ray of light (like the path of a bullet), does not look the same to a casual bystander as to the man who fired it on the move. The path looks longer to the bystander; and therefore the time that the light takes on its path must seem longer to him, if he is to get the same value for its speed³².

Relative motion affects measurements of lengths and also of time so that,

[t]he length L of an object in motion with respect to an observer always appears to the observer to be shorter than its length L_0 when it is at rest with respect to him....The length L_0 of an object in its rest frame is called its proper length³³.

One can say that special relativity, concerns itself with the laws of nature as seen from two reference frames such as two ships, cars, trains, *etc.*, moving with respect to each other at constant speed v . As noted earlier these are called inertial frames of reference. The only difference, is a difference of time and time is a relative concept. If there is acceleration, one would have to go beyond special relativity into the domain of general relativity, which deals precisely with accelerated frames of reference i.e. gravitation. But this would be beyond the scope of this chapter, although it would make an interesting study in its own right³⁴.

Another important note derived from the theory is that two events appearing simultaneous to a stationary observer will not seem simultaneous to another observer moving relative to the first one. The classical example *Einstein* accords is that of a flash of lightning hitting the ground at two places as observed by a passenger on a train platform embankment as opposed to the observation of a passenger on a moving

³² *Ibid.*, pg. 249.

³³ Beiser, A., *Concepts of Modern Physics*, Mc Graw Hill Inc., New York, 5th edition, 1995, pg 15.

³⁴ Clark, R.C., *Einstein-The Life and Times*, Avon Books, New York, 1984, pg. 101-137.

train³⁵. He also gives other examples such a person observing events from a jetty and another on a moving ship.

[T]he old idea of simultaneity is dethroned; for events which are simultaneous to the observer on the jetty are not simultaneous to the sailor on the (ship) deck. ‘So we see,...that we cannot attach any *absolute* signification to the concept of simultaneity, but that two events which, viewed from a system of coordinates, are simultaneous, can no longer be looked upon as simultaneous events when envisaged from a system which is in motion relatively to that system³⁶.

The classical examples I will prefer to use to illustrate these physical quandaries are the same ones that Einstein used throughout most of the examples he quoted. This is the example of an observer A on a moving train, relative to the observations of an observer B on the stationary platform or embankment.

If an observer A stood on a moving train traveling at a speed of x metres per second and threw a stone in the same direction as the moving train at y metres per second, then the added velocity of the stone as observed by the stationary observer B, would be $x + y$ metres per second. This is in accordance with Newtonian mechanics. Einstein proved mathematically that velocities add differently. The addition of velocities as $x + y$ is wrong but undiscernible at slow speeds due to the very small error. As one starts to approach speeds near to that of light, the error also starts to grow so that the

³⁵ Einstein, A., *Relativity - The Special and the General Theory*, Folio Society, London, 2004, pg. 33. This book is a reprint of the original translation in English in 1920 and published by Methuen and Co., in the UK, of the article by Einstein published in Germany called *Über die spezielle und allgemeine Relativitätstheorie* by Verlag von Freidrich Viewhweg & Sohn in 1916. Einstein’s first publication of the special theory was in 1905, in the journal *Annalen der Physik*, where it was called, ‘Zur Elektrodynamik bewegter Körper’. Later in 1916, he published his general theory in the same journal.

³⁶ Clark, R.C., *Einstein-The Life and Times*, Avon Books, New York, 1984, pg. 119.

addition of velocities can no longer be considered simply as $x + y$ but needs to become $(x + y)/(1 + xy/c^2)$ as we shall see briefly³⁷.

If a person A standing on the train traveling at x m/s shone a torch light with the velocity of light being c m/s, then the observed velocity of light should be $x + c$ m/s. This in fact does not happen, so that the velocity of light from the observer A on the train is equal to the velocity of light from the torch of an observer B stationary on the embankment. The velocity of light from these two starting points, A and B is in fact always c m/s as the velocity of light is always a *constant*! This constancy of the velocity of light c , bears mathematical and theoretical consequences on the fact that not only is the passage of time t itself an inconstancy to different observers, but as a consequence, so is distance d and therefore space. In relativistic mechanics time and space are not treated as separate entities, there is only space-time. The transformation of space coordinates from one inertial observer to another involves time and the transformation of time lapses between inertial observers involves distance, and one must use the *Lorentz transformation* to establish the correct relationship between the two inertial observers. The speed of light c in a vacuum is the same for all observers and is the maximum speed possible. *The Lorentz transformation* is written in the standard form appearing below where γ is called the *Lorentz factor* and is defined as $\gamma = (1 - V^2/c^2)^{-1/2}$ where V is the relative velocity of the observers. Therefore³⁸;

$$x' = \gamma(x - Vt)$$

$$y' = y$$

$$z' = z$$

$$t' = \gamma(t - Vx/c^2)$$

³⁷ Pais, A., *Subtle is the Lord*, Oxford University Press, Oxford, 1982, pg. 143.

³⁸ Longair, M.S., *Theoretical Concepts in Physics*, Cambridge University Press, 1984, pg. 264.

If space-time itself is not a constant but differs on the different observers according to their relative velocities, so is mass m different to observers traveling at different velocities, hence his equation of energy $E=mc^2$, where c is a constant and therefore energy E and mass m would be directly proportional to each other and inconstant. This equation follows from the conceptual background of general relativity and cannot be obtained from the conceptual background of special relativity. It is an equation which has been validated experimentally being the basis of energy conversions by stars, and this furnishes further proof of the correctness of the theory of Special Relativity.

This theory has other implications on the observations of the stationary observer A on the embankment. If an observer B mounts a stationary train while A observes from the platform, there is no relative movement between A and B. As the train starts to move at a velocity v m/s away from A, B will start to move away from A at v metres per second. Now imagine that instead of A there is a platform clock which marks twelve noon when the train moves away from the platform. At constant velocity v m/s after one second the train will be v metres away, after two seconds it will be $2v$ metres away and so on and so forth. So that as the train draws away from the platform at velocity v , at the distance equal to $5v$ metres one would have observed the passage of five seconds on the station clock. However let us now imagine a scenario, where the train with the observer B moves away from the platform clock at a velocity which is fractionally less than that of light but comparable to c m/s at noon. To the observer B the clock will always show noon, because light from the clock can never reach the observer B, because the speed of light is traveling at the same speed of the train and can never catch up with it. This means that at the speed of light, the relationship

between the observer B and the clock will stand still! Time stands still and there is no passage of time between the observer B and the clock. It will always remain noon for B relative to the clock, while the passage of time between B and other observers on the train passes away normally. The relationship between A and the platform clock also passes normally away and time here does not stand still. Thus one observes that at the speed of light the time relationship between B and A and between A and B, stands still. At speed differences close to the speed of light, time is slowed down accordingly. Thus the passage of time and distance, depends on the relative speeds between the observer A and B, hence the principle of relativity³⁹!

This has been amply demonstrated by *Langevin's Twin Paradox*, described by Paul Langevin in 1911, where the example of two identical twins is taken. One remains here on earth, while the other one is put in a space ship travelling away from Earth at velocities close to the speed of light. After a number of years, the twin in orbit returns to earth, where it is realised that the two twins are now no longer the same age. The twin who has been in orbit is much younger in age than the twin who has remained on earth. This is because for both of them, the passage of time was not a constant but varied according to the velocity of the observer!

³⁹ Longair, M.S., *Theoretical Concepts in Physics*, Cambridge University Press, 1984, pg. 264. “We have already indicated that, at any particular point in space, we can reset the clocks so that they read the same time *at that point*. In the above example we set $x' = 0, x = 0; t' = 0, t = 0$. In other words, at that point we can consider the event to be simultaneous in the two frames of reference. However, *at all other points in space*, events are not simultaneous. (From the Lorentz transformation)... we see that at $x = 0, t = 0$ implies $t' = 0$, i.e. simultaneity. However, at all other points in space, observers disagree about the time at which events at all other values of x occur, i.e.

$$t' = \gamma(t - Vx/c^2)$$

and hence if $x \neq 0, t' \neq t$. In other words, if observers in S and S' can agree on simultaneity at one point in space-time, they will disagree at all other points. This is the origin of the phenomena of time dilation, length contraction, twin paradoxes etc. It is the fundamental difference between Newtonian relativity and special relativity”.

Einsteinian relativity adds the property of *elasticity* in time to that of causality. The time measured by a clock which an observer carries with him, called *proper time*, differs from that of clocks moving relative to him. Although this is noticeable only at velocities approaching that of light, these new time rules lead to surprising situations....Consider a pair of twins, 20 years old; one of them undertakes a journey to explore the Universe. He makes a return journey at a constant velocity of 297 000 km/s (99% of the velocity of light), to a planet which is twenty light years away (a light year is the distance covered by a wave of light in one year). On his return to Earth, the astronaut's watch tells him that he has been away for 6 years; however, for the twin remaining on Earth, 40 years have passed. This indeed means that time experienced by each twin is different: biological clocks are affected in the same way as atomic clocks. The brothers' ages can also be measured in terms of the number of their heartbeats: the astronaut is really only 26 when he returns and his twin is 60!⁴⁰

We can now take another example as the one above but add a new factor. Imagine a train platform with an observer A and an observer C who is pregnant with a human being E. There is another observer B in the stationary train who also can see both A and C and observe that C is in early pregnancy with E. In fact whether B can observe that C is pregnant or not, is irrelevant to our argument. The train now moves away from the platform at the speed of light or since this is not actually possible, say at around 90% of the speed of light. The relationship between both B and A, and between B and C and between B and E, is one where time has stood still. There is no aging to be seen between these observers, if some way for argument's sake could be found to keep visual observation open (this is possible even electronically). On the other hand during the same instant, the passage of time between observer A and C is occurring. Let us say that five years have passed since the leaving of the train. That

⁴⁰ Luminet, J. P., *Black Holes (Les Trous Noirs)*, translated by Bullough, Alison, and King, Andrew,

means that the relation between A and C has changed such that both A and C are five years older. It also means that C has delivered baby E which is now child E who is about four and a quarter years old depending on the time of the pregnancy when the train departed. On the other hand, the time relationship between B and A and B and C and B and E (if for argument's sake he could see him) has not changed at all. They are still all frozen in the time instant when the train left to observer B, as B is to all three other observers. That means that at the same instant of time, what for B appears to be an embryo or foetus E, to A and C appears as a child E of four and a quarter years of age! E is the same person and human being which appears to be aged differently to different observers traveling at different speeds. However this does not mean that the inertial frames of B and the the other mentioned observers meet in the same time. B is actually observing what happened to A, C and E five years ago and not in E's real time. This is what B observes but it does not correspond to E's real time. There is only one real E not two of them!

However it is possible to reconstruct an example which allows the different inertial frames of stationery observers and those traveling close to the speed of light c to actually meet in the same time instant. Going back to the twin paradox mentioned above. If an human being C on Earth gives birth to twins while an observer A looks on. If one of the twins E1 is kept on Earth while the other E2 is put on a rocket which travels in space close to the speed of light. Say that after five years the rocket returns to Earth. What A will observe is that E1 will now be five years old while E2 will be much younger. Let us for the sake of argument assume that A's legal concept of personhood begins when E1 empirically exhibits self consciousness at around three years of age. When E1 is five years old, to A, E1 is a person. However when E2

returns to Earth, A will probably observe an E2 that is not yet a person according to his definitional empirical functional criterion, even though these twins were born at essentially the same time. This would lead to the anomaly that two individuals who were born at the same time, would not qualify for personhood status at the same time. In E2's case, he would qualify for personhood status at a much later period when he exhibits to A the particular established functional criterion. To press a point home, E2's personhood status can be further delayed if he keeps being sent back into space every time he returns to Earth. This would create a serious anomaly between two human beings born at the same time or even those conceived at the same time and is counter intuitive. What's more, if the language used in any legal document does not refer to the particular empirical phenomenon which defines the parameter of personhood but only (as in most legal documents) to the usual time-frame when this phenomenon usually occurs, say three years of age rather than the exhibition of self consciousness around that age, then matters becomes even more complicated as the actual legal instrument itself will become useless. If a law says for argument's sake that personhood begins at three years of age from birth, then that law will not be referring to the actual empirical phenomenon after the passage of three years for the human being who remained on Earth, as for the human being who space travelled!

5.4 Inferential Argumentation as per Civil Legislation on Personhood

All this has certain repercussions as to the mode of static mechanics that we are used to reasoning with, the mechanics of Galileo and Newton, when discussing the classical differences between human being and human person for those who do hold such differences.

And sight, a stimulation of the human retina by certain electromagnetic waves, is perhaps the most illusory of most senses. 'Seeing is believing', and

so it is difficult to appreciate that the light of common day – all that unaided human physiology allows for the visual search for the world around – comes through only a narrow slit in a broad curtain (the electromagnetic spectrum)...Thus the human species is unconsciously and inevitably selective in describing the nature of the physical world in which it lives and moves. Once this is appreciated, the implications of Einstein's Special Theory begin to take on a more respectable air...there existed a further limitation...produced by man's lack of experience of speeds comparable to that of light⁴¹.

The laws of mechanics having been proven to be dynamic,

one man's 'now' is another man's 'then'; that 'now' itself is a subjective conception, valid only for an observer within one specific frame of reference⁴².

Thus those, who as described above, are espoused to *functional empiricism* as delineating the differences between human being and human person, a difference that rests on the passage of time when compared to other human observers, have now no longer a standard foot to stand on as far as the passage of time is concerned, when dynamic mechanics are applied. If they use the empirical phenomenon to ascribe personhood status, then that will mean that people born on the same date would not all have become persons three years later if some of them space travelled and later returned. On the other hand, if the attainment of personhood were to be attested to legally by the passage of the time it normally took for the empirical function to manifest itself, this would make the law itself completely unworkable, as this time would change considerable for all those people who would have space traveled.

⁴¹ Clark, R.C., *Einstein-The Life and Times*, Avon Books, New York, 1984, pg. 123.

⁴² *Ibid.*, pg.119.

When philosophers make the choice of attributing personhood to functional empirical development, they would err in thinking that time and space had to be static dimensions rather than dynamic concepts of a very relative nature. All concepts of personhood based on static concepts of time and space relative to the observations by other individual observers can lead to several conflicting possibilities.

One may imagine the civil and moral confusion that can ensue from such a system being in place. Dichotomizing being from personhood, already in effect robs several human beings of their personhood status and where the right to life is legally pinned on the status of personhood rather than that of being, this means that they also may be denied their right to life. However in some future not too distant society where space travel becomes a norm of the day, the confusion and actual denying of personhood and consequent right to life issues, takes on a new perspective, because people who are born or conceived around the same time will not all be eligible to the same rights at the same time here on Earth if either their parents after they have been conceived or they themselves when still young, choose to travel in space. This is not a far-fetched scenario taking into account today's developments.

A legislator on Earth in those circumstances, regarding laws where personhood is ascribed to certain exhibited functional empiricism, would have to remove every trace of the passage of time relating to laws denoting the usual time when the criteria for personhood become manifest. Time itself may no longer be used as a parameter for the denoting of personhood rights as this would be very relative to the observers and the physical traveling parameters of the subjects concerned. The legislator would then have to specify that for evidence of personhood, the required empirical functions

denotes by the law would need to be actually exhibited. This would not be so difficult if the particular functions were to be visible to the naked eye, such as birth or the attainment of self-consciousness. However many of the different empirical ontological or functionalist events thought to confer personhood, which were described earlier, tend to occur *in utero* such as the attainment of the primitive streak or the beating of the heart or the development of neural tissue. Ways would then have to be found to make these physical embryonic attainments visible through imaging media or other means thus further complicating matters. The fact remains that even after all this has been seen to, one is still faced with the scenario that human beings conceived on the same day might not qualify for personhood rights on the same day or even in the same year or years. It is obvious that this system could easily degenerate into one where the denial of personhood rights and subsequently the right to life becomes arbitrary and contingent upon factors that might not be totally under the subject's control thereby leading to discrimination and the eugenic control of the population through various means.

