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REFLECTIONS ON THE MORAL STATUS OF THE PRE-EMBRYO

THOMAS A. SHANNON
Worcester Polytechnic Institute
and
ALLAN B. WOLTER, O.F.M.
Old Mission, Santa Barbara, Calif.

IN THIS PAPER we wish to review contemporary biological data about the early human embryo in relation to philosophical and theological claims made of it. We are seeking to discover more precisely what degree of moral weight it can reasonably bear. While other ethical conclusions might well be drawn from the results of such a reflective investigation, we limit ourselves to a few moral considerations based on our current knowledge of how human life originates. As Catholics, we too believe that "from the moment of conception, the life of every human being is to be respected in an absolute way because man is the only creature on earth that God 'wished for himself' and the spiritual soul of each man is 'immediately created' by God."[1] But we are also vitally concerned as to when one might reasonably believe such absolute value could be present in a developing organism. We would also like to defuse some of the polar opposition fanned by the rhetoric of both prolife and prochoice advocates that creates a legislative dilemma for morally and religiously responsible politicians. We even hope that a rational analysis of available scientific data might lead to some broad consensus among concerned citizens that the term "human life" is not necessarily a univocal conception.

All life is a many-splendored creation on the part of God; this is especially true of human life at any stage of its development. But we suggest that appropriate protection of the human organism changes with its developmental stages. We wish to present a theory which recognizes the right of every potential mother to a meaningful life and a healthy personality development,[2] but which condemns irresponsible destruction of fetal life.

One of the hallmarks of the Catholic tradition, with certain conspicuous exceptions, has been to be in dialogue with the philosophy and science of its day and to use such insights in articulating the vision of

[1] Cf. *Donum vitae*, quoting *Gaudium et spes*, in Thomas A. Shannon and Lisa Sowle Cahill, *Religion and Artificial Reproduction* (New York: Crossroad, 1988) 147.

[2] We are concerned here especially with victims of rape, incest, or sexual abuse.

Catholicism. Such efforts have been done better and worse. Many have taken time to evaluate the correctness or usefulness of a particular articulation. But in almost all cases, because of new discoveries in science, changes in scientific theory, and the use of new philosophical frameworks, the insights and articulation of the faith of one generation have differed from those of another. Sometimes such differences have led to severe conflict. One remembers the Copernican revolution, the case of Galileo in the 17th century, and the tensions introduced by the rediscovery of Aristotelian science in the 13th century. Nor can historians of medieval theology forget that certain philosophical views of Aquinas himself were regarded as theologically dangerous by two successive archbishops of Canterbury and condemned by the bishop of Paris in 1277 on the advice of the prestigious university theological faculty, a condemnation that was lifted insofar as it applied to St. Thomas only two years after the saint's canonization in the 14th century.

Anyone who has studied the history of ideas, scientific, philosophical, or theological, knows that there is a usefulness in reviewing the theoretical conceptions of the past, since they have a habit of recurring cyclically in a new and useful scientific garb.[3] The same is true of the theoretic conceptions used by theologians in articulating their faith. We argue that the most recent scientific discoveries fit in more admirably with the epigenetic conception of how a human being originates that was held for centuries by the great theologians and doctors of the Church than does the more recent and now more commonly accepted—though happily not defined—moment of fertilization as coincident with the time of animation. The widespread acceptance of the theory of immediate animation is of post-Tridentine origin,[4] having entered into the tradition only in the early 17th century, and in 1869 the distinction between the formed and unformed fetus was no longer canonically recognized. This assumption about immediate animation still plays a large part in contemporary ecclesiastical documents, as well as do references to the scientific literature purporting to buttress arguments supporting the theory, as we will discuss later.

[3] Philosophers of science have stressed the important difference between the linear growth of scientific data and theoretic conceptions used to interpret them, for important theories have a life of their own that ensures their perenniality. Or, as Santayana put it, those who forget history are condemned to repeat its mistakes.

[4] For theologians at the Council of Trent, in contrasting the virginal conception of Christ with the ordinary course of human nature, asserted that normally no human embryo could be informed by a human soul except after a certain period of time: "cum servato naturae ordine nullum corpus, nisi intra praescriptum temporis spatium, hominis anima informari queat" (*Cathecism of the Council of Trent*, Part 1, art. 3, n. 7), cited in E. C. Messenger, *Theology and Evolution* (Westminster, Md.: Newman, 1949) 236.