One can easily call to mind a society developing similar to that in the novel *Brave New World* or that in the film *Gattaca* or *The Island*, where human life loses its intrinsic dignity and simply becomes a tool in the hands of others including those in authority. In the current scenario, certain human being's personhood could be purposely delayed using several possible means with the result that an arbitrary eugenic selection particularly regarding the right to personhood status and consequently to life becomes manifestly possible. This of course would never be the scenario if personhood and being would be recognized as being present at the same time for the same reasons mentioned in this chapter above and in previous chapters!

6

CHAPTER SIX

Tutorism and Doubt Regarding the Exact Beginning of Human Life

Prudence is wisdom in human affairs

Thomas Aquinas

S.T., 2a2ae, q. 47, a. 2, ad 1.

6.1 Which Ethical System?

The resolution of doubt is not as difficult to resolve when one's ethical yard-stick is utilitarian or subjective as the ethical reservations raised by doubt regards the human act is swept away by the utility of the act. On the other hand one finds substantial difficulty when dealing with the resolution of doubt from an objective rule-centred ethical system like that expounded by natural moral law. I will therefore now devote my energies to help resolve this issue. Our actions in many ordinary life events such as eating and sleeping need no ethical classification by any existing ethical system as they are morally neutral actions. However other human acts do have moral import and need to be considered through either subjective or objective ethical systems.

In classical natural law ethics one seeks to decide on moral issues against the objective criteria of natural law. One has to make sure that one's line of conduct

correspond to these objective criteria. One may have enough information to decide issues oneself after reflecting on them and one may also have recourse to the opinions of others which may be conflicting with one's own. After long periods of reflection on the nature of the moral act, one may find oneself no nearer to an ethical solution to a particular moral dilemma.

Often in ordinary life one does not find such difficulty in arriving at certain ethical solutions but on other occasions, it becomes difficult in choosing how to best act out moral alternatives beset by doubt. It can then boil down to choosing to never act or wrongly choosing to act on a practical doubt. From the middle ages onwards many proponents of rule-centred natural law ethics have formulated systems to guide one through the correct resolution and conversion of theoretical doubt, for example as per the nature of the moral object, into practical moral certitude¹ allowing one to act forthrightly.

6.1.1 Tutorism

Tutorism is simply speaking, the '*via tutior*' or safe way. It implies that when one is faced by a decision involving doubt, one should always choose the safer way. Tutorism itself in its absolute form, has been condemned by Alexander VIII² as open to abuse and therefore inadequate to solve moral dilemmas as such, but it can still be applied in certain specific circumstances such as in the defence of human life, as I shall explain below. Some individuals draw tutorism into the moral reasoning to

¹ Davis, H., *Moral and Pastoral Theology*, Vol. I, Sheed and Ward, London, 1959, pg. 81.

² Roberti, F., Cardinal, Palazzini, P., *Dictionary of Moral Theology*, Burns and Oates, London, 1962, pg. 1196.

Lehmkuhl, A., *Theologia Moralis*, Vol. I, Herder, Friburgi Brisgoviae, MDCCCXCIII, pg. 59, "Ex quibus *primum* axioma (tutorismum absolutum) aperte codemnatum est a S. Sede, thesi 3, ab Alex. VIII. Confixâ: 'Non liceat sequi opinionem vel inter probabiles probabilissimam'. Quo habemus, ut licite amplectamur sententiam libertati faventem, non require omnimodam ejus objectivae veritatis certitudinem".

resolve the doubt involved on when human life begins. Although they admit, that it is not scientifically or philosophically exactly known, when this point in time exists, the safer way may lead one to conclude that *morally* one should err on the side of caution and accede to the alternative belief that human life starts at penetration of the ovum by the sperm.³ I will proceed to refute this argument which, in my opinion, is based on a wrong concept of the resolution of doubt through the wrong application of the tutorist argument.

6.1.2 *Epistêmê and Phronēsis*

The evaluation of ethical principles is not a simple weighing up of theoretical aspects, principles and ‘laws’, which can lead one to rock solid conclusions about different issues. Although this theoretical background of knowledge of taxonomy is important, it is by no means the only consideration that should be weighed. In Aristotle’s *Nicomachean Ethics*⁴, he clearly draws the necessity for resolving ethical issues to stand on two bodies of knowledge. One he calls *episteme*, or scientific theoretical knowledge, with a well-established empirical scientific taxonomy of well-known and reproducible principles. The other he calls *phronēsis*, or practical wisdom, the prudence to deal with issues in a perceptive and timely way as they arise.

Phronēsis is very similar in analogy to the clinical practice of medicine. As a medical doctor, one is aware of the scientific facts or *epistêmê*, of important theoretical signs and symptoms of the thousands of diseases and conditions which exist. However as every experienced physician worth his salt will tell you, when one applies the

³ Ford, N., ‘When Does Human Life Begin? Science, Government, Church’, *Pacifica*, Vol. 1 No. 3, 1988, Pacifica Theological Studies Association, Australia, pg. 317. “In the meantime so long as there are reasonable doubts about when the zygote begins, the Church rightly teaches that moral principles require the benefit of any doubt should always be given in favour of human life”.

⁴ Aristotle, *Nicomachean Ethics*, VI. v.1-4, 1140a-b, xiii.1-6, 1144b.

scientific facts to clinical practice, one has to constantly weigh up and down, the relevant facts according to the different patients and different presentations of the same illness. One tries to get the overall clinical picture as it is called. This important ‘phronetic’ exercise has to be done on the spot according to prudent judgment borne of experience.

It is the same precept that can be used in ethical and moral evaluation. Legally this has a corollary in the difference in the concepts of law or *nomos*, rule governed law, and equity or *epieicheia*⁵, a reasonable practical application of general legal rules. For example the Roman Pontiffs (not Popes) of early ancient Rome specialized in imparting measures of equity similar to those in a small claims tribunal today, as opposed to the full weight of legal measures in law court proceedings which could dispense strict legal justice as to the written law, but find it more difficult to provide more equitable solutions. There is a discretion and discernment in the former that is not present in the latter⁶.

Epistêmê obliges us to keep in mind a certain body of principles before deciding upon a particular issue. When these principles and fundamental rights contradict each other or clash, as they often do, one must exert a certain *phronēsis* to be able to decide and judge which of the rights has to be accorded *prima facie* preference, which brings us to the issue of *prima facie* rights, not an easy area to navigate⁷!

⁵ Aristotle, *Nicomachean Ethics*, V. x. 3-7, 1137b.

⁶ As Rome grew from a city state into an empire, it became impossible to maintain hearings by these pontiffs, the dispensation of equity being assumed by the Emperor of Rome as *Pontifex Maximus*, a title now assumed by the Roman Catholic Popes after the conversion of Rome to Christianity.

⁷ Jonsen, A.R., Toulmin, S., *The Abuse of Casuistry A History of Moral Reasoning*, University of California, Berkeley, 1988, pg. 23 – 100.

St. Thomas Aquinas devoted a number of questions to the virtue of prudence where he pointedly follows the Stoics⁸ and likens *phronēsis* to translation, as it concerns wisdom in human affairs.

Clearly prudence is wisdom in human affairs, yet it is not wisdom pure and simple, because it is not about the utterly ultimate, but about the good-for-man, which is not the most ultimate and best of goods that exist⁹.

Aquinas also says that in applying prudence, it is important not only to “know the general moral principles of reason” but also the “individual situation in which human actions take place”¹⁰, that is the particular *circumstances* and *intentions* surrounding each individual act¹¹. He maintains that the reasonable conclusions of proofs need not only be in the universal but can also be applied to particular cases as the human mind can extend to individual matter quoting Aristotle’s *De Anima*¹². Aquinas further goes on, to state that prudence involves reason engaged with conduct, whereby the act of reason goes through three stages. The first being obtaining *counsel*, the second is forming a *judgement* and the third is what he calls *commanding* (*imperium*), which means bringing into execution that which has been thought out, his latter point being the chief act of practical reason and therefore of prudence itself¹³. He goes on to enjoin that one should take one’s time deliberating but that once one has decided, the

⁸ Jonsen, A.R., Toulmin, S., *The Abuse Of Casuistry – A History of Moral Reasoning*, University of California Press, California, 1988, pg. 130, quoting Cicero, *De Officiis*, I, 43.

⁹ Aquinas, T., *S.T.*, 2a2ae, q. 47, a. 2, ad 1.

¹⁰ Aquinas, T., *S.T.*, 2a2a3, q. 47, a. 3, c.

¹¹ Aquinas, T., *S.T.*, 2a2ae, q. 47, a. 15; q. 49, a. 7, ad 1-2; q. 49, a. 8, ad 3. See also Gilby, T., *St. Thomas Aquinas - Summa Theologiae – Prudence*, Vol. 36, Blackfriars, Cambridge, 1974, pg. 176, Appendix 1. “Consequently, the morality of a human action in the concrete, cannot be comprehensively defined by the common and general rules of law, or even by detailed and delicate refinements on them. Indeed prudence may often be engaged where there is no operative and relevant law. Not that prudence is antinomian, but simply that its precise concern as such is not to be resolved into keeping a law, though often, or even usually, this in fact may be involved. Its function is to put right reason into human deeds by translating our deliberations and choices, which otherwise would remain arrested at an internal or immanent attitude in the ‘order of intention’ into effective practice in the ‘order of execution’.

¹² Aristotle, *De Anima*, III, 4. 429b10.

¹³ Aquinas, T., *S.T.*, 2a2ae, q. 47, a. 8, c.

process of execution should be prompt¹⁴ this being a chief trait of prudence. He also follows Aristotle in adding that because the “matter of prudence is composed of contingent individual incidents”, prudential practical or moral certitude does not encompass absolute theoretic certainty¹⁵. He also asserts that some men may form reasonably good judgement about many extraordinary things, a virtue he calls *gnomé* or wit, which in the English language is mandated by an appropriate word called ‘perspicuity’¹⁶.

In order to deal with the material for this chapter we must also turn our attention to the language of law. Law is pre-eminently an expression of reason¹⁷! No law has power to oblige except to the degree that it does in fact preserve or contribute to the general or common good. The nature of law is not simply that the individual be subject directly to the will of the governing powers, but that both are subject to the requirements of the *good of society*. It is that alone which gives moral import to law, lacking which there is no just or true law. Written laws are too universal in their formulation and scope to cover all possible contingencies and eventualities. Aristotle believed that one could exercise the virtue of *epieicheia* or equity, to correct the

¹⁴ Aquinas, T., *S.T.*, 2a2ae, q. 47, a. 8, c quoting Aristotle’s *Ethics* VI, 9. 1142b3.

¹⁵ Aquinas, T., *S.T.*, 2a2ae, q. 47, a. 9, ad 2, quoting Aristotle’s *Ethics* 1, & 7. 1094b12 & 1098a26. See also Gilby, T., *St. Thomas Aquinas - Summa Theologiae – Prudence*, Vol. 36, Blackfriars, Cambridge, 1974, pg. 183 - 184, Appendix 4. “John of St. Thomas, a classical commentator on the *Summa*, points a difference between truth in theory and in practice; the first is quite objective and is measured by what is and what is not, whereas the second is partly subjective and is measured by what should or should not be done according to a person’s capacity and duty in a complex of variable circumstances. Though practical truth reposes on theoretical truth, it cannot be extrapolated from the theoretical truth held by the human mind. Idle, then, to seek a necessity which cannot be found, or to hanker after an illusory infallibility when you have done what you can and have no intention of deceiving yourself or doing wrong. Idle, also, ... to require a sealed guarantee of guiltlessness... prudence is content with probable and moral certainty. And this is not reluctantly accepted as second best”.

¹⁶ Aquinas, T., *S.T.*, 2a2ae, q. 51, a. 4, c & ad.3.

¹⁷ Aquinas, T., *S.T.*, 1a 2ae, q. 93, a. 1, “*Lex aeterna nihil aliud est quam ratio divinae sapientiae, secundum quod est directiva omnium actuum et motionum*”, quoting from Augustine’s *De libero arbitrio*, 6; PL32, 1229, *lex aeterna est summa ratio, cui semper obtemperandum est*”. There is no dichotomy between the mind of God and the will of God who is ultimate reason! God is a simple being.

limitations inherent in the law (see above). This does not mean that one abandons justice, but this is itself an act of justice. *Epieicheia* is not strictly a simple interpretation or an application of law. Some say, that it is the interpretation of the mind and will of the lawmaker at the time the law was promulgated. But others insist that it goes beyond simply being an interpretation of the lawmaker's will. It is rather the connection of that very will with reason. For any particular will to take on the character of law, that will has to be regulated by reason orienting behaviour to the common good¹⁸.

For Klaus Demmer *epieicheia* is comparable to the dynamic evolving systems of science where theory and praxis are woven together to discover new and better ways of acting between tradition and contemporary reality. Casuistry may then be used in a new interpretive way to seek the moral middle ground between laxity and rigorism as a person tries to find the *Kunst des Möglichen* or the art of the possible. One can then define *epieicheia* as,

the virtue of freedom that reflects our willingness to occasionally go beyond traditional applications of a norm and to introduce an element of newness to a moral tradition¹⁹.

When dealing with language of law one often runs across the problem of doubt. It is one thing to deal with doubt in an empirical manner, where one often has to verify or otherwise, factual and empirical occurrences and apply them to certain hypothesis to create theories, it is rather a different manner altogether to deal with a moral doubt. Moral or ethical doubts are very often deductive in nature and often one comes across

¹⁸ Mahoney, J., *The Making of MoralTheology*, Clarendon Press, Oxford, 1987, pg. 232 *et seq.*

¹⁹ Keenan, J.F., *History of Catholic Moral Theology in the Twentieth Century: From Confessing Sins to Liberating Consciences*, Continuum, London, 2010, pg. 155.

grey areas where one is not able to proceed with any certainty. In an ethical and moral perspective, certainty is an all too important consideration and the incertitude is often incorporated into the formula for deciding on a practical doubt. Very often, where the issue of human life is concerned, many proponents apply the tutioristic principle, implying that in the absence of solid empirical evidence, one should resort to the safest mode of action, contending that life needs to be protected from the earliest possible time. It is difficult to counter this argument of safety because there is no philosophical or scientific proof that the human body and the human soul start at one and the same moment although this is the position I maintain. Neither is one absolutely certain of either the scientific argument or the philosophical one regarding the beginning of human life, although one can deduce opinions to various degrees. The tutioristic argument therefore holds that ethically, when in doubt one takes the safer way and therefore maintains that it is best to consider that human life begins at the penetration of the male sperm into the human ovum, because when there are elements of doubt, one should err on the side of caution. Error on the beginning of human life, since no consensus exists as to the point of its beginning, should lie on the side of safety. This is by no means a definitive position but rather a moral position.

The argument these individuals often obtain in order to prove their point is the classical one of the hunter and the bush. If one is out hunting and one sees a bush behind which one observes a degree of movement about which one is not sure as to the nature of the movement's provenience, whether being beast or human, does one go ahead and shoot on the relative degree of doubt or does one apply caution and refrain from action? One cannot act out of moral incertitude and therefore the justified answer is for one to refrain from shooting.

However are we justified in applying the solution to the problem in such a tutioristic way when we are dealing with a problem of law, albeit natural law, regarding the precept of non-maleficence to other creatures of our same species, particularly the precept of not ending another's life? The tutioristic system also known as *rigorism*, has its own defects and has been circumscribed as a moral system²⁰.

Tutorism is subject to at least three inherent defects. First it makes security the moral norm at the expense of truth. It raises questions about the fundamental reliability of man's other resources to solving man's self-deception and self-interest. The second problem with rigorism is that it accepts the terms of law as being more significant than their purpose. This jettisons the concept of the purpose of the common good of law. The third problem with rigorism is that it gives precedence to obedience to another's will as a moral virtue rather than to reason which should be considered the essence of all law²¹. Tutorism is only applicable where certainty is demanded on various grounds such as when the validity of a sacrament is concerned, the attainment of justice or other obligatory end such as salvation is concerned, and the fundamental established rights of others are concerned²². In these cases the principles of reflexology do not apply because it would be considered that in these cases one would be acting out of incertitude, not probable certitude.