We would also like to remind our readers, however, that some 40 years ago two learned priests from the University of Louvain,[5] where this theory of immediate animation was originally introduced, repudiated its scientific standing and went to some lengths to explain historically how this mistaken interpretation of empirical data was initially accepted. We claim that the most recent scientific evidence concerning fertilization and the development of the very early human embryo does even more to reinforce their view that any theory of immediate animation seems to have become as untenable today as it was commonly held to be for centuries by Catholic thinkers. We think that since scientific observations, now recognized as erroneous, played such a historical role in the development of the position favoring such a theory, new and respected scientific evidence should be utilized by Catholic theologians when they discuss the process of fertilization and conception to determine its moral implications.

We hope our analysis will be welcomed because of our acceptance and use of the methodology of the tradition and because we take seriously the role of science in helping articulate the context of moral problems, as do current ecclesiastical documents. While our conclusions may differ from those of these documents, we think such differences are to be cherished because they help the community understand its beliefs and values at a much deeper level and allow some of the forgotten riches of our Catholic tradition to be expressed to a new audience.

This rearticulation needs careful examination, however, for the fact that something is new does not *ipso facto* make it good or correct. Thus a careful and prayerful process of discernment should also be an important part of the way we rearticulate our tradition, for the community must genuinely receive the reconceptualization of the tradition before it is authentic. This essay is an attempt at such a process of discernment by setting out an account of the process of individuation in the early human embryo in light of modern biology and reflecting on it in the light of some important theological and philosophical insights that seem to have perennial vitality.

The medievals and post-Renaissance theologians articulated their theory of the person, the body, and ensoulment in light of the biology and philosophy of their day. On the basis of this they appropriately drew moral conclusions. We know now that the biology used at any one time, if not out of date, may well need updating. But the philosophy and history of science also make it clear that there is a significant difference as to how our scientific knowledge of the wonder of God's creation grows. We believe that such a moment of review is necessary today if we are to give

[5] We refer to Dr. Messenger and Canon Henry de Dorlodot.

a reasonable defense of the respect Catholics have traditionally had for human life. For we know that in the male seed there is no homunculus, but it was not until the 1700s that mammalian sperm was discovered, and not until the 1800s that the mammalian egg was found and its role revealed. Modern diagnostic technologies such as ultrasound and fetoscopy have given us a whole new perspective on the development of the human embryo. Thus, while we can correctly say that the biological data of a past era are inadequate in light of the discoveries of modern science, we cannot dispose as easily of the basic philosophical or theological way our scholastic predecessors interpreted those data. And we certainly cannot fault their use of the most advanced scientific knowledge available to them as a necessary condition for articulating any rational philosophico-theological conception of the person, the body, and ensoulment. It is in that spirit that we present this brief review of what embryology has to tell us today.

CONTEMPORARY PERSPECTIVES ON THE HUMAN EMBRYO

1. The Pre-embryo[6]

In mammalian reproduction an egg and sperm unite to produce a new and almost always genetically unique individual. The process, how this occurs, is undergoing tremendous reconceptualization and remodeling in the light of new studies and new diagnostic technologies which allow access to this entity.

A critical discovery of the past two decades in that of capacitation, "the process by which sperm become capable of fertilizing eggs."[7] Human sperm need to be in the female reproductive tract for about seven hours before they are ready to fertilize the egg. This process removes or deactivates "a so-called decapacitating factor that binds to sperm as they

[6] This is the term being used to describe this entity from the zygote state to the beginning of the formation of the primitive streak during the third week (see Keith L. Moore, *Essentials of Human Embryology* [Philadelphia: Decker, 1988] 16). The primitive streak gives rise to other structures which continue the physical development of the embryo. The purpose of using this term, as well as other terms such as zygote, embryo, and fetus, is to integrate scientific descriptions into the moral discussion. These terms, as used in this essay, beg no moral questions but help us clearly identify the entity we are discussing. Cf. Clifford Grobstein, *Science and the Unborn: Choosing Human Futures* (New York: Basic Books, 1988) 62. But see *Donum vitae*, which also uses these terms but attributes "to them an identical ethical relevance, in order to designate the result (whether visible or not) of human generation from the first moment of its existence until birth" (Introduction 1 n.). The text of *Donum vitae* can be found in Shannon and Cahill, *Religion and Artificial Reproduction* 140 ff.; all references will be to this text.