One is never justified in acting from moral incertitude, but there exist ways of resolving a doubt of law which allows one to proceed with theoretical doubt using a system known as reflexology. This considers the issue of moral certitude. One cannot

²⁰ It was regularly propounded by the Jansenists in the seventeenth century and created great mischief due to false pretexts as to recourse to sacraments in the Catholic Church and was finally condemned in its absolute form by *Pope Alexander VIII* in 1690.

²¹ Mahoney, J., *The Making of Moral Theology*, Clarendon Press, Oxford, 1987, pg. 243-244.

act with incertitude, however one is justified in acting from a position of probable certitude when one is constrained to act.

6.2 Liberty or Law

The whole issue of using reflex principles to resolve doubt is surrounded by the legal principle of possession, that is whether one is in possession of one's liberty or free will, or whether the law itself is in possession thereby negating the possibility of one's free will as to interpreting the extent of its binding application. Legally, one is considered to be in possession of one's liberty unless the law is clearly promulgated and clearly applies to a particular issue thus in turn binding the individual by that particular law. *Lex dubia non obligat*. The famous maxim that 'possession is nine tenths of the law' or the one that 'in case of a doubt the one in possession has the better case', can be interpreted to hold good in this case where doubt of conscience as to the application of the law exists, and where the truth is uncertain. As we shall see, some individuals believe that in the case of doubt, possession belongs to liberty, others accept this principle to varying degrees while still others tend to favour the safety of the law. Mahoney clearly states this when he writes that in defending probabilism, as one form of reflexology, the main argument holds that the doubt should go for freedom.

Why should a doubtful law *ipso facto* have no claim upon men's consciences?...If, then, there is any doubt about which has claim to ownership or dominion over man's conscience and behaviour, a law coming to man from outside, or his innate freedom of choice and action, clearly on the basis of this legal maxim personal freedom is in possession and the law has no *locus standi*²³.

²² Harty, J.M., *Catholic Encyclopedia*, catholicity.com, The Mary Foundation, 1996-2007, <http://www.newadvent.org/cathen/1244a.htm> [18.08.2007].

We shall return to the differences between these systems later. What position one actually takes depends on the particular reflex principles that one adopts. What is sure is that as we shall see below, when one is in doubt as to the moral act, then it is acceptable to apply casuistic principles to resolve the ethical dilemma.

Casuistry, considered as the poetics of practical reasoning²⁴, has been in use to deal with doubt with regards to the moral act since the sixteenth century. It may be defined as “that part of ethics which resolves cases of conscience, applying the general rule of religion and morality to particular instances in which circumstances may alter cases or in which there appears to be a conflict of duties”²⁵. It can be considered as practical case ethics (French: Casuistique; German: Kasuistik). Although it had acquired something of a bad name in the past because of some misuse by certain practitioners which actually amounted to an abuse, it has never been refuted as a principle for resolution even by the Catholic Church and has recently been commended by both Protestants such as the Bishop of Oxford, Kenneth Kirk and Catholics such as Edward Long, Paul Ramsey, Nigel Biggar, Stanley Hauerwas, Klaus Demmer²⁶ and also Albert Jonsen and Stephen Toulmin who see casuistry as context laden engaging the person, the circumstances and the culture and cannot operate in a vacuum. Jonsen goes on to describe casuistry as,

An imaginary building where the frame is set in principles, but the entire make-up of the house, from mortar to furniture, is constituted by

²³ Mahoney, J., *The Making of Moral Theology*, Clarendon Press, Oxford, 1987, pg. 228.

²⁴ Miller, R.B., *Casuistry and Modern Ethics: A Poetics of Practical Reasoning*, University of Chicago Press, Chicago, 1996.

Keenan, J.F., Shannon, T.A., *The Context of Casuistry*, Georgetown University Press, Washington D.C., 1995.

²⁵ Jonsen, A.R., Toulmin, S., *The Abuse of Casuistry A History of Moral Reasoning*, University of California, Berkeley, 1988, pg. 11.

²⁶ Keenan, J.F., *History of Catholic Moral Theology in the Twentieth Century: From Confessing Sins to Liberating Consciences*, Continuum, London, 2010, pg. 159.

circumstances...Principles and circumstances are complementary in a complex and subtle way²⁷.

Jonsen and Toulmin go on to express the view that,

[t]he practical choice...is not between a high-minded ethics of pure principle and an inevitably debased morality of cases and circumstances: it is between *good* casuistry, which applies general rules to particular cases with discernment, and *bad* casuistry, which does the same thing sloppily.²⁸

Also,

[w]e need to respect not only the general principles that require us to treat similar cases alike, but also those crucial distinctions that justify treating dissimilar cases differently²⁹.

So in the Catholic, and we have seen even other Christian churches such as the Anglican, there is a long tradition of casuistry, which has never been denounced and has often been given respectable acceptable reviews for the resolution of conscience even by high ranking hierarchical officials throughout history. For example the recent statement that

[d]issent can have meaning only in the area of casuistry, not in the specific area of norms³⁰,

and that,

[t]he *abuse* of casuistry is properly directed, not against all casuistry, but only against its *abuse*³¹.

Notwithstanding its former notorious fame, which as we have said is only due to its abuse, casuistry may effectively be used today, to deal with cases where theoretical

²⁷ Keenan, J.F., *History of Catholic Moral Theology in the Twentieth Century: From Confessing Sins to Liberating Consciences*, Continuum, London, 2010, pg. 161.

²⁸ Jonsen, A.R., Toulmin, S., *The Abuse of Casuistry A History of Moral Reasoning*, University of California, Berkeley, 1988, pg. 15-16.

²⁹ *Ibid.*, pg. 14.

³⁰ Ratzinger, J., *On Conscience*, National Catholic Bioethics Centre, Philadelphia, Ignatius Press, San Francisco, 2007, pg. 75, reporting a speech given in 1984.

knowledge, especially in science and medicine, is still provisional while everybody is expecting instant ethical solutions in clear terms. It can provide the mediation between law and liberty³² and can help resolve the dilemma of making a choice between either certainty or relativism. In such cases, *invincible ignorance* saves the day³³. Nowadays, in ethics, people have shifted from the rather legalistic maxim of “*lex dubia, lex nulla*”, to incorporate the concept of obligation, so that the preferred maxim today is rather “*obligatio dubia, obligatio nulla*”³⁴.

6.3 Reflex Principles

As Aristotle said, certainty is not found in moral matters as is in mathematical science³⁵. Although reflex principles and casuistry had acquired a bad name due to the abuses of the systems involved, there is no doubt that today one finds scope to return to the issues of ‘case ethics’ especially in the field of medical ethics. There are several reflex principles³⁶ involved which I shall look into with detail, however it is interesting to keep in mind that the different positions held need not be mutually exclusive! One may be prompted to use probabilist reflection on issues which are complex and one may not have the time to reflect on, while in other issues where time and circumstances allow for greater depth of reflection, one may be more prudent in

³¹ Kirk, K.E., *Conscience and Its Problems An Introduction to Casuistry*, James Clarke and Co., Cambridge, UK, 1999, pg.125.

³² See Jean-Marie Aubert in Keenan, J.F., *History of Catholic Moral Theology in the Twentieth Century: From Confessing Sins to Liberating Consciences*, Continuum, London, 2010, pg. 159.

³³ Fleming, J.A., *Defending Probabilism-The Moral Theology of Juan Caramuel*, Georgetown University Press, Washington D.C., 2006, pg. 144-150.

³⁴ Delhaye, P., *The Christian Conscience*, Desclee Company, New York, 1968, pg. 227.

³⁵ Aristotle, *Nicomachean Ethics*, Bk I, 1094b.

³⁶ Piscetta, A., Gennaro, A., *Sommario di Teologia Morale*, Societa Editrice Internazionale, Milano, ristampa 1954 (translated from latin by Antonio Cavasin), pg. 31-33.

seeking out the sounder opinion³⁷. What is not acceptable is to use more than one system on the same issue at the same instant of time³⁸ or to act out of incertitude.

6.3.1 *Probabilism*

The issue of acting out of incertitude, dealing with doubt, must be resolved particularly if the doubt is practical and one has to act. It is not ethically correct to act out of incertitude, especially in grave matters, but once ethical doubt can be resolved by reflex principles and a position borne of ethical certitude can be worked out not contrary to the obligation of law, a position may be undertaken allowing one to act without slight of conscience. One of the most well known methods of dealing with doubt is the system of Probabilism³⁹.

Probabilism is defined as the resolution of doubt with moral rectitude, whereby when the existence or the cessation of a law is doubtful, it is lawful to act on the less safe opinion (that in favour of liberty from the law) if it is solidly probable, even though the more safe view (that in favour of law) is certainly more probable.

Famous probabilists⁴⁰ whose intentions were very often strict and well intended were motivated out of pastoral concern for their flocks. Unfortunately, barring the rare

³⁷ Jonsen, A.R., Toulmin, Stephen, *The Abuse of Casuistry A History of Moral Reasoning*, University of California, Berkeley, 1988, pg. 261.

³⁸ Delhaye, P., *The Christian Conscience*, Desclee Company, New York, 1968, pg. 227.

³⁹ Lehmkuhl, A., *Theologia Moralis*, Vol. I, Herder, Friburgi Brigoviae, MDCCCXCIII, pg. 59, "In tali dubio sufficit et requiritur, ut sententia libertati favens sit *vere probabilis*, seu gravi ratione nixa – axioma *Probabilismi*".

⁴⁰ Ballerini, A., *Opus Theologicum Morale*, Volumen I, officina Libraria Giachetti, Filii et Soc., Prati, 1892, Tractatus II, 82, "Quomodo concilietur usus opinionis probabilis cum certitudine necessaria de honestate actionis". 87, "Et Vasquez (Gabriel Vasquez – 1551-1604) in 1.2. disp. 62. cap.5. n. 26.: 'Ego quidem existimo, posse aliquem recte operari cum assensu tantum probabili, etiamsi habeat formidinem oppositae parties... Dixi *cum formidine oppositae parties* non autem cum dubitatione et haesitatione; qua si aliquis dubius esset circa aliquod genus operationis, non posset salva conscientia operari; qua non posset habere iudicium conscientiae singulare cum assensu". 93, "Instar omnium sit Suarez (Francisco Suarez – 1548-1617) in 1.2. tr. 3 disp. 12. sect. 6. n. 8.: 'Dicendum primo: Quotiescumque est opinio probabilis, hanc actionem non esse malam vel prohibitam vel praeceptam; potest aliquis formare conscientiam certam vel praticam conformem tali opinioni. Praeter Auctores citatos favent huic conclusioni multa, quae adducit Navarrus, Sylvester, Angelus, Antoninus. Ratio

times when there was evident abuse, their intentions were good but often misconstrued. For the probabilists, the possession of liberty in the face of doubt, plays a central and more important concept, than the possession of law. The concept of moral responsibility makes no sense without liberty and law does not oblige unless its existence is certain and sufficiently promulgated. If one was not certain about the truth, then one in possession of his liberty is entitled to the benefit of the doubt. Without proof, the possession of liberty has to be maintained⁴¹. Adjacent to the possession of liberty and freedom from the law is also the concept of invincible or inculpable ignorance as far of course as it really is invincible and the action itself cannot be delayed. Since in the case of real invincible ignorance the law is not in possession, then one is not obliged by the law and liberty is in possession. Consequently the law does not impose identical ethical obligations on everyone⁴².

It is important to keep in mind that one must distinguish between a *solidly* probable opinion and an improbable one. Not all ‘other’ opinions are considered probable. The upholding of a slightly probable opinion is referred to as *laxism*⁴³. “An opinion is solidly probable which by reason of intrinsic or extrinsic arguments is able to gain the assent of many prudent men”⁴⁴. *Extrinsic* probability is that which is conferred on an

est, quia *excedit ordinarium modum humanae facultatis* maiorem cognitionem obtinere in singulis actionibus. Item quia esset *intolerabile onus obligare omnes* homines ad conferendas singulas opiniones. Praeterea existimo illam rationem sufficientem; quia quandiu est iudicium probabile, quod nulla sit lex prohibens vel praecipiens actionem, *talis lex non est sufficienter proposita vel promulgata homini*. Unde cum obligatione *legis sit vix se onerosa et quodammodo odiosa*, non urget, donec certius de illa constet. Neque contra hoc urget aliqua ratio; quia tunc revera *non est contraia pars tutior* in ordine ad conscientiam, neque ibi est aliquod dubium practicum nec periculum”.

⁴¹ Fleming, J.A., *Defending Probabilism-The Moral Theology of Juan Caramuel*, Georgetown University Press, Washington D.C., 2006, pg. 125-127.

⁴² *Ibid.*, pg. 127.

⁴³ Lehmkuhl, A., *Theologia Moralis*, Vol. I, Herder, Friburgi Brisgoviae, MDCCCXCIII, pg. 59, “Qui vero opinionem etiam leviter probatam seu improbabilem in favorem libertatis se amplecti posse autumat, se *Laxismo* adhaerere ostendit: quem pro systemate nemo profitetur, ad quem tamen in singulis questionibus aliquando scriptores quidam delabi deprehenduntur”.

⁴⁴ Harty, J.M., *Catholic Encyclopedia*, catholicity.com, The Mary Foundation, 1996-2007, <http://www.newadvent.org/cathen/1244a.htm> [18.08.2007].

opinion by the adherence of an independent number of prudent and learned individuals. Some authors disagree as to the number necessary, some say three, some four, some six, but rather than the number, the more important criterion is academic authority. In that case even one person of an exceptional and well acclaimed status would be sufficient to make an opinion solidly probable. However extrinsic probability is always secondary to the *intrinsic* probability where cogent arguments of a particular case even if it is not a conclusive argument, establish precedence over extrinsic arguments⁴⁵.

Probabilism can only apply to a case if there is a doubtful not a manifest, obligation to law. There are therefore no exceptions to the application of probabilism.

But there are apparent exceptions as they have been called; cases that stand altogether outside the scope, not only of Probabilism, but of every other system that has been invented, except the system of choosing the most secure means to the end, the system called Tutorism⁴⁶.

If the danger is manifest, there is no room for probabilism. This is not because tutorism is the preferred system of honour, one must not forget that it has been condemned as a system, but because one must always choose the safest means in certain cases because one is “antecedently bound to do so”⁴⁷. Probabilism cannot be applied to cases where a ‘definite object’ has to be secured beyond possibility of

Vermeersch, A., *Theologiae Moralis*, Tomus I, Universitatis Gregoriana, Roma, 1947, Tractatus IV, 315, “Probabile, in genere, dicitur quod dignum est approbatione, quod admitti potest, quod est secundum rationem”.

Lehmkühl, A., *Theologia Moralis*, Vol. I, Herder, Friburgi Brisgoviae, MDCCCXCIII, pg. 59, “Probabile, in genere, dicitur quod dignum est approbatione, quod admitti potest, quod est secundum rationem”.

⁴⁵ Vermeersch, A., *Theologiae Moralis*, Tomus I, Universitatis Gregoriana, Roma, 1947, Tractatus IV, 315, “Ex fonte unde hauriatur, distinguitur probabilitas *intrinseca*, vel *extrinseca*, prout motivum assensus rationibus intrinsecis, ab assentiente perceptis, desumitur, vel ex doctorum auctoritate opinans rem probabilem esse aestimat. Melius diceretur probabilitas ab intrinseco vel ab extrinseco nota”.

⁴⁶ Davis, H., *Moral and Pastoral Theology*, Vol. I, Sheed and Ward, London, eight edition, 1959, pg. 97.