[7] Steven B. Oppenheimer and George Lefevre, Jr., *Introduction to Embryonic Development* (2nd ed. Boston: Allyn and Bacon, 1984) 87.

pass through the male reproductive tract."[8] This permits the acrosome reaction to occur, which is the means by which lytic enzymes in the sperm "are released so that they can facilitate the passage of the sperm through the egg coverings."[9] Then the sperm are able to penetrate the egg so fertilization can begin.

Fertilization usually occurs in the end of the Fallopian tube nearest the ovary. Sperm usually take about ten hours to reach the egg, and if not "fertilized within 24 hours after ovulation, it dies."[10] Fertilization, however, is not just a simple penetration of the surface of the egg. Rather, it is a complex biochemical process in which a sperm gradually penetrates various layers of the egg. Only after this single sperm has fully penetrated the egg and the haploid female nucleus, one having only one chromosome pair, has developed, do the cytoplasm of the egg and the nuclear contents of the sperm finally merge to give the new entity its diploid set of chromosomes. This process is called syngamy. It takes about 24 hours to complete and the resulting entity is called the zygote. Thus the process of fertilization (and it is important to note that it is a process) generally takes between 12–24 hours to complete,[11] with another 24-hour period required for the two haploid nuclei to fuse.

Fertilization accomplishes four major events: giving the entity the complete set of 46 chromosomes; determination of chromosomal sex; the establishment of genetic variability; and the initiation of cleavage, the cell division of the entity.

Now begins a very complex set of cell divisions as the fertilized egg begins its journey down the Fallopian tube to the uterus. About 30 hours after fertilization, there is a two-cell division; around 40–50 hours there is a division into four cells; and after about 60 hours the eight-stage cell division is reached. "When the embryo approaches the entrance to the uterus, it is in the 12–16 cell stage, the morula. This occurs on the fourth day."[12] Although the cells become compacted here, there is yet no predetermination of any one cell to become a specific entity or part of an entity. On around the sixth or seventh day the organism, now called the blastocyst, reaches the uterine wall and begins the process of its implantation there so that it can continue to develop. Here we have a differentiation into two types of cells: the trophectoderm, which becomes the outer wall of the blastocyst, and the inner cell mass, which becomes the

[8] Ibid. 87.

[9] Bruce M. Carlson, *Patten's Foundations of Embryology* (5th ed. New York: McGraw-Hill, 1988) 134.

[10] Oppenheimer and Lefever, *Introduction* 175.

[11] Ibid. 176.

[12] Ibid. 175.

precursor of the embryo proper. This process of implantation is completed by the end of the second week, at which time there is "primitive uteroplacental circulation."[13]

Critical to note is that from the blastocyst state to the completion of implantation the pre-embryo is capable of dividing into multiple entities.[14] In a few documented cases these entities have, after division, recombined into one entity again. Nor must this particular zygote become a human; it can become a hydatidiform mole, a product of an abnormal fertilization which is formed of placental tissue.

Note also that the zygote does not possess sufficient genetic information within its chromosomes to develop into an embryo that will be the precursor of an individual member of the human species. At this stage the zygote is neither self-contained nor self-sufficient for such further development, as was earlier believed. To become a human embryo, further essential and supplementary genetic information to what can be found in the zygote itself is required, namely

> the genetic material from maternal mitochondria, and the maternal or paternal genetic messages in the form of messenger RNA or proteins. In terms of molecular biology, it is incorrect to say that the zygote has all the informing molecules for embryo development; rather, at most, the zygote possesses the molecules that have the potential to acquire informing capacity.[15]

> That potential informing capacity is given in time through interaction with other molecules.... This new molecule with its informing capacity was not coded in the genome. Thus, the determination to be or to have particular characteristics is given in time through the information resulting from the interaction between the molecules.[16]

The development of the zygote depends at each moment on several factors: the progressive actualization of its own genetically coded information, the actualization of pieces of information that originate *de novo* during the embryonic process, and exogenous information independent of the control of the zygote.