⁴⁷ *Ibid.*

doubt where the conditions of fulfillment of the object concerned, are absolutely essential. Such examples are cases where the sacraments and salvation are concerned. I may not visit a place which may probably cause me to err morally, just because there is only a probable opinion of erring! Accepted concupiscence is sin. I may not use doubtful physical material in the conferment of a sacrament. Circumstances may however force one to act otherwise in both cases.

Probabilism may also not be used where another person's rights are already definitely in possession. A physician may not use a probably therapeutic remedy on a patient, when a manifest remedy exists or if one is in doubt as to the beneficial effect of the remedy, not use it at all, unless one is constrained by circumstances to do so. In a court of law, the defendant is considered innocent and in possession of his rights even if he is probably guilty.

It is also inordinate for one to use probabilism, where a *probable* invasion of another person's natural rights is involved, except where there is a counterweighing probable argument on one's side. Thus when recalling the hunter and bush argument, the right to respect for human life wins the day for the object behind the bush and one is obliged not to shoot at the unknown object⁴⁸. In all these cases, the obligation definitely already exists *a priori*, and applying the principles of probabilism or any other system, is groundless. There is no doubt of obligation in these cases but certitude, and therefore reflexology principles are not applicable.

6.3.2 *Probabiliorism*

In Probabiliorism⁴⁹, the less safe opinion (in favour of liberty) can be followed only when it is more probable than the safe opinion (in favour of law)⁵⁰. Therefore it is unlawful to act on the less safe opinion unless it is also the more probable opinion. There are varying opinions as to the efficacy of probabiliorism over probabilism but both systems have been used by different adherents. The big problem with probabiliorism is that one has to have a profound knowledge of the subject and authors involved in order to be able to decide between a more probable and less probable opinion. If one might be in a position to do so, then one might opt for this system, but in practical everyday matters, and for the man in the street, this is often inconvenient and not possible, as knowledge and time are in short supply. There is also the charge brought on by probabilists that in the case of resolving practical doubt this would lead to the system of tutiorism, as it is the only efficacious way of reasonably dealing with certain issues, in any degree of certitude⁵¹.

6.3.3 *Aequiprobabilism*

In *Aequiprobabilism*⁵² when the uncertainty concerns the existence of a law, it is lawful to follow the less safe opinion when it has equal or almost equal probability with a safe opinion, but that when it is a matter of the cessation of law, the less safe

⁴⁸ *Ibid.*, pg. 97-100.

⁴⁹ Lehmkuhl, A., *Theologia Moralis*, Vol. I, Herder, Friburgi Brisgoviae, MDCCCXCIII, pg. 59, “In illo dubio sufficit et requiritur, ut sentential libertati favens sit *probabilior, quam opposita* – en axioma *Probabiliorism*”.

⁵⁰ Lehmkuhl, A., *Theologia Moralis*, Vol. I, Herder, Friburgi Brisgoviae, MDCCCXCIII, pg. 59, “In tali dubio sufficit et requiritur, ut sententia libertati favens sit *vere probabilis, seu gravi ratione nixa* – axioma *Probabilism*”.

⁵¹ Harty, J.M., *Catholic Encyclopedia*, catholicity.com, The Mary Foundation, 1996-2007, <http://www.newadvent.org/cathen/1244a.htm> [18.08.2007].

Davis, H., *Moral and Pastoral Theology*, Vol. I, Sheed and Ward, London, eight edition, 1959, pg. 82-85.

⁵² Lehmkuhl, A., *Theologia Moralis*, Vol. I, Herder, Friburgi Brisgoviae, MDCCCXCIII, pg. 59, “In illo dubio sufficit et requiritur, ut sentential libertati favens sit *aeque probabilis, atque opposita* – axioma *Aequiprobabilismi*”.

opinion cannot lawfully be followed unless it is more probable than the safe view⁵³. This means that three prepositions are extant. First, if the question is the existence of a law, then one may follow an opinion in favour of liberty. Second, if the question is the cessation of law and equal (or nearly) probable opinions are in conflict, then the law is in possession and must be obeyed. Third, when the opinion in favour of a law is surely more probable than the contrary, it must be followed over the opinion in favour of liberty⁵⁴.

This teaching was developed in the eighteenth century by Alphonsus Maria Liguori⁵⁵ after refuting probabiliorism and later probabilism. It was declared in 1831 by Pius XI that his teachings could be “safely” followed and professed and in 1950 by Pius XII as a “safe norm” for the Catholic Church to follow. Aequiprobabilism acknowledged the principle on the one hand that *lex dubia non obligat*, and that one may follow a solidly probable opinion, but also acknowledged that a law is really doubtful only when the opinions in favour and against are evenly balanced⁵⁶.

Davis⁵⁷, states that in aequiprobabilism, there are also inherent defects, the most obvious being in the third preposition that “a greater probability more nearly approaches the truth”, but degrees of probability are not degrees of truth and that often in the past, the more probable opinion was later found to be false. The second

⁵³ Harty, J.M., *Catholic Encyclopedia*, catholicity.com, The Mary Foundation, 1996-2007, <http://www.newadvent.org/cathen/1244a.htm> [18.08.2007].

⁵⁴ Davis, H., *Moral and Pastoral Theology*, Vol. I, Sheed and Ward, London, eight edition, 1959, pg. 86-87.

⁵⁵ De Liguorio, A.M., *Theologia Moralis*, Tomus Primus, tract. I, c. 3, no. 55 *et seq.*, “Dico II^o quod si opinio qua stat pro libertate, est tantum probabilis, vel aequae probabilis ac altera quae stat pro lege, nec etiam ipsam quis sequi potest, eo quod sit probabilis. Nam ad licite operandum sola non sufficit probabilitas; sed requiritur moralis certitudo de honestate actionis, juxta illud B. Pauli ad Rom. (xiv): *Omne autem quod non est ex fide, peccatum est. Dicitur ex fide* S. Chrsostomus, S. Ambrosius et alii cum S. Thoma. – Propterea falsum reputo effatum illud commune inter probabilistas, nimirum: *Qui probabiliter agit, prudenter agit.*

⁵⁶ Mahoney, J., *The Making of Moral Theology*, Clarendon Press, Oxford, 1987, pg. 142-143.

preposition also seems to bring in some confusion as to the difference between cessation of a definite law and the actual existence of a law ‘*ab initio*’, as in both cases human liberty is always in possession, even if the law has probably been rescinded. It is the certainty of law that curtails possession of liberty, with the burden of proof lying upon the law! He further accepts however that each of both systems is openly taught and has its adherents, although the tendency in modern times is towards the gentler and more liberal system: “*Quod si res dubia est, vincat humanitas et facilitas*”⁵⁸. Humanity and gentleness should carry the day in doubtful matter!

6.3.4 Compensationism

Compensationism⁵⁹ is the most recent addition to the three systems and is an effort at reconciliation of the systems above, where human prudence should guide one in doubt. It effectively contains two notable points. The first being that the degree of probability of various opinions has to be balanced by the importance of the law. Second, the importance of law compared to the lesser degree of probability of the less safe opinion, should be balanced by a proportionally compensating utility for the act⁶⁰. This system is analogous to the principle of double effect⁶¹ where there is one

⁵⁷ Davis, H., *Moral and Pastoral Theology*, Vol. I, Sheed and Ward, London, eight edition, 1959, pg. 86-88.

⁵⁸ *Ibid.*, quoting St. Gregory Nazianzen

⁵⁹ Prümmer, D.M., *Manuale Theologiae Moralis*, Tomus I, Herder, Barcinone, 1958, pg.15. “Systema nova compensationis seu rationis sufficientis vult limites legis dubiae obligantis aliter definire. Strenuo defendit contra Probabilismum, legem dubiam aliquo (liceat imperfecto) modo obligare. Contra Probabilioristas autem legi dubiae non vindicant tantam obligationem, quantum habet lex certe cognita. Obligatio enim legis mensuranda est ex gradu cognitionis, ideoque lex certe cognita obligat perfecto modo; lex penitus ignota nullo modo obligat; lex autem imperfecto modo cognita, imperfecte obligat. Proinde per se non licet agere contra legem imperfecte cognitam, quia est lex dubia. Nihilominus facile accidere possunt casus, in quibus adsunt gravia motiva agenda contra legem dubiam, e. gr. Poenitens favens puro Probabilismo absolute vult sequi sententiam probabilem, relicta probabiliori, vel si sententia benigna probabilis est magis proficua pro spirituali salute poenitentis quam sententia probabilior, visis omnibus circumstantiis. In huius modi casibus remanet periculum, legem saltem materialiter transgredienti. Iamvero cum etiam materialis transgressio legis sit aliquod malum, non licet se tali periculo exponere sine sufficienti ratione. Hinc in tali casu adhibenda sunt principia de cooperatione ad malum vel potius de voluntario indirecto”.

⁶⁰ Harty, J.M., *Catholic Encyclopedia*, catholicity.com, The Mary Foundation, 1996-2007, <http://www.newadvent.org/cathen/1244a.htm> [18.08.2007].

good effect and one bad, caused by the same action. In this case there is a good effect which balances a *doubtful* effect in a case where there is doubt whether liberty or the law is in possession. This system has been criticized as it actually opens the way towards tutorism, as it gave support to the belief that following a serious doubtful law (safer) had an advantage over following a less serious doubtful law (less safe). Also one is presumptuous to state that compensationism is a prudent system, when all the previously described three systems are all an exercise in the virtue of prudence including the more liberal system of probabilism⁶².

6.4 Certainty and Types of Doubt

A certain conscience mandates certainty as to the conclusions which one draws as to the morality of a particular concrete act. If one bases one's certainty on evident principles, then one is said to be *absolutely* certain. If it is based on apparently good reasons or on sufficiently good authority that exclude prudent doubt, then it is said to be *perfect* moral certainty. When neither absolute nor perfect moral certainty may be obtained, one must sometimes be satisfied with *imperfect* moral certainty where the use of reflex principles removes any practical incertitude and converts it to practical certainty which is *imperfect* where a mistake is quite possible but not likely⁶³.

⁶¹ Prümmer, D.M., *Manuale Theologiae Moralis*, Tomus I, Herder, Barcinone, 1958, pg.15. "Ponitur enim causa, ex qua sequitur duplex effectus, alter bonus scil. Libertas in actione, alter malus, nempe periculum transgredienti saltem materialiter legem. Inter condiciones autem requisitas ad cooperationem vel ad voluntarium indirectum requiritur gravis et proportionate causa. Quo maior effectus malus praevisus est, eo maior causa excusans requiritur. Quare ad sciendum, num contra aliquam legem dubiam agree liceat in casu particulari, sequendo opinionem minus probabilem, relicta probabilior, pensanda est gravitas legis et probabilitas opinionis oppositae.. Quo gravior est lex et quo probabilior est eius obligation in casu actuali, eo major requiritur causa excusans".

⁶² Davis, H., *Moral and Pastoral Theology*, Vol. I, Sheed and Ward, London, eight edition, 1959, pg. 113-115.

⁶³ Davis, H., *Moral and Pastoral Theology*, Vol. I, Sheed and Ward, London, eight edition, 1959, pg. 69.

There are many sub-definitions of doubt, and it would be useful to clearly classify some of these definitions which I have already referred to above. A clear taxonomy of these definitions, will further help us resolve the matter in hand.

Positive doubt is where there are comparatively sufficient reasons both in favour and against a particular dilemma and therefore both points of view are balanced. In *negative* doubt, there are no overtly valid arguments against a particular position with quasi-conclusive but still doubtful good arguments in its favour⁶⁴. Other authors argue that very often in a negative doubt, grave discernible arguments are missing on both sides of an argument⁶⁵. Therefore in a general sense, negative doubt may be resolved in moral certitude, after appropriate attention has been given and no valid contrary arguments are discovered to a specific mode of action⁶⁶. Therefore positive doubt may be termed as *serious* doubt, while negative doubt may be described as *slight* doubt⁶⁷.

Doubt is further classified into *speculative* and *practical*⁶⁸. Speculative (or theoretical) doubt is concerned with a rather abstract theoretical truth regarding an ethical or moral issue. It is hypothetical and interpretive. All doubt of law or doubt of obligation due to that law, may be speculative. Not all speculative doubt is doubt of law⁶⁹. Practical doubt or incertitude deals with the concrete resolution of the present action and regards the lawfulness of a conduct presently under consideration. That is

⁶⁴ Häring, B., *The Law of Christ*, Vol. I, Mercier Press, Cork, 1963, translation of original in German *Das Gesetz Christi*, 1959, pg. 171.

⁶⁵ Vidal, M., *Manuale di Etica Teologica*, Vol.I, Cittadella Editrice, Assisi, 1994, pg. 604.

⁶⁶ *Ibid.*

⁶⁷ Delhaye, P., *The Christian Conscience*, Desclee Company, New York, 1968, pg. 215.

⁶⁸ Aertnys-Damen, *Theologia Moralis*, Tomus I, Marietti, Torino, 1947, pg. 81, “In dubium *speculativum*, quod spectat *rei veritatem in seipsa consideratae*,*et practicum*, quod spectat operis *exercitium*”.

⁶⁹ Tauer, C.A., ‘The Tradition of Probabilism and the Moral Status of the Early Embryo’, *Theological Studies*, 45, March 1984, Marquette University, Wisconsin, pg. 27.

consideration of the act ‘here and now’ before me⁷⁰. It is never permissible to act if there is a practical doubt, that is practical incertitude, but if there is a speculative or theoretical doubt one can still act with practical certitude by applying reflex principles of moral conduct to the difficulty⁷¹.

Does this theoretical doubt carry with it a practical doubt which would preclude the action? Not necessarily, if I can substitute for the theoretical certitude of the solution of the case the certitude of tested principles of action...⁷².

A doubt of *law* (*dubium iuris*)⁷³ exists where there is doubt as to the application and scope of a particular law including the “meaning, extension, existence, or cessation of a law”⁷⁴. A doubt of *fact* (*dubium facti*), “deals with the existence (or not) of an (empirical) fact to which the law must be applied”⁷⁵, (words in parentheses are my additions) that is regarding concrete facts⁷⁶ from which an obligation arises because of a command which is certain and conferring an obligation⁷⁷. It is concerned with the performance or not of a particular act relating to the fulfillment or nonfulfillment of the law⁷⁸.

⁷⁰ Häring, B., *The Law of Christ*, Vol. I, Mercier Press, Cork, 1963, translation of original in German *Das Desetz Christi*, 1959, pg. 171.

Vidal, M., *Manuale di Etica Teologica*, Vol.I, Cittadella Editrice, Assisi, 1994, pg. 603.

⁷¹ Delhaye, P., *The Christian Conscience*, Desclee Company, New York, 1968, pg. 221.

⁷² *Ibid.*, pg. 221.

⁷³ Aertnys-Damen, *Theologia Moralis*, Tomus I, Marietti, Torino, 1947, pg. 81, “In *dubium iuris*, quando dubitatur de aliquot praecepto vel obligatione: et *dubium facti*, quando de facto aliquo dubitatur”.

⁷⁴ Roberti, F. Cardinal, Palazzini Pietro, *Dictionary of Moral Theology*, Burns and Oates, London, 1962, pg. 432.

⁷⁵ *Ibid.*

⁷⁶ Häring, B., *The Law of Christ*, Vol. I, Mercier Press, Cork, 1963, translation of original in German *Das Desetz Christi*, 1959, pg. 180. “...*factum nonpraesumitur, sed probari debet*, a fact, an act or action, may not be legally ‘presumed’ to exist or have taken place, but must be demonstrated”.

⁷⁷ Häring, B., *The Law of Christ*, Vol. I, Mercier Press, Cork, 1963, translation of original in German *Das Desetz Christi*, 1959, pg. 175.

Roberti, F. Cardinal, Palazzini, Pietro, *Dictionary of Moral Theology*, Burns and Oates, London, 1962, pg. 432.

Vidal, M., *Manuale di Etica Teologica*, Vol.I, Cittadella Editrice, Assisi, 1994, pg. 604.