2. *The Embryo*

The next major stage of development is that of the embryo. This is the beginning of the third week of pregnancy and "coincides with the week that follows the first missed menstrual period."[17] This phase begins with

[13] Moore, *Essentials* 14.

[14] Carlson, *Patten's Foundations* 35.

[15] Carlos A. Bedate and Robert C. Cegalo, "The Zygote: To Be or Not to Be a Person," *Journal of Medicine and Philosophy* 14 (1989) 642–43.

[16] Bedate and Cegalo, "The Zygote" 644.

[17] Moore, *Essentials* 16; italics in the original.

the full implantation of the pre-embryo into the uterine wall and the development of a variety of connective tissues between it and the uterine wall. Eventually the placenta develops and is the medium through which maternal-embryonic exchanges occur.

Two major events now occur. The first is the completion of gastrulation, "profound but well-ordered rearrangements of the cells in the embryo."[18] This process results in the development of various layers which ultimately give rise to the tissues and organs of the entity and is completed by the third week. At this time all expressions of the genes are switched off except those that determine what a particular cell will be. There are now three layers present which are responsible for the development of much of the organism:

> The embryonic ectoderm gives rise to the epidermis; the nervous system; the sensory epithelium of the eye, ear, and nose; and the enamel of the teeth. The embryonic endoderm forms the linings of the digestive and respiratory tracts. The embryonic mesoderm becomes muscle, connective tissue, bone and blood vessels.[19]

The second major event, the process of embryogenesis or organogenesis, now begins and is completed by the end of the eighth week. This process results in the development of all major internal and external structures and organs.

By the end of the third week the primitive cardiovascular system has begun to form with the development of blood vessels, blood cells, and a primitive heart. Since the "circulation of blood starts by the end of the third week as the tubular heart begins to beat,"[20] the cardiovascular system reaches a functional state first.

The nervous system progresses from a neural tube to the essential subdivisions of the brain into forebrain, midbrain, and hindbrain.[21] During this time also the upper and lower limb buds begin to appear. The digestive tract begins to form, as do all the external structures such as the head and the eyes and ears. Hands and feet make their appearance, as do, by the end of the eighth week, distinct fingers and toes.

The development of the nervous system is critical because this is the basis for the "generation and coordination of most of the functional activities of the body."[22] The rudimentary brain and spinal cord are present around the third week but are as yet "unspecialized or undifferentiated for neural function."[23] Neuron development begins around the

[18] Carlson, *Patten's Foundations* 186.
[19] Moore, *Essentials* 18.
[20] Ibid. 24.
[21] Carlson, *Patten's Foundations* 296.
[22] Ibid. 456.
[23] Grobstein, *Science* 47.

fifth week, and around the sixth week the "first synapses ... can be recognized."[24] Carlson observes that at about the seventh week "the embryo is capable of making weak twitches in the neck in response to striking the lips or nose with a fine bristle."[25] Grobstein notes "the earliest continuous neuronal circuitry for reflex conduction and behavior could be initiated as early as six weeks."[26] Such a pattern, Carlson says, "signifies that the first functional reflex arcs have been laid down."[27]

In a rather thorough review of the literature Michael Flower describes various embryonic movements and the neural basis necessary for their possibility.[28] Flower notes that the earliest reported elicited reflex response from an embryo occurred at 7.5 weeks. This was a movement away from a stroking stimulus to the mouth. Such movements were typical during this period of the eighth week of development.[29] In the middle of the ninth week the patterns make a transition to whole body responses, and during the 12th week local reflexes dominate. These data indicate a critical level of integration of the nervous system.

This review of embryonic development up to the eighth week shows a dramatic process of development from the initiation of fertilization to the formation of an integrated organism around mid-gestation. The rest of the paper will concentrate on examining what moral implications these data might have. The intent is not to draw a moral ought from a biological is, but to reconsider the compatibility of moral and philosophical claims with what we know of developmental embryology.

MORAL CONSIDERATIONS

1. Conception

A critical finding of modern biology is that conception biologically speaking is a process beginning with the penetration of the outer layer of the egg by a sperm and concluding with the formation of the diploid set of chromosomes. This is a process that takes at least a day. This raises a question as to how one ought to understand the term "moment of conception" frequently used in church documents.