6.5 The Application of Reflex Principles to the Case under Review

In the case under review, we are considering the matter when human life actually begins, that is the philosophical and biological point that is commensurate with the existence of a human life with the natural rights that go with such a statement of fact borne out of an accepted body of natural and positive law. In the previous chapters, I have taken the liberty to delve into detail into the biological and philosophical aspects that lead one to consolidate the opinion as to when human life starts to exist. In the penultimate chapter to this, I have argued against using a dichotomy between the concept of the human being, and the concept of personhood, using classical and innovative reasons to throw light on the matter. The resolution of the present problem will accept that both these concepts mentioned begin to exist at one and the same time and there will be no gradatory attempt in dealing with the present dilemma.

Delving in detail into the position of the beginning of human life, leads one to narrow conclusions as to when this actually begins. However one is still left with a certain doubt! Granted in this case the doubt has been narrowed substantially, but still present. How does one go about resolving a doubt on the beginning of human life especially where more than one effect is precipitated by one's action? There is here doubt, but doubt on human life. This brings in a number of important considerations. What is actually in doubt affects the nature of an act where one has to act in a situation concerned with probable human life. I am not contesting the norm here, the norm being the preservation of human life attested to by every legal and fundamental law known to man and commanding quasi-absolute and fundamental respect. However having considered the scientific and philosophical aspects, I still have some small doubt as to whether the matter (cell) that I am dealing with at penetration is

⁷⁸ Tauer, C.A., 'The Tradition of Probabilism and the Moral Status of the Early Embryo', *Theological*

actually certain empirical human life. I have in effect, at this point in the thesis, formed a probable opinion. In my analysis it is not only a probable opinion, but a highly more probable opinion, the very least to my mind, it being an equiprobable one.

Does this entitle me to put my mind at rest as to the nature of the moral act had I to decide to dispense with the matter in hand? Am I entitled to use casuistry to solve this problem and proceed with the act? How am I to be ethically justified in proceeding with an act that may involve the sacrifice of a human life? As we have already seen above, the use of most of the casuistic principles mentioned are circumscribed by the fact that we are here dealing with human life. In matters regarding human life, all books underline the fact that one must choose the safer option. Human life is so important that a probable opinion here is just not morally acceptable. If the biological matter before us is a human life, then his or her fundamental rights are already in possession and if human life is a fact in this case, then there is no incertitude as to the obligation of the actor and as to the possession of the rights of the human being. If the presence of a factual empirical human life is in doubt, then there is no other way but to apply the principle of tutiorism and refrain from action harming that life⁷⁹. Even a probabiliorist opinion is considered unsafe in this case.

Where it is a question of probable danger only, probabilities would have to be measured; where it is a question of manifest danger, law is already in possession and urges its claims here and now. There is no room for

Studies, 45, March 1984, Marquette University, Wisconsin, pg. 17.

⁷⁹ Kirk, K.E., *Conscience and its Problems-An Introduction to Casuistry*, James Clarke & Co, Cambridge, 1948, pg. 270-275. There is here a recollection of the rules laid down by Innocent XI in 1679 regarding the exceptions when tutiorism, must be enforced. Kirk is an Anglican Bishop.

probabilism (reflex principles)⁸⁰ in such cases, because the obligations are not doubtful⁸¹.

In such cases, since the obligation already exists *a priori*, and is not uncertain, therefore one has to be sure by applying the safest way in the application of ethical principles⁸². One cannot act out of practical incertitude and must resolve doubt into practical moral certainty.

Taking the concrete example of doubt in the classical hunter and the bush example with an unknown being hidden behind it, the hunter's incertitude boiling down as to whether the object is really a subject in possession of rights (man) or any other animal without such rights, he has no choice but to refrain from shooting. If the object is a man, then he surely is in possession of his rights, one of which is the right to life. If he is in possession of his rights, then there is a clear obligation for one to respect those rights even if one is more probably sure that it is a beast not a man. In these cases there are manifest obligations which already exist, and therefore there is no incertitude as to the obligations, which means that the hunter is obliged not to act out of incertitude and therefore one must desist from shooting. If there is even the slightest possibility that it is a man, one must not shoot!

6.6 *Doubt of Fact or Doubt of Law?*

As we have seen, when the proverbial hunter above comes across his dilemma, he should not shoot because there is in this instance, a practical doubt of fact. If there is a human being behind the bush, then that human being is in full possession of his right to life *a priori* and the hunter has the ethical obligation to respect that right. In this

⁸⁰ My parenthesis.

⁸¹ Davis, H., *Moral and Pastoral Theology*, Vol. I, Sheed and Ward, London, eight edition, 1959, pg. 97.

⁸² *Ibid.*, pg. 99-100.

case the tutioristic principle mentioned earlier applies because it is doubt about factual human life.

Let us first try to resolve the question from one particular angle. The principle that factual doubt may on occasion be converted to legal doubt is borne out by many opinions. Once this is the case, then the matter under review is well on its way to qualifying for a probable opinion. There are several references which show this to be the case which dispel any improbable opinion. Philippe Delhaye states that if for example, one does not know whether a particular type of food is allowed to be eaten on a particular day of abstinence which constitutes a doubt of fact, then this will lead to the dilemma whether one is obliged to eat this particular food or not which constitutes a doubt of law.

In some cases, we must remember, a doubt of fact becomes a doubt of law, for because of the doubtful fact, we do not know whether the law applies⁸³,

McHugh and Callan also argue that by recourse to an argument that is similar to the food problem above, if the food before them is probably lawful (doubt of fact), then the legislator, in this case the Church, would not want the law to oblige (doubt of law) so as not to put the individual through the trouble and expense of ordering more food. Another example they bring is that when one is obliged by the law to say certain prayers, and one has serious reason to think that these prayers have been said (doubt of fact), then one is not obliged (doubt of law) to say these prayers again

Probabilism is used not only in probability of *law*, but also in probability of *fact* that can be reduced to probability of law⁸⁴.

also,

⁸³ Delhaye, P., *The Christian Conscience*, Desclee Company, New York, 1968, pg. 215.

⁸⁴ McHugh, J.A., Callan C.J., *Moral Theology-A Complete Course*, Vol.I, Joseph F. Wagner, Inc, New York, 1958, pg. 265.

[i]n other cases one may change the probability of fact into a probability of law by recourse to a probable opinion or argument that under the existing doubt of fact the legislator does not wish the law to oblige⁸⁵.

In the *Dictionary of Moral Theology*, Roberti and Palazzini also state clearly that a doubt concerning law, conditions the obligation, but a doubt concerning an undeniable fact, not affecting the very nature of that same fact, does not make one certain that one is fulfilling the law (and often in important issues such as with human life, one has to err on the side of caution and safety). However if the doubt regards the very nature of the existence of the very fact itself, where the fact itself is a condition for the obligation derived from the law, there is no certainty that the moral obligation exists with respect to that particular law.

A doubt concerning the existence of a law affects the obligation itself, which cannot become a moral obligation unless the individual is aware of it. Nevertheless, a doubt concerning a fact does not affect the nature of the fact and, hence, it does not make us certain that we are fulfilling the law....But if the fact is a condition for the obligation itself, the doubt of fact resolves itself into a doubt of law; thus there is no certainty that a moral bond exists⁸⁶.

Antonio Rosmini speaks about the true title of obligation in law. He makes it very clear that in circumstances that affect the true title of the law, the law itself then has no actual bearing and there is doubt as to its existence. Title of law is a very important concept in its promulgation, and if the title falls, so does obligation. Doubt as to the essential nature of a fact itself is not like doubt of the presence or not of an established fact, where there is doubt as to whether the fact is simply present or not. If the fact is present the law exists. Doubt as to the very nature of the existence of the particular fact required by law, changes or challenges the title of law and therefore removes the obligation from that law.

⁸⁵ *Ibid.*, pg. 263.

⁸⁶ Roberti, F., Cardinal, Palazzini, P., *Dictionary of Moral Theology*, Burns and Oates, London, 1962, pg. 1198.

Sometimes our doubt is not about the existence of a positive law but about the existence of some fact which is a condition of the law's obligation...It is clear therefore that I cannot apply a law as long as I lack certainty and reliability about the...facts...In the case of circumstances which constitute a true title of obligation, uncertainty about the title, in my opinion removes the law⁸⁷.

However this is clearly not the case in the example before us concerning doubt as to ensoulment at the beginning of human life and the doubt of fact clearly cannot in this case be converted into a doubt of law. The big question to be begged in this particular case is whether the matter before us presents itself as a doubt of fact or as a speculative doubt of law, and whether the fact itself can be empirically demonstrated!

What if one had to look at the issue from another angle, since the doubt concerned is not an actual empirical fact, a fact⁸⁸ being one that can be empirically proven, but only a probable metaphysical theory, one that is still hypothetically or theoretically presumed? It is important to note that when attempts were made in the past to include facts as going beyond the empirical to include the theoretical, this led to conceptual confusions⁸⁹. Does a doubt of theory or hypothesis, which can never be empirically demonstrated, be considered as a doubt of fact? Could it be that besides doubts of fact and doubts of law, a third category that of a *doubt of theory*, could be helpful⁹⁰.

⁸⁷ Rosmini, A., (1797-1855), *Conscience*, translated by Denis Cleary and Terence Watson, Rosmini House, Durham, 1989, pg. 332-335. Quoting Alphonsus Maria Liguori, "We must note that in this case, the fact itself...furnishes the obligation of the law, which is true of any title whatsoever – it is not simply a fact occasioning a law which already binds of itself".

⁸⁸ In this case, fact would have to mean something that can be verified according to an established standard of evaluation, an objective and verifiable observation in contrast to a hypothesis or theory, which is intended to explain or interpret facts, <http://en.wikipedia.org/wiki/Fact> [12.05.2007]. In the article entitled "Facts and Empirical Truth", in the *Canadian Journal of Philosophy* 3 (1973) 201, Frederick Suppe defines facts by saying that "facts are what empirically true propositions state or assert about the world".

⁸⁹ Tauer, C., 'Probabilism and the Moral Status of the Early Embryo', in Beattie Jung, P., Shannon, T.A., *Abortion and Catholicism – The American Debate*, Crossroad, New York, 1988, see pg. 70 – 71.

⁹⁰ *Ibid.*, pg. 70 – 71.

Many of the prepositions of natural science are theoretical in nature; they are devised and tested as causal explanations of empirical regularities. Analyses of theory in the scientific context suggest that metaphysical and often religious propositions belong in this category, since they too are devised as explanations of phenomena that are observed⁹¹.

Catholic moralists have not in the past attempted to define a fact, as it seems that the concept was self elucidating. The evidence available to us to judge what they meant by ‘fact’ are their own examples which all appear to involve “empirically verifiable states of affairs”, thus rendering it “consistent with the tradition to claim that the doubt about the time of ensoulment of the human embryo is not a doubt of fact”⁹². In Aristotelian terms, doubt of human ensoulment, could be a doubt between two composites which are of a totally different nature, only one of which is human. It could be a doubt between the different possible forms (vegetative or rational) of the same matter or else it could be doubt about the time when a human form informs matter so as to form the human composite. Consequently doubt as to form would be purely metaphysical.

Could one ask if whether perhaps not even a doubt of law may ever be resolved by reflex principles if the question of a human life were to be involved? The moral philosophers of the Catholic tradition of the past and also the church’s magisterium, have recognised the use of reflex principles where a doubt of law was concerned, and where this doubt of law concerned a right to human life or a basic human life was concerned. Two glaring examples are the justification of castration of boys to

⁹¹ Tauer, C., ‘Probabilism and the Moral Status of the Early Embryo’, in Beattie Jung, P., Shannon, T.A., *Abortion and Catholicism – The American Debate*, Crossroad, New York, 1988, pg. 71.

⁹² Tauer, C., ‘Probabilism and the Moral Status of the Early Embryo’, in Beattie Jung, P., Shannon, T.A., *Abortion and Catholicism – The American Debate*, Crossroad, New York, 1988, see pg. 72, also pg. 71.

preserve a high pitch in religious choirs and the other being the acceptance of sorts of slavery that were accepted⁹³.

Let us go back a step. Usually, once a practical doubt of fact can be converted into a doubt of law, then it may be reduced to speculative doubt and consequently principles of reflex may be applied to resolve the doubt and one may act out of moral certitude.

Probabilism is used in probability of law, whether the law in question is *natural, divine or human* – that is in every case of law where invincible ignorance is possible⁹⁴.

However in any particular case where the doubt is one of fact *which concerns human life*, we have seen that it cannot be converted to a doubt of law.

The question about when human life begins and the point when an ovum representing uninformed physical matter becomes ensouled or informed in order to become a human being, is essentially a metaphysical hypothetical matter. It is a matter which is not empirically factual within the spatiotemporal world but one which deals with the metaphysical aspect of man⁹⁵. It deals with theory rather than fact. Facts are what empirically true propositions state or assert about the world⁹⁶. Since it is my belief, that the existence of the metaphysical form and physical matter constituting human organismic nature begin to coexist contemporaneously, there is a point, in my opinion reached after syngamy has occurred, when there is no further doubt as to the existence of an empirically factual human organism or being. Therefore to maintain

⁹³ *Ibid.*, pg. 72 – 73.

⁹⁴ McHugh, J.A., Callan C.J., *Moral Theology-A Complete Course*, Vol.I, Joseph F. Wagner Inc., New York, 1958, pg. 265.

⁹⁵ Tauer, C.A., ‘The Tradition of Probabilism and the Moral Status of the Early Embryo’, *Theological Studies*, 45, March 1984, Marquette University, Wisconsin, pg. 22 - 23.

⁹⁶ *Ibid.*, pg. 22, quoting Frederick Suppe from ‘Facts and Empirical Truth’, *Canadian Journal of Philosophy*, 3 (1973) 201.

consistency with myself, once this empirically measurable point in physical development is universally recognised, then one must also assume that the metaphysical component of form has at this stage informed matter! As we have seen however, prior to this point in physical development, doubt about metaphysical theory could be converted from the theoretical or hypothetical to the legal realm. However once the existence of the physical principle of human nature is universally recognized as an empirically definable human organism, then in my opinion, this marks the point of no return, where doubt concerning human life, cannot be converted now from one of empirical fact to one of theory and then one of law, since the fact now can be demonstrated empirically.

In the question as to the time of ensoulment of a human being, where there is uncertainty whether a particular living being is indeed human, this becomes morally relevant because keeping in mind the law that one should not kill, there is an attempt to specify the *scope* of the said law. The theoretical question about the ensoulment of the embryo is equivalent to the moral question about the scope of the law which forbids killing and hence therefore the doubt of theory is converted to a doubt of law.

The theoretical doubt about the existence of a subject translates into uncertainty about rights and hence into a doubt of law⁹⁷.

If the issue being considered were a doubt of human fact, then given that the matter concerns human life, it may not be converted to a doubt of theory and then a doubt of law as shown above and one may not apply the reflex principles discussed above because then one considers the law to be in possession and there is the corresponding

⁹⁷ Tauer, C., 'Probabilism and the Moral Status of the Early Embryo', in Beattie Jung, P., Shannon, T.A., *Abortion and Catholicism – The American Debate*, Crossroad, New York, 1988, pg. 74 – 75.

obligation not to harm that particular life⁹⁸. In that case it would be a probable opinion about human life. Tutorism here has to be applied as considered above. If the individual behind the bush is human, not beast, then he is definitely in possession of his rights. One should not proceed in this case. If there were to be a human being, he/she would be doubtless, a human being, the human nature of which is without doubt, empirically proven and not questionable.

But what if behind the bush lays not the possible existence of a human being, but a metaphysical theory about the hypothetically debatable beginning of human life, “a doubt on a point of metaphysical theory”⁹⁹. Not therefore a probable opinion on human life, but a probable opinion on a theory of *probable* ensoulment of matter by a formal cause to call a human life into act.