One could understand "moment" metaphorically as referring to the process as a whole, or if it is meant to convey an instant of time, then it would seem to refer to either the end of the process of biological concep-

[24] Ibid. 48.

[25] Carlson, *Patten's Foundation* 457.

[26] Grobstein, Science 48.

[27] Carlson, *Patten's Foundations* 458.

[28] Michael J. Flower, "Neuromaturation of the Human Fetus," *Journal of Medicine and Philosophy* 10 (1985) 237–51.

[29] Ibid. 238–39.

tion when the zygote has become an embryo, or to some prior stage of development that has been reached in which this human life form (fertilized egg, zygote, or pre-embryo) has acquired a distinct set of properties. However, it seems that the theologians who framed these carefully crafted documents wished to convey the idea that at the moment of conception (whatever stage of development of human life obtains) everything is present that is required essentially for this human organism to be a person in the philosophical/theological, if not psychological, sense of the term: a rational or immortal soul has been created and infused into the organic body. At the same time, while they wished to set forth guidelines, they declared it was still a theoretically open question and hence they did not want to specify, or define, the moment when such passive conception (as it was called by Catholic theologians for many centuries) took place. Prayerful reflection on what embryology and our Catholic tradition tell us may not yield any direct positive knowledge of when passive conception takes place, but it does seem to throw considerable light on when it has not occurred.

Biologically understood, conception occurs only after a lengthy process has been completed and is more closely identified with implantation than fertilization.[30] The pastoral letter *Human Life in Our Day* speaks of conception "initiating a process whose purpose is the realization of human personality."[31] Such a phrase is biologically correct if applied to implantation and seems to be a reasonable moral description of the typical outcome of conception.

2. *Singleness*

Clearly and without any doubt, once biological conception is completed we have a living entity and one which has the genotype of the human species. As Grobstein nicely phrases it, "conception (fertilization) is the beginning of a new generation in the genetic sense. . . ."[32] This zygote is capable of further divisions and is clearly the precursor of all that follows. But can we say with *Donum vitae*, quoting the "Declaration on Procured Abortion," "From the time that the ovum is fertilized, a new life is begun

[30] Norman M. Ford, *When Did I Begin? Conception of the Human Individual in History, Philosophy, and Science* (Cambridge: Cambridge University, 1988) 176–77. This outstanding and comprehensive analysis of the biological data came to our attention after we had completed much of our own research for this article. We wish to acknowledge how much we have learned from it and to commend it for its exceptionally thorough review of the biological data and philosophical analysis. We also wish to acknowledge the earlier contribution of James J. Diamond, M.D., to this topic: "Abortion, Animation, and Biological Hominization," *TS* 36 (1975) 305–24.

[31] *Human Life in Our Day*, par. 84.

[32] Grobstein, *Science* 25.

which is neither that of the father nor of the mother; it is rather the life of a new human being with his own growth"[33]?

How are we to understand this phraseology in the light of the biology of development? For, while it is correct to say that the life that is present in the newly fertilized egg is distinct from the father and mother and is in fact usually genetically unique, it is not the case that this particular zygote is fully formed and it is not a single human individual, an "ontological individual," as Ford suggests.[34] Because of the possibility of twinning, recombination, and the potency of any cell up to gastrulation to become a complete entity, this particular zygote cannot necessarily be said to be the beginning of a specific, genetically unique individual human being. While the zygote is the beginning of genetically distinct life, it is neither an ontological individual nor necessarily the immediate precursor of one.

Second, the zygote gives rise to further divisions "resulting in an aggregate of cells, each of which remains equivalent to a zygote in the sense that it can become all or any part of an embryo and its extra-embryonic structure."[35] Such cells at this stage are totipotent:

> Within the fertilized ovum lies the capability to form an entire organism. In many vertebrates the individual cells resulting from the first few divisions after fertilization retain this capability. In the jargon of embryology, such cells are described as totipotent. As development continues, the cells gradually lose the ability to form all the types of cells that are found in the adult body. It is as if they were funneled into progressively narrower channels. The reduction of the developmental options permitted to a cell is called restriction. Very little is known about the mechanisms that bring about restriction, and the sequence and time course of restriction vary considerably from one species to another.[36]

Such a process of restriction is completed when the cells have become "committed to a single developmental fate. . . . Thus determination represents the final step in the process of restriction."[37] Such determination begins during gastrulation, three weeks into embryonic development.