As for any obligation to adopt a tutorist position,...it is fallacious moral argumentation to apply this form of casuistic reasoning to the scientific question: the classical tutorist position requires that when human life is at stake (and sacramental validity), one must adopt the more safe course, that is the one favouring life. However, in this matter, the precise question is whether a protectable human life is in being. The answer to that depends, I think, on the accumulation of scientific evidence regarding oogenesis, embryogenesis, etc. If a good scientific case can be made that protectable human life can be identified from penetration (which I doubt very much), then the tutorist argument would apply to actions that would or would not endanger it. The tutorist rule applies to actions that probably protect human life, not to protecting probable life. In general I have always thought that the invocation

⁹⁸ McHugh, J.A., Callan C.J., *Moral Theology-A Complete Course*, Vol.I, Joseph F. Wagner Inc., New York, 1958, pg. 263 and 248, “But, even when one holds an opinion as solidly and certainly probable, one may not follow it as a moral guide, if there is something in the nature of the object or matter itself which forbids this. (a) A probability of law favouring liberty may not be followed in those matters in which some natural, divine or human law requires one to follow the safer side”.

⁹⁹ Tauer, C.A., ‘The Tradition of Probabilism and the Moral Status of the Early Embryo’, *Theological Studies*, 45, March 1984, Marquette University, Wisconsin, pg. 25.

of these tutorist exceptions to an otherwise acceptable probabilism was too easy a way to close off debate on an issue¹⁰⁰.

Therefore there is as referred to above, an hypothetical theory about an object which is not empirically proven yet to be human life and which is therefore in reality, not a fact, not a factual human life. There is a doubt about a metaphysical theory on factual human life. The resolution of the fact would be hypothetical or theoretical and nowhere empirical. It becomes therefore in effect, the only way to resolve the issue. There is here a doubt of theory which can only be transposed into a speculative doubt of law. We know that the law not to kill another human being exists, but we do not know in this particular dilemma, whether the law not to kill, applies to any theory or hypothesis of the many existing! Therefore there remains essentially, simply a pure speculative doubt of law¹⁰¹, because there is here “a question about the existence of a law or about its extension or application to certain specific cases...*factum non praesumitur, sed probari debet*, a fact an act or action, may not be ‘presumed’ to exist or to have taken place, but must be demonstrated”¹⁰².

When the procedures allowed by law do not settle questions about the existence and relevance of rules of law, one may follow the axiom which allows liberty. One’s moral duty is to obey laws, not anything and everything which might be a law; thus, a rule of law which is doubtful does not bind one to obedience¹⁰³.

¹⁰⁰ Personal correspondence on this subject with Albert R. Jonsen, also correspondence with Thomas A. Shannon, Julia Fleming and Carol A. Tauer. [February 2007].

¹⁰¹ Tauer, C.A., ‘The Tradition of Probabilism and the Moral Status of the Early Embryo’, *Theological Studies*, 45, March 1984, Marquette University, Wisconsin, pg. 27. “...the theoretical question about the ensoulment of the embryo is equivalent to a moral question about the scope of the law forbidding killing. The doubt which exists is therefore a doubt of law, an uncertainty about the scope of the natural and divine law against killing. And as we have seen, the Church has traditionally used probabilistic methods in determining the scope and application of that law”.

¹⁰² Häring, B., *The Law of Christ*, Vol. I, Mercier Press, Cork, 1963, translation of original in German *Das Desetz Christi*, 1959, pg. 175 & 180.

¹⁰³ Grisez, G., *The Way of the Lord Jesus*, Vol. I, Franciscan Press, Quincy University, USA, 1997, Ch. 12 Questions B and C.

Since there remains only a speculative doubt of law about a metaphysical theory, it now becomes acceptable to use any of the reflex principles discussed above. Since the norm is a rule of natural (and positive law) and depends for its scope on certain empirical fact, in the case of the doubt regarding a simple hypothesis and therefore being speculative doubt, it can be settled by methods of an interpretation of doubtful law. That is whether the law has scope or not in this case. Not a matter of cessation of law, but of existence or scope of law. The theoretical doubt about the time of ensoulment thus involves a doubt of law, while all doubt of law may be in category, speculative doubt and therefore in this case, one may act on the basis of a probable opinion¹⁰⁴. As we have seen before, one may not act on a practical doubt as this is immorally acting on incertitude. One may however act on a speculative doubt if it is a doubt of law derived from speculative theory or hypothesis by converting it to practical certitude. Because the maxim has been changed from law to obligation, which states that a doubtful obligation does not bind, doubts of speculative and interpretive theory about the beginning of human life are converted into uncertainty of law due to the uncertainty about the theories of ensoulment which may never be empirically proven; they are metaphysical doubts that are in principle unresolvable. This questions one's obligations to heed uncertain law, which means that the obligation to respect uncertain rights does not bind one and therefore there is no forthcoming obligation to uphold any *a priori* rights to an uncertain theory regarding metaphysical form actively informing passive matter in order to bring a human being into existence.

¹⁰⁴ Tauer, C.A., 'The Tradition of Probabilism and the Moral Status of the Early Embryo', *Theological Studies*, 45, March 1984, Marquette University, Wisconsin, pg. 27, "the theoretical question about the ensoulment of the embryo is equivalent to a moral question about the scope of the law forbidding killing. The doubt which exists is therefore a doubt of law, an uncertainty about the scope of the natural and divine law against killing".

6.7 *The Application of Reflex Principles to the Human Embryo.*

Having ascertained that the specific doubtful issue under review is not a case of a doubt of fact, but is rather that of a doubt of law, it now becomes possible to apply casuistic principles to the issue and therefore be able to determine the nature of the moral act. It must be emphasized that adequate recourse to resolving the issue scientifically and philosophically as far as possible has been undertaken. My belief strongly inclines towards the position that the human being exists from the moment of syngamy and although I am not absolutely certain, I can resolve my theoretical doubt by applying certain casuistic principles.

First of all I have ascertained in the previous chapters, that the opinion which I hold, is not an improbable one, but a solidly probable one based on both intrinsic and extrinsic arguments. Incertitude has been eliminated and I am able to act on a probable opinion with ethical certitude. The natures of both arguments lead me to conclude that it is the more probable opinion even though it is not in favour of the obligation to law but of liberty.

If my preferred reflex principle would be that of probabiliorism, then I am able to hold that human life begins at syngamy because, the opinion I hold in favour of liberty is more probable than the opinion in favour of the legal obligation. If the system I prefer would be that of aequiprobabilism, then I am entitled to the above opinion in favour of liberty, because it is at least equally probable to the opinion in favour of the obligation. Since the issue at stake, as we have observed above, regards the actual existence *ad initio* of an obligation, not the cessation of an existing obligation, liberty is in possession, and therefore I am free to hold my indicated opinion. Ethical rectitude is also in place if I choose to apply the principle of

probabilism, because this allows me to apply a less solidly probable opinion in favour of liberty over a more solidly probable opinion in favour of the obligation, which is not the case here because I believe that the opinion in favour of liberty is the more probable. However even if, for the sake of the argument, I had to hold that my opinion was less probable but still solidly probable, then I would still be morally justified in sticking to that same opinion. Truth does not depend on an argument being more or less probable and often less probable arguments have been found to be true as time unfolds and new knowledge becomes available.

Some authors in fact suggest that the best way forward, is to approximate the truth as far as is possible by asking which judgment is more likely true, irrespective of whether it is restrictive in its outcome or not¹⁰⁵, and follow this position with responsible commitment. This argument is of course probabiliorist. Others suggest that judgments of liceity should be augmented by judgments of prudential expediency prioritizing both the intention and the circumstances surrounding the person who is about to act¹⁰⁶.

This leaves us with compensationism, which allows one to adopt a less solidly probable opinion in favour of one which is more probable as long as there is a compensating grave and proportionate cause. In my position which holds that human life begins at syngamy, which I consider more probable, the system of compensation does not apply, as my opinion I hold to be more probable, however, if, for the sake of the argument it were to be less probable, one would have to offset this against compensating proportionate reasons, which as I shall delve into, shortly, I believe

¹⁰⁵ Grisez, G., *The Way of the Lord Jesus*, Vol.I, Franciscan Press, Quincy University, USA, 1997, Ch. 12 Question D.

¹⁰⁶ Delhaye, P., *The Christian Conscience*, Desclee Company, New York, 1968, pg. 245-254.

there are. I must add at this juncture that my preferred method of solving a problem of ethical doubt is probabilist if I am hard pressed to take a decision when time or information is not available to allow me to go deeper into the issue. In the case where I would have the time and possibility to gather the relevant information, I would then solve an ethical problem preferably through the system of equiprobabilism.

I must also add, after having considered all the issues, that solving the issue of when human life begins is only possible when using reflex principles, as to the doubt whether or not a human being exists, but not where one holds the possibility of the definite existence of the human being as a species but not yet the existence of human personhood. This leads to the so called reductionist or gradatory views of human development. The reason being, as was stated in *paragraph 6.6*, that a query as to the objective existence of a human being is a doubt of theory which can be converted to a doubt of law. There is a doubt as to the theory about the beginning of a factual physical human being. There is a doubt as to prior obligation. Therefore there is speculative doubt of law and reflex principles apply. If however, the human being is taken to exist as a physical animal species, but one questions whether the human person exists, then there is no longer a doubt of fact resolving itself into a doubt of law, but solely a doubt of fact. An empirical human being exists in fact, the doubt is whether it is as yet a person and therefore is a subject of human rights. There is here no doubt of prior obligation if personhood exists, just a factual doubt. Is the human zygote which definitely exists as a human being, meritorious of the respect granted to human persons?

The same dilemma is faced by the hunter as whether the object behind the bush deserves respect as if it was a human subject or not. If it was a human subject (no

dichotomy between subjectivity and objectivity here) then factually there is no doubt that it deserves respect and therefore one is obliged not to shoot. A doubt of fact where human life is concerned obliges one to adopt a tutorist ethical position. There is certitude of rights and obligations. The same analogy applies in the argument for personhood. There is a doubt of fact of personhood or subjectivity concerning factual objective empirical human life. There is a probable opinion on human personhood. Therefore since factual human life is concerned there is a prior obligation and the doubt of fact cannot be resolved into a doubt of law. In the original case of the hunter and the bush, the doubt about the presence of human life also concerns factual human life without a doubt as to the nature of that human life. If a human being existed there, he or she would certainly be in full possession of their rights. In the case of doubt of personhood, if a person is present, then he/she would be in full possession of their rights. Both these cases present as prior obligations for factual human life. If a human being is present behind the bush, he must be protected. If disputed personhood is present in a human being, it has to be protected, obligations are not doubtful but certain. Since factual human life is concerned, the tutoristic principle should be applied, and no reflex principles are possible. The casuistic principles do not apply where there already is a certitude of obligation. In the case of when human life begins, there is not a doubt about human life, but a doubt about *probable* metaphysical theories regarding the initiation of human life, or *doubtful* metaphysical hypotheses on the beginning of human life. Therefore the law itself is doubtful as to existence and the obligation is therefore doubtful and therefore reflex principles may be allowed as described in *paragraph 6.6*.

Notwithstanding that all reflex principles have never been denied by the Catholic theological tradition, some would draw attention to the passage in *Evangelium Vitae* where it is written that,

from the standpoint of moral obligation, the mere *probability* (my italics) that a human person is involved would suffice to justify an absolutely clear prohibition of any intervention aimed at killing a human embryo¹⁰⁷.

One could surmise from this paragraph that the use of probability or other reflex principles, to solve doubts around the question of when human life begins, would be out of place as the tutioristic principle seems to be applied in this case. However, one cannot take this second paragraph of verse sixty of *Evangelium Vitae*, out of context when compared to the first paragraph. In the first paragraph it is made clear that what the writer's intentions are, specifically refer to the situation *after* fertilization has occurred and not in establishing the point when fertilization is complete and where there is the first existence of the zygote. The writer is referring to the other problem disassociating the human being from human personhood, not pinpointing the problem where the question begs theories or hypothesis regarding the beginning of human life. In fact it is stated at the end of the first paragraph, "how could a human individual not be a human person"?¹⁰⁸ It is absolutely misleading on reading the second paragraph, to detach it from the context meant in the first paragraph¹⁰⁹, and therefore as explained above, this leaves the way open for casuistic principles to be applied to the doubt surrounding the beginning of the human being.

¹⁰⁷ John Paul II, *Evangelium Vitae*, Libreria Editrice Vaticana, 1995, para. 60.

¹⁰⁸ *Ibid.*

6.8 Perplexity

In both problems of doubt and perplexity, one is uncertain as to the correct ethical norm or acceptable standard to follow. Whereas in doubt one hesitates about acting on a principle which has arguments both in its favour and against, in perplexity, one is placed between *two* alternatives, both of which are intrinsically evil¹¹⁰. I would add at this point that one should be forced to choose between one of these alternatives because of circumstances, but not fall on these two alternatives as a matter of choice¹¹¹, “we are shut up to an absolute choice between two evils; no other alternative is possible, no other open; one or other must be chosen”¹¹². It is not an application of the double effect principle of ethics, one action with two effects one good and one bad. We have here two separate possible actions, both with evil consequences and one must choose, often with great difficulty which is the course of action which comprises the lesser evil (or the greater claim). Alphonsus Maria Liguori recognized this in his writings as there here are two evil possibilities involved, while in doubt there is only one¹¹³. Some people however dispute this and state that there is never the necessity to do wrong and the choice to be made between two moral evils never arises simply boiling down the issue to specific circumstances¹¹⁴. *Kirk* however thinks that the two issues of doubt and perplexity are

¹⁰⁹ Leone, S., ‘La Questione Dell’Ootide: Evidenze Scientifiche e Valutazioni Bioetiche’, *Rivista di Teologia Morale*, Vol. 28, No.149, 2006, , pg. 89-100.

¹¹⁰ Kirk, K.E., *Conscience and Its Problems, An Introduction to Casuistry*, James Clarke and Co., Cambridge, UK, 1999, pg. 325.

¹¹¹ Roberti, F., Cardinal, Palazzini, P., *Dictionary of Moral Theology*, Burns and Oates, London, 1962, pg. 432.

¹¹² Kirk, K.E., *Conscience and Its Problems, An Introduction to Casuistry*, James Clarke and Co., Cambridge, UK, 1999, pg. 333.

¹¹³ Kirk, K.E., *Conscience and Its Problems, An Introduction to Casuistry*, James Clarke and Co., Cambridge, UK, 1999, pg. 388.

¹¹⁴ Davis, H., *Moral and Pastoral Theology*, Vol. I, Sheed and Ward, London, eight edition, 1959, pg. 72 – 73.

best kept separate even though some people try to resolve it into doubt through compensationism¹¹⁵.

6.9 Systems of Ethics

Before I discuss, the specific argumentations as to the application of casuistic principles to practical circumstances such as the issue of the beginning of human life *vis-à-vis* the process of *in vitro* fertilization (IVF), I must declare the ethical base which I will be departing from, in order to consider the ethical difficulties involved. It would be easier to deal with these issues from a so called teleologismic theory of ethics, either the *consequentialist* perspective, where the one act involves two effects and the end justifies the means of an action, or the *proportionalist* perspective, where it is permitted to allow a pre-moral ontic evil to attain a proportionate good¹¹⁶. My point of departure here is based on *natural law* ethics where the intrinsic value of the moral object is maintained although possibly subjectively increased or decreased by the intention or motive of the actor's will and circumstances. Indeed, the whole issue of this thesis is to resolve the matter of doubt about the moral object, in this case it being the respect that should be shown for human life. This I am striving to accomplish not by questioning the norms themselves, but by applying a well supported and long established method of casuistical analysis in the case of resolution of the doubt¹¹⁷.

¹¹⁵ Kirk, K.E., *Conscience and Its Problems, An Introduction to Casuistry*, James Clarke and Co., Cambridge, UK, 1999, pg. 392.

¹¹⁶ Hoose, B., *Proportionalism-The American Debate and its European Roots*, Georgetown University Press, 1987.

6.10 *Applied Ethics of Specific Medical Cases*

It is obvious that while carrying out complicated procedures such as IVF, one will often have to weigh the doubt regarding the point as to the uncertainty of when human life begins with other ethical issues that would be hanging in the balance. I will repeat Karl Rahner's maxim from Volume IX of his *Theological Investigations*, referenced earlier, that "The reasons in favour of experimenting might carry more weight, considered rationally, than the uncertain rights of a human being whose very existence is in doubt"¹¹⁸. I would also like to quote Eberhard Schockenhoff in that,

[one] must therefore expect a priori that the judgement about practical conduct and perceptive acts of the practical reason will have a different status of certainty than the logical conclusions drawn by the speculative intellect. Human knowledge must be content here with the degree of certainty which corresponds to the contingent object it has to regulate....this form of universal practical validity ...is not to be considered a defective mode of the degree of certainty which can be attained by the theoretical reason. The fact that practical judgements are always valid *ut in pluribus* is completely in accordance with their own degree of certainty....They are just as valid as the judgements of the theoretical reason with regard to speculative knowledge¹¹⁹.

In carrying out IVF procedures there are several points where doubt as to the human nature of the biological material, has to be offset against specific consequences. Until recently, one of the biggest problems with IVF dealt with freezing of supernumerary embryos. It is now being solved because new techniques are being developed which

¹¹⁷ Ratzinger, J., Cardinal, 'Bishops, Theologians and Morality' in Beattie Jung, P., Shannon, T.A., *Abortion and Catholicism-The American Debate*, Crossroad, New York, 1988, pg. 300.

¹¹⁸ McCormick, R.A., *The Critical Calling : Reflections on Moral Dilemmas since Vatican II*, Georgetown University Press, Washington D.C., 2006, pg. 343.

allow the freezing of unfertilised ova for future use rather than the freezing of fertilized ova *sive* embryos. Although this procedure is still in the early stages, and eggs are much more fragile than embryos to the freezing and thawing procedure¹²⁰ much progress has been made in this field in these last few years¹²¹. The obtaining of the ova from the ovaries of a female candidate for IVF is a very hazardous procedure. It involves artificial hyperstimulation of the ovaries of the female using hormones with resultant growth in size of the ovaries which may lead to several dangerous medical complications. The withdrawal of the ova from the ovaries also presents a hazardous and painful procedure which involves danger to the organs and the life of the patient especially if state of the art equipment is not used¹²². During the hearings held by the *Permanent Committee for Social Affairs* of the *Maltese Parliament* on Biotechnology including IVF procedures, everyone was particularly moved by one person who gave evidence during the hearings and who had undergone an IVF procedure. She declared quite emphatically that if the new law that was currently being considered was going to force her to go through hyperstimulation of the ovaries once again, because it might have been considering making freezing of embryos

¹¹⁹ Schockenhoff, E., translated by McNeil, B., *Natural Law and Human Dignity: Universal Ethics in an Historical World*, Catholic University of America Press, Washington D.C., 2003, pg. 154.

¹²⁰ 'Egg freezing boosts baby chances', *BBC News*, 19/06/2006, BBC MMVI, <http://news.bbc.co.uk/go/pr/fr/-/1/hi/health/5095096.stm> [20.06.2006].
'Why putting my eggs on ice gives me a new hope for motherhood', *Daily Mail*, 21/08/2007, Associated newspapers Ltd, UK. <http://www.daily mail.co.uk> [22.08.2007].
Templeton, S.K., Watt, H., 'Putting Motherhood on Ice', *The Sunday Times* (UK), 2 September 2007.
Neergaard, L., 'Warning Issued Over Human Egg Freezing', Associated Press, Washington, 23.10.2007, http://ap.google.com/article/ALeqM5j_LDy5T3Ca6AeJVpK17H2gTHGWAg [23.10.2007].

¹²¹ Cobo, A., 'Ongoing pregnancy rates from vitrified eggs as good as those from fresh', *Health and Medicine*, June 30, 2010. See also Noyes N, Porcu E, Borini A., 'Over 900 oocyte cryopreservation babies born with no apparent increase in congenital anomalies'. *Reprod Biomed Online*. 2009 Jun;18(6):769-76.

¹²² Horowitz, J., Pundi, R.S., *Ovarian Hyperstimulation Syndrome*, 6 Nov. 2008. <http://emedicine.medscape.com/article/1343572-overview> [18.08.2009]. See also Kaiser, U.S., 'The Pathogenesis of the Ovarian Hyperstimulation Syndrome', *The New England Journal of Medicine*, Vol. 349: 729 – 732, 21 Aug., 2003, No. 8.

illegal, then it would be better for everyone if no law was passed at all and the situation should be left as at present, that is a situation not regulated by any law¹²³.

Now if instead of the freezing of the embryos, one had to freeze the ootid stage, for those who believe that human life begins at syngamy the moral issue would be completely skirted because the ootid does not yet comprise a human being. Several ootids may be frozen and then thawed and used as per necessity, but there would never be the risk of having a frozen parallel humanity. Formulating a law along these lines solves the problem for those who believe that life begins at syngamy. However it still creates a problem for those who believe that life starts at penetration or at the formation of the female pronucleus after the second meiotic division or those who still harbour doubt as to the exact point when the zygote is formed.

For those who harbour this doubt, one may use any form of casuistry explained above that one chooses to adhere to. If one wishes to apply the principle of probabiliorism, then one can only apply the less safe option in favour of liberty if one is disposed to believe it as the more probable opinion. If it is considered as the less probable opinion, then one cannot act in favour of liberty, but must decide in favour of the law. There is no such dilemma with aequiprobabilism and probabilism. In aequiprobabilism since the situation involves an opinion concerning the existence of a law, then one may follow the less safe option when it has equal or quasi equal probability with the safe opinion. In probabilism, one can always follow the less safe opinion as long as it is a solidly probable opinion. In the case of compensationism, one may feel that the greater option in favour of the law, or the safer option, may be compensated by the fact that a specific good effect is being caused by sparing the

¹²³ See evidence by Janet (pseudonym), minuted evidence given in the meeting of the Permanent

mother the morbidity and the mortality of going through another hyperstimulation cycle. Therefore one may opt to freeze in the ootid stage. These are matters for the informed conscience of the individual.

However, in the case of moral certitude that human life begins before syngamy, or in the case of a probabiliorist who believes that the choice of syngamy is not the more probable opinion and therefore feels obliged to choose the safer opinion before syngamy, then are there other applied ethical choices that may be made to free oneself from the moral dilemma? Can they weigh the bad effect of freezing what they consider to be an embryo and therefore contrary to the dignity of human life, against the good effect of preventing quite certain maternal morbidity and mortality?

If one were to consider the first principle of double effect, then one would be considered as carrying out a morally bad act in freezing morally certain human life in a way that would be disrespectful and possibly harmful to human life and therefore the principle of double effect would not justify such an act. Taking *Kenneth Kirk's* advice above, is there the possibility of turning to perplexity to deal with the problems that were not resolved by the application of reflex principles of doubt pertaining to the moral object or else that of double effect? It is often difficult to think of perplexity as being applicable in IVF for the simple reason that no one is actually forced to go through IVF procedures, and thereby the concept of having to decide between two evils by choosing the lesser evil, never arises. The principle of perplexity arises when one is *forced* to act by choosing one of two evils, and one is then constrained to choose the minor or lesser evil. However, sometimes it has been known, and I have met with this particular case in my private practice as a physician,

that the psychological state of an individual, or that of both of the couple in a married relationship, starts to severely deteriorate rapidly with resultant chronic anxiety and depression if not outright separation. The most difficult cases to treat psychologically are those women who want to get pregnant and cannot, especially when they are aware that there are alternatives available. They will usually leave no stone unturned, nor spare any money to reach their aim.

In such circumstances may one argue that one is forced into doing IVF to maintain the good mental state of health of the affected couple? If such is the case in hand, any use of reflex principles to resolve practical doubt which in fact do not resolve the issue of freezing the ootid in favour of liberty, as explained above, may be resolved by the principle of perplexity. Such could be the case with probabilioristic reasoning. We mentioned above that certain cases of probabiliorism could lead one not to resolve an issue in favour of liberty, but in favour of the obligation. In such cases, being forced to carry out IVF by circumstances would mean that experimentation on a practically doubtful human embryo, due to the practical doubt as to the existence of a human embryo before syngamy occurred, with the moral uncertainty that goes with it, could be considered as the lesser evil when compared to the danger from hyperstimulation to the life and the health of the mother. In such a case, would not freezing a doubtful embryo in the ootid stage, be a lesser evil than the high possibility of severely harming or killing the mother?

If however one is morally certain that a human embryo already exists during the ootid stage (or after syngamy has occurred), then not even the application of perplexity will resolve this issue of freezing, because in that case, one may still argue that the freezing of the embryo at the stage before syngamy, helping to create the

phenomenon of a parallel frozen humanity, could still be considered to constitute a greater evil than the possible harm and definite hardship to the mother! With my medical practical experience in both medicine and obstetrics, I would not be party to such reasoning.

The same issues are raised when considering the possibility of polar biopsy on the ootid as part of a procedure of *Preimplantation Genetic Diagnosis* called *PGD* or *PIGD* for short. It is possible to do both first and second polar body biopsy and where possible both can be extracted at the same investigation. It has to be carried out carefully as there is the possibility of damaging the ovum, although many viable foetuses have been developed after this procedure and healthy children have been delivered¹²⁴. It is therefore considered reliable and safe¹²⁵. The rate of implantation from polar biopsy alone was fifteen percent, polar biopsy plus blastomere biopsy was twenty-six percent and after blastomere biopsy alone was twenty-five percent¹²⁶. Polar body biopsy limits the testing of the genetic information to the ovum only, which is only the female side of the genetic material¹²⁷. Chromosomal abnormalities arising from the contribution of the male genome after penetration cannot be tested using this procedure, however these only account for less than five percent of abnormalities¹²⁸.

¹²⁴ Verlinsky, Y., Kuliev, A., *Preimplantation Genetic Diagnosis: Polar Body Biopsy*, Reproductive Genetics Institute, Chicago, Illinois, USA, First world Congress On: Controversies in Obstetrics, Gynaecology and Infertility, Prague, Czech Republic, 1999.

¹²⁵ *Ibid.*

¹²⁶ Cristina Magli, M., Gianaroli, L., Ferraretti, A.P., Toschi, M., Esposito F., Fasolino, C.M., 'The combination of polar body and embryo biopsy does not affect embryo viability', *Human Reproduction Vol.19No.5*, European Society of Human Reproduction and Embryology, pg. 1163-1169, 2004

¹²⁷ *Polar Body Diagnosis*, Opinion of the German National Ethics Council, 16 June 2004, <http://www.ethikrat.org>

¹²⁸ Nationaler Ethikrat, *Genetic Diagnosis Before and During Pregnancy*, German National Ethics Council, Berlin, 2003.

This procedure allows one to test for severe abnormalities in the female chromosomal package in diseases that are known to be in the family and inherited through the female line. Polar body biopsy can be used to test for single-gene disorders¹²⁹ and aneuploidy (abnormal number of chromosomes)¹³⁰. Severe genetic conditions such as Cystic Fibrosis and Thalassaemia¹³¹, which can be detected in polar body testing, signify that the female pronucleus is free from the gene responsible for this condition and the fertilization should be allowed to proceed. It is of course a way of selecting those ova or ootids which are free from disease, but this is quite obviously done for therapeutic purposes. The rationale for using this procedure to detect these diseases prevents the passing on to the offspring of severe debilitating disease which are often fatal at a relatively young age. The quality of life of sufferers of these genetic diseases is well documented and one need not write volumes about the severe hardships that these individuals and their families go through. There are several universities and laboratories today who offer this service.

The main point of ethical contention is that since the second polar body is usually extruded after the sperm has penetrated the ovum, whereby a short time window is created whereby both polar bodies if possible, or the second polar body alone, is removed for analysis, there is a possibility of actively stopping the fusion of the female and male pronucleus. Obviously, for those who believe that there is a human life at penetration of the ovum by the sperm or that a human life exists prior to

¹²⁹ Verlinsky, Y., Rechitsky, S., Cieslak, J., Ivakhnenko, V., Wolf, G., Lifchez, A., Kaplan, B., Moise, J., Walle, J., White, M., Ginsberg, N., Strom, C., Kuliev, A., 'Preimplantation Diagnosis of Single Gene Disorders by Two-Step Oocyte Genetic Analysis Using First and Second Polar Body', *Biochemical and Molecular Medicine*, 62, pg. 182-187, 1997, Academic Press.

¹³⁰ Wells, D., Escudero, T., Levy, B., Hirschhorn, K., Delhanty, J.D.A., Munné, S., 'First clinical application of comparative genomic hybridization and polar body testing for preimplantation genetic diagnosis of aneuploidy', *Fertility And Sterility*, Vol.78 No.3, September 2002, pg. 543 - 549, American Society for Reproductive Medicine.

syngamy, then this would be ethically unacceptable. However for those who, like myself, believe that human life starts at syngamy, this is a very important window of opportunity of preventing serious disease by stopping the process of pronuclear fusion, before syngamy occurs. This would be analogous to the selection or washing of sperm in those diseases we know are inherited through the male genetic line. Herein lays the dilemma. For those with positions of practical certitude on either side of the debate, then ethically the question is closed. For those with practical doubt however, then the position has to be converted as usual into ethical certitude using the reflex principles enunciated. As in the case of freezing referred to in the paragraphs above, probabilists and aequiprobabilists should have no problem in applying this procedure. Nor should compensationists have any problem since the compensating proportionate reason of preventing severe suffering and illness is enough of a prudent cause to justify favouring liberty over the obligation and overturning one's doubt. This would be in fact what Karl Rahner was referring to as quoted earlier. Neither should probabiliorists have a problem, at least those who believe that the opinion in favour of liberty is more probable than that in favour of the obligation. For those who favour the obligation however, then the procedure would be ethically illicit.

In the cases above, where doubt is resolved in favour of the obligation, can one look towards the principle of double effect as a possible solution? The two effects to be considered are the destruction of a morally certain human life compared to preventing severe disease in the same offspring, caused by an act that stops the development of the organism and destroys it. The current normative understanding of the first principle of double effect stating that the nature of the action itself must be morally

¹³¹ Rechitsky, S., Verlinsky, O., Amet, T., Rechitsky, M., Kouliev, T., Strom, C., Verlinsky, Y., 'Reliability of preimplantation diagnosis for single gene disorders', *Molecular and Cellular Endocrinology*, 183, S65-S68, 2001, Elsevier Science Ireland Ltd.

good or indifferent, leads one to conclude that the destruction of morally certain human life just to prevent disease, would be a morally evil choice in itself and therefore the principle of double effect would not hold.

That leaves us with the principle of perplexity! Considering that circumstances are forcing one to carry out IVF because of the health conditions of the mother or the couple for that matter, then is it the lesser of two evils to destroy morally certain innocent human life in order to prevent severe suffering to that same life? Again I believe the answer to be a clear no. In the case of IVF procedures becoming much easier and less dangerous to the mother's health in the future, could IVF be considered as a means to carry out eugenic practices to weed out the dangerous genes causing extreme human suffering by the destruction of morally certain human life? Again I think the answer to be negative.

I have thus taken a deep look at Karl Rahner's application of his maxim mentioned at the beginning of the section, to the issues under consideration. It seems to me to be clear here, that Rahner is referring to proportionate cause that is implicit in both compensationism and also the fourth principle of double effect. Double effect seems to be implied in compensationism. This comes as no surprise because it is well known, that in establishing the principle of compensationism in the middle to later nineteenth century, one of the proponents of this system, *Prümmer*, argued that the double-effect principle was used to balance on one hand freedom as a good thing, while on the other hand the material transgression of a doubtful law as the evil consequence. If the reason to allow the bad effect was equally important, or as we say

proportional, then it would be alright to accept the bad consequence as an indirectly willed side-effect¹³².