Genetic uniqueness and singleness coincide on one level only after the process of implantation has been completed and on another after the restriction process is completed. Thus, if we take implantation as the marker of both conception and human singleness, this does not occur

[33] *Donum vitae* I, 2, in Shannon and Cahill, *Religion and Artificial Reproduction* 148.

[34] An ontological individual is defined as "a single concrete entity that exists as a distinct being and is not an aggregation of smaller things nor merely a part of a greater whole; hence its unity is said to be intrinsic" (Ford, *When Did I Begin*? 212).

[35] Grobstein, "Early Development" 235.

[36] Carlson, *Patten's Foundations* 23.

[37] Ibid. 26.

until about a week after the initiation of fertilization. If we use determination and restriction, because of their signaling of the loss of totipotency of the cells, as the markers of human singleness, then individuality does not occur until about three weeks after fertilization. Of critical importance is Ford's observation: "*The teleological system of the blastocyst should not be identified with the ontological unity of the human individual that will develop from it.*"[38]

There is, then, a partial answer to the very interesting question[39] *Donum vitae* asks: "How could a human individual not be a human person?"[40] A Catholic philosopher might well object or reply that this is certainly a very muddled question, for "traditionally speaking" individuality has been considered a necessary, though not sufficient condition for human personhood. The rational soul has never been considered the formal reason why something human is individual. Obviously, "human individual" can have several meanings. If it refers to a fertilized ovum, this is indeed something both human (qua product) and numerically single. Yet, until the process of individuation is completed, the ovum is not an individual, since a determinate and irreversible individuality is a necessary, if not a sufficient, condition for it to be a human person.

Something human and individual is not a human person until he or she is a human individual, that is, not until after the process of individuation is completed. Neither the zygote nor the blastocyst is an ontological individual, even though it is genetically unique and distinct from the parents. The potential for twinning remains until the beginning of gastrulation, although it is rare for it to occur this late. Additionally, a zygote that divides can reunite and one individual will emerge. Furthermore, each cell can form a total individual. A human individual, to use the language of the document, cannot be a human person until after individuality is established.

Also, as Grobstein noted, genetic uniqueness does not necessarily imply singleness.[41] That is, when fertilization is complete and the haploid state is reached, the organism has its full complement of genetic information. At this point it is genetically unique. But because of the potentiality for twinning, this uniqueness may be shared by more than one organism. Thus, even though unique, the organism is not necessarily single. Singleness or individuality occurs after the genetically unique organism has implanted and its development is restricted to forming one unified organism.

[38] Ford, *When Did I Begin*? 158; italics ours.

[39] Although any conclusions should not be laid at his door, Richard McCormick started Shannon thinking about this problem and was suggestive in phrasing the question.

[40] *Donum vitae* I, 2, in Shannon and Cahill, *Religion and Artificial Reproduction* 149.

[41] Grobstein, *Science* 25.

An individual is not an individual, and therefore not a person, until the process of restriction is complete and determination of particular cells has occurred. Then, and only then, is it clear that another individual cannot come from the cells of this embryo. Then, and only then, is it clear that this particular individual embryo will be only this single embryo.

One can reasonably conclude, then, that if there is no single human entity, there is no person. For the one is the presupposition of the other. Thus, when *Donum vitae* approvingly refers to the findings of modern science and argues "that in the zygote . . . resulting from fertilization the biological identity of a new human individual is already constituted,"[42] does not this statement of the Congregation fail to make a critical distinction between genetic uniqueness and singleness? In using "individual" rather than "person" in this meticulously worded statement, the Congregation may have sought to sidestep the controversial question of when personhood begins. But if "individual" be taken in its philosophical or technical meaning, scientific data available today hardly justify the claim that a particular zygote is necessarily both genetically unique and an individual.

This is particularly important in assessing the theological intent of the Congregation, particularly since it argues that 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 this first appearance of a human life."[43] As the statement stands, three concepts appear to be conflated here: genetic uniqueness, singleness, and personal presence. The argument for the first presence of human and personal life in the zygote relies heavily on scientific claims about the fertilized egg. However, such claims of singleness and personhood cannot be made, the former scientifically and the latter philosophically. We assume that the Congregation would want to adjust its findings in the light of these distinctions.

3. Ensoulment[44]

In this section and elsewhere, we will be discussing the principle of immaterial individuality or immaterial selfhood. In the Catholic tradi-

[42] *Donum vitae* I, 2, in Shannon and Cahill, *Religion and Artificial Reproduction* 149.

[43] Ibid. I, 2, in Shannon and Cahill, *Religion and Artificial Reproduction* 149.

[44] There is much literature on this, but two interesting articles which are extremely useful for their summaries are Joseph Donceel, S.J., "A Liberal Catholic's View," in *Abortion in a Changing World*, ed. Robert E. Hall (New York: Columbia University, 1970), and Carol Tauer, "The Tradition of Probabilism and the Moral Status of the Early Embryo," *TS*, 45 (1984) 3-33. Both articles can be found in *Abortion and U.S. Catholicism: The American Debate*, ed. Patricia B. Jung and Thomas A. Shannon (New York: Crossroad, 1988).

tion, and clearly in many of the sources we cite, the usual term for this is "soul." Our practice will be to use the term "soul" when speaking within a clear traditional context. But when we develop our own presentation, we will use the term "immaterial individuality" or "immaterial selfhood," because the term "soul" has many connotations and images connected with it and in so far as possible we wish to avoid problematic usages and confusing images.

a. Issues

Although far from being a defined doctrine, there is support in Roman Catholic moral theology for the position that ensoulment is coincident with fertilization or, at least, as early as possible after conception. This position apparently dates from the early-17th-century writings of Thomas Fienus, professor on the faculty of medicine at Louvain.[45] This opinion gradually caught on and became the dominant opinion. This position was complemented by teachings that held that the embryo "possesses all the essential parts of a human body, though very minute in size."[46] This teaching on immediate animation eventually worked its way into the mainstream of Catholic moral theology. If doctors of medicine were Catholics, explains Dorlodot,

> they were told that the theologians of their time held that the soul is created by God immediately after fecundation. The theologians in turn based themselves on the opinion of the doctors, as these did on that of the theologian. In other words, *caecus caeco ducatum praestat.* Finally, the moral theologians, who completely forgot the principles which, according to the great doctors of Catholic morality, render abortion always illicit, invoked the danger of favouring abortive or sterilizing practices.[47]

Additionally, the removal from canon law in 1896 of the distinction between the formed and unformed fetus suggests that there is not a time when the body is unformed.[48] The *Ethical and Religious Directives for Catholic Health Facilities* provide another reason when they include in the definition of an abortion the "interval between conception and implantation."[49] Also, we have the 1981 testimony of Cardinal Cooke and Archbishop Roach in support of the Hatch amendment: "We do claim that each human individual comes into existence at conception, and that

[45] Henry de Dorlodot, "A Vindication of the Mediate Animation Theory," in *Theology and Evolution*, ed. E. C. Messenger (Westminster, Md.: Newman, 1959) 271.

[46] Dorlodot, "A Vindication" 273.

[47] Ibid.

[48] Cf. John Connery, S.J. *Abortion: The Development of the Roman Catholic Perspective* (Chicago: Loyola University, 1977) 212.

[49] Washington, D.C.: U.S. Catholic Conference, 1977, 4.

all subsequent stages of growth and development in which such abilities are acquired are just that—stages of growth and development in the life cycle of an individual already in existence."[50] Finally, in *Donum vitae* we read: "nevertheless, 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 this first appearance of a human life."[51]

If this statement is to be accepted as it stands, we suggest that the conclusions of science should be interpreted differently, particularly if we reflect on what we know from science in the light of a centuries-long tradition among Catholic philosophers and theologians. For like them we are struck by both the wonder and sacredness of human life even from its obscure beginnings, as well as to when we could begin to suspect a personal presence might be there. Nor can we forget that for some 17 centuries the Church indeed condemned abortion, but not on the ground that it might by even the most remote possibility be in all cases a question of murder. Certainly some of the greatest minds and doctors of the Church refused to believe, as many today seem to do, that ensoulment is coincident with fertilization or that we must trace the genesis of each human person back to that moment. Obviously, the Sacred Congregation for the Doctrine of Faith had no intention of definitively settling this question, for it stated pointedly, "This declaration expressly leaves aside the question of the moment when the spiritual soul is infused. There is not a unanimous tradition on this point and authors are as yet in disagreement."[52] It did not believe, however, that such theoretical openness should lead to any rash or precipitious practical action, for it goes on to say: "From a moral point of view this is certain: even if a doubt existed concerning whether the fruit of conception is already a human person, it is objectively a grave sin to dare to risk murder."[53]