¹³² Delhaye, P., *The Christian Conscience*, Desclee Company, New York, 1968, pg. 226.
McHugh, J.A., Callan C.J., *Moral Theology-A Complete Course*, Vol. I, Joseph F. Wagner Inc., New York, pg. 276.

Epilogue

REINTERPRETING A COUNTERINTUITIVE NORM

When water chokes, what is one to wash it down with?

Aristotle - Ethics VII

I am approaching the end of my dissertation but before I finish, I would simply like to conclude by looking at some other arguments that also throw some significant light on this issue. Essentially these are those of reproduction and the argument from contingency and necessity.

Argument from Reproduction

Reproduction is one of the vital functions associated with life, whether that of a living cell or that of a living organism. Sexual reproduction is not exhibited at all stages of an organism's life but only at the mature stages. A child is not able to sexually reproduce, but nobody denies that a human child is a human organism. The argument derived from sexual reproducibility is not therefore a conclusive or useful one as far as our current deliberations are concerned. However, it must be said that there are two forms of reproduction, namely sexual and asexual. Sexual reproduction involves combining two genetic information packs from separate individuals of the same species and is an important evolutionary step from organisms which essentially divide asexually. The evolutionary step imparts to the new organism a completely new genetic code which allows the species cohort to better withstand changes in the environment.

Asexual reproduction on the other hand, involves cell division whereby cells of a specific genetic plan are able to replicate the same genetic information pack by first replicating the genetic plan itself and then dividing it into separate packs. The cell cytoplasm then also separates to form two separate cells each with the same genetic code. These cells may both remain as two single cell organisms but if the cells remain closely connected and communicating at the cell membranes, there are two cells bound together which are genetic clones, but one organism. The two cells then further subdivide so that there are four cells, all genetically similar, and so on and so forth until after a few generations of divisions there are thousands and millions of the same genetically identical cells in the one organism. Thus growth and differentiation within the single organism is achieved. This process of replication or growth is achieved by the mechanism of *mitosis* which has been referred to in the first chapter on the empirical considerations of fertilization. For mitosis to occur the genetic material inside each cell must first replicate. This replicated genetic material then divides to form two genetic information packs which are mirror images of each other. Ultimately the cytoplasm separates so that two cells are formed which are clones of each other but still remain in close contact at their cell membranes in an organism. In the human embryonic mass, the cells are further kept together by the existence of a tough outer membrane surrounding them called the *zona pellucida*. It is interesting to note that this process of mitosis, that is asexual reproduction, is only able to occur in the one cell embryo, after amphimixis or syngamy (karyogamy) has occurred. Earlier, in the penetration or pronuclear stage, the cell is not in any physical position to undergo asexual reproduction.

The anatomical form of the cell commensurate with mitosis only presents itself after syngamy has occurred. In fact after syngamy occurs it is the first thing the cell does. It replicates its genetic material on the formed spindle and divides asexually to become two cells, each an exact clone of the other, but in close approximation so as to still form one organism. The fact that at no earlier stage of development is the embryo's form ready to undergo asexual reproduction means that the form commensurate with the functionality of the cell has not yet been achieved. Once the anatomical form exists as metaphysical form in first act, then asexual reproduction as second act, is able to follow soon after. Does the fact that asexual reproduction only occur in the anatomical form represented after syngamy, suggest that it is the metaphysical form as first act that is commensurate with and able to support mitosis as second act?

I have forwarded this argument because it may seem like a pretty good one to put forward, reproduction being one of the main vital classical functions which signify the existence of life. However, although the argument above may seem intuitively valid, it is only an inconclusive one and does not help to resolve the case of identifying the point of the beginning of human life. This is because syngamy may also be commensurate with being the second act, of a living cell of the human species as first act, which cell is formed at penetration or even more possibly at the pronuclear stage. I will return to this argument shortly. Like wise, mitosis may be commensurate with being second act of the first act at penetration.

Arguments from Necessity and Contingency

Let me now revisit the first argument in this chapter, that of sexuality. I will treat it at this stage while introducing the arguments from necessity and contingency. The *materia necessaria* is an *a priori* concept, the necessary *propositio per se*, the predicate of which is the constitutive element of the subject matter concerned¹. In classical terms one can say that the particular which is true, corresponds to the universal. The *materia contingenti* presents a case where the particular is true but does not correspond to the universal. It is accidental to the universal. A contingent matter is therefore true as a particular but not as a universal. I have stated that reproduction is a classical sign of life. It is present in all the living cells of the species *Homo sapiens* as asexual reproduction or mitosis as well as in all single cells of the same species, which are totipotent thereby constituting a living organism and therefore reproduction may occur asexually. I have also argued that as an organism, *Homo sapiens* is also able to reproduce sexually, although not all stages of the organism may exhibit this capacity. Children exhibit asexual reproduction within their body as they grow but are unable to exhibit sexual reproduction until they reach puberty. A living cell of the species *Homo sapiens* necessarily reproduces only asexually, while a living organism of species *Homo sapiens* necessarily reproduces both asexually and sexually. Therefore the incapacity to reproduce sexually in the cell of the species would be a necessary incapacity as a result of its anatomical form and developmental potential based on the translating capacity of the cell while the

¹ “The judgements in necessary matter were known (by the Schoolmen) as *propositiones per se*. From Sauvage, G.M., *The Catholic Encyclopedia: Necessity*, <http://www.newadvent.org/cathen/10733a.htm> [07.12.2009]. One can define predicate as the part of a sentence that says something about the subject or else one can say the object that is receiving the action in a complete sentence, i.e. having a subject, verb and object. See also Aristotle, *De Interpretatione*, Sect.I, Part 9, Sect. II, Part 12 and Part13. Aquinas, T., *On the Power of God*, Art. IV and Art. V. Aquinas, T., *Commentary on the Posterior Analytics of Aristotle*, I, Lect. X and XXXV. Aquinas, T., *Commentary on Aristotle’s De Anima*, II, Lect. XIV.

incapacity to reproduce sexually in the organismic form of the species can only be contingent as the cell in its present anatomical form becomes able to develop to the adult form by translating the zygotes's new genome, so called ZGA. I shall try to use the fact that the organism in single cell form is the only cell of the species which has the contingent incapacity to reproduce sexually (thereby implying a necessary capacity) to distinguish at what point the human organism comes into existence.

If we now return to the pronuclear stage of fertilization, I have argued that at this stage, the cell is not able to carry out asexual reproduction, but is able to do so only after syngamy. This itself simply shows that before syngamy the incapacity for asexual reproduction could constitute only a *contingent* incapacity but not a *necessary* one if the first act of being occurred at penetration or at the formation of the pronuclear stage. With syngamy this incapacity is removed and asexual reproduction may proceed, which in fact is the first thing that happens after syngamy. The cell which is in being after syngamy being an organism, can also exhibit an incapacity for asexual reproduction which incapacity is however also a contingent one depending on the phase cycle of the cell. Therefore from the aspect of asexual reproductive incapacity no new light may be thrown on the beginning of human life. Both the living cell and the organism necessarily reproduce asexually and any incapacity to reproduce is considered contingent. But what about the capacity, or the lack of it, with regards to sexual reproduction?

I have already observed that only the living organism, as opposed to a living cell, of the human species has the capacity to carry out sexual reproduction while separated individual somatic cells of the species do not have this capacity. At the pronuclear

stage of fertilization, does the human cell present have the capacity for sexual reproduction? Well the answer is obviously no. After syngamy (karyogamy), does the human cell present at that stage have the actual capacity for sexual reproduction? Again the answer is obviously no. No two cells at that stage can come together to mix their haploid genetic material. So there is an incapacity for sexual reproduction at both stages of fertilization, both in the pronuclear cell present before syngamy occurs and the zygote (or some argue at the two cells) produced after syngamy. However is the incapacity at both these stages, a necessary or a contingent incapacity? This is a question that needs to be asked, because if the incapacity for sexual reproduction is a necessary one then that cell represents only a living cell of the species of man, but if the incapacity of the cell for sexual reproduction is a contingent one, then that represents a cell which is an organism of the human species at a particular stage of development, and this implies a necessary potency for the organism to reproduce sexually.

Before syngamy, at the stage of penetration, before the second meiotic division has occurred, with sixty-nine chromosomes in the cell, cellular chromosome composition evident by the lack of production of the second polar body, is not yet finalised. Therefore sexual reproductive incapacity is obviously a necessary one, as it would be impossible to determine which of the chromosomes would be selected for any hypothetical potential sexual reproduction. After syngamy has occurred, where there is definitely an organism of the human species, we have already observed that the incapacity for sexual reproduction is only a contingent one, contingent upon translational capacity of the cell and growth leading ultimately to the sexually mature state of the organism. The important question to ask here is this. Does the cell present

in the pronuclear stage of fertilization, before syngamy has occurred, represent a necessary or contingent incapacity for sexual reproduction?

This is not an easy question to answer. If the incapacity for sexual reproduction is a necessary one, then that cellular stage is simply a cell of the species *Homo sapiens*, while if the incapacity is a contingent incapacity, then that single cell would be an organism of the same species. What would constitute necessary or contingent incapacitation, is determined by the cell's ability to translate proteins during protein synthesis, leading to the mature adult form of the organism. This in turn is dependent on full transcriptional capacity of the genome of the said cell. The issue could be adequately settled by a scientific paper showing that full transcriptional capacity allowing translation to proceed, is only achieved after syngamy has taken place. This seems to increasingly be the case with epigenesis. We already know scientifically that full translational capacity only occurs in the cell after syngamy has taken place and the new protein products of this appear at the four to eight-cell stages, the so called maternal to embryonic transfer (MET) or zygotic genome activation (ZGA). We do not yet know when full transcriptional activity is achieved opening the possibility of protein translation although all fingers point to it as occurring after syngamy especially with the information emanating from further research on epigenesis and paramutation . A scientific paper in this respect again would be very useful and would probably lead to the point establishing the beginning of human life entering the scientific realm rather than remaining in the philosophical one. We do know that transcription starts in the pronuclear stage but it is by no means complete at this stage allowing to produce all the transcripts necessary for translation to start. We also know that transcription itself can be considered as a passive activity of the chromosomes

and therefore the cell, and that it is translation by the cell that would constitute an active process requiring self-movement of the cell.

I would reason that due to the fact that all translational capacity of the pronuclear cell is necessarily carried out by maternal m-RNA from the ovum's maternal progenitor genome, and in that physical form of pronuclear separation, would never be able to translate its own genome, then the incapacity for sexual reproduction seems to be a necessary one. After syngamy has occurred, the physical form of the cell is such that allows the cell to translate the proteins of the cell's own genome thereby rendering the incapacity of the cell for sexual reproduction to one which is contingent.

It is true that even after syngamy up to the four cell stage, maternal m-RNA is still responsible for translation, but now the anatomical form of the cell is such, as to render this maternal translational capacity as no longer necessary, as it was before syngamy, but only contingent until the necessary translational capacity of the new cell with a combined nucleus itself takes over. Before syngamy, maternal m-RNA translation capacity was necessary as the form of the cell did not allow any other type of translation to occur. However, after syngamy and the new anatomical form of the cell, the translational capacity of the maternal m-RNA becomes contingent until ZGA takes over with its own necessary translational capacity. The contingency of maternal m-RNA translational capacity after syngamy, is now in line with the cell's contingent incapacity for sexual reproduction. It is now the post syngamic cell's genome's translational capacity that becomes the necessary one pointing the cell in a new developmental direction, and not the translational capacity of the maternal m-RNA, but the new m-RNA produced by the zygote's own genome. Similarly the necessity

of the translational capacity of the maternal m-RNA before syngamy was matched by the necessary incapacity of the cell for sexual reproduction, before syngamy had occurred.

Conclusion

To conclude I will go through a quick review of my work. In *Chapter I* I looked at the all the scientific evidence present to us to this point in time. I defined the fourteen stage process of fertilization, established that maternally derived m-RNA transcripts regulate the development of the penetrated ovum till the four cell stage when zygotic genome activation occurs. I also established that from what we now know about egigenesis in plants and other animals, it seems highly likely that the two pronuclear components have to be together in one nucleus for transcription to be able to be finalized and the translation of the new zygotic genome is able to proceed. Although this has not yet been proven to occur in man, the fact that it occurs in other living things including mammals, and the occurrence of genomic imprinting in man, seems to point to its existence in this species also.

In *Chapter II*, I examined the philosophical questions surrounding fertilization. I opted that the issue would be decided from a natural law approach and described the classical evolution of this moral law. I examined Aristotelian metaphysics with the classical definitions of act and potency and established the important concept of active as against passive potency. I distinguished between first act and second act as ‘form followed by function’ and concluded that observed zygotic genome activation in translation was in fact second act which pointed to syngamy as first act. I also went to lengths to establish the difference between a living cell and an organism and to

discern the point in fertilization where such an organism comes into being by the cell establishing an active potency and independence. All my conclusions point to syngamy as being this point.

In *Chapter III* I examined how within a process such as that of fertilization, which is about twenty to thirty hours long, and ends with the formation of the zygote, there can none-the-less be pointers to the existence of a specific individual, and throughout this process and indeed throughout the whole process of individual human life itself, one is able to discern through the help of the masters of process philosophy where markers for such human individuation begin and stop and what they are. The rich concepts, vocabulary and neologisms of process philosophy can all widen one's horizons on concepts of individuality within process and all these point to syngamy, and not penetration, as representing the beginning of individual human life.

In *Chapter IV*, I looked into detail at the opinions of both those in favour of syngamy as the beginning of the human organism both in science and in philosophical circles giving concrete reasons for both and also at the arguments of those against syngamy being in favour of penetration. I also considered those in favour of the pronuclear ootid stage. In a detailed analyses I showed how the arguments of the latter two argumentees contained serious flaws when compared to those of the former and I established a good *solid* probable opinion in favour of syngamy as the beginning of human life.

In *Chapter V*, I showed how the concept of personhood separated from that of being, and denying that both existed at the same time together, could create problems of

actual legal issues for any human civil legal regime. It is essentially a thought experiment which shows that our common perceptions of time and distance in the world do not scientifically add up to the empirical reality of time and space and if one tries to apply this scientific reality to a dichotomy between personhood and being, conceptual and legal confusion would ensue. This shows the importance for a modern society to consider both personhood and being to be extant simultaneously.

In *Chapter VI*, I finally turned to the question of the resolution of doubt in deciding for or against the issue in hand, the point of beginning of human life during fertilization. Should one always adopt a tutioristic argument if one was not sure as to the exact point of the beginning of human life or were there other avenues which one could morally proceed along? Having introduced casuistry and its proper and improper uses, and having established the need for moral certitude before acting on practical doubt, I went on to define the various types of doubt and also introduced the principles of reflexology necessary to help turn practical incertitude caused by a scientific lack of certainty into practical moral certitude. I argued that we have before us an opinion that was more sure than unsure in favour of syngamy and at the very least an aequiprobabilistic one. Arguing that the question of the beginning of human life is essentially a hypothetical metaphysical question thereby constituting a doubt of theory and therefore essentially, a doubt of law not one of fact. It follows that one is able to proceed to apply the principles of reflex to the question of when human life begins especially if there are mitigating medical conditions that may be circumvented by applying the conclusion that individual human life begins at syngamy. With at least an aequiprobabilist approach, and at most even with a probabioristic one, one

may safely use practical moral certitude and act by holding the opinion that syngamy is the beginning of human life.

I therefore conclude that one should have no moral problems in holding a position of syngamy (karyogamy) as being the beginning of individual human life during the process of fertilization or conception and I personally would feel morally justified in acting on that belief. I have tried as much as possible to offer scientific support for this conclusion and as this question cannot be said to be scientifically conclusively resolved, I have put forward several philosophical and ethical reasons to dovetail with, and support this opinion. I believe that in doing so I have made it easier for several people to take practical decisions with moral certitude and that I hope that I have thus made the world a better place to live in.

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