Several very critical questions arise here, particularly since abortion was traditionally considered a sin against marriage but not homicide. One of them, concerning the moral possibility of acting on probable knowledge, has already been masterfully treated by Carol Tauer.[54] Others

[50] Archbishop John Roach and Cardinal Terence Cooke, "Testimony in Support of the Hatch Amendment." *Origins* 11 (1981) 357–72; also in Jung and Shannon, *Abortion* 15.

[51] *Donum vitae* I, 1, in Shannon and Cahill, *Religion and Artificial Reproduction* 149.

[52] *Declaration on Abortion* (Washington, D.C.: U.S. Catholic Conference, 1975) 13.

[53] Ibid. 6.

[54] See n. 44 above. While many have been unhappy with Carol Tauer's article and have dismissed it, Shannon has not yet seen a substantive refutation of her argument that the "application of the probabilist methods would permit some early abortion" (Jung and Shannon, *Abortion* 79).

concern practical and philosophical issues relating to the development of the pre-embryo and embryo. It is to these issues that we now turn.

The dominant position of the moral tradition on ensoulment was the acceptance of a time during the pregnancy when the fetus was not informed by the rational soul. Two distinctions were used in discussing this. The first distinction is between active and passive conception and is exemplified in *De festis* of Benedict XIV, in which the pope comments on the doctrine of the Immaculate Conception.

> Conception can have a twofold meaning, for it is either active, in which the holy parents of the Blessed Virgin, joining each other in a marital role, have accomplished those things which have to do most of all with the formation, organization, and disposition of the body itself for receiving a rational soul to be infused by God; or it is passive, when the rational soul is coupled with the body. This infusion and union of the soul with a duly organized body is commonly called passive conception, namely, that which occurs at that very instant when the rational soul is united with a body consisting of all its members and its organs.[55]

Thus the pope would seem to understand active conception, in our terminology, as the physical union of egg and sperm that will become the embryo, while passive conception would be the moment the rational soul is infused into a suitably organized body, one that results from (begins with) organogenesis.

The second distinction is between mediate and immediate animation by such a soul. The theory of mediate animation is succinctly stated as follows:

> Animation by the intellectual soul is impossible so long as the parts of the brain which are the seat of the imagination and the vis cogitativa (and we might add, the memory) are not suitably organized. But it still is more evident that there cannot be animation by the intellectual soul when the brain is not even outlined, or again, when even the embryo really does not as yet exist. Now that is precisely the case with the ovum, and the morula, and of that which results from its development, so long as there has not appeared, on a particular part of the germ, that which by its ulterior development will become a fetus.[56]

[55] "Conceptio dupliciter accipi potest; vel enim est activa, in qua Sancti B. Virginis parentes opere maritali invicem convenientes, praestiterunt ea quae maxime spectabant ad ipsius corporis formationem, organizationem et dispositionem ad recipiendam animam rationalem a Deo infundendam; vel est passiva, cum rationalis anima cum corpore copulatur. Ipsa animae infusio et unio cum corpore debite organizato vulgo nominatur Conceptio passiva, quae scilicet fit illo ipso instanti quo rationalis anima corpori omnibus membris ac suis organis constanti unitur" (Benedict XIV, *De festis*, lib. II, c. 15, n. 1, in *Opera omnia* 9, ed. J. Silvester [Prato: Aldina, 1843] 303a).

[56] Dorlodot, "A Vindication" 266. It was here that Messenger and Dorlodot recalled that the only theological attempt to define the role of the rational soul as the substantial form

Immediate animation occurs coincidentally with the fusion of egg and sperm, known as the moment of conception. This is the position utilized in the teachings referred to at the beginning of this section. This distinction is also thoroughly discussed by Donceel, as previously noted.[57]

Medieval theologians were particularly interested in clarifying the technical meaning of "conception" in their justification of the celebration of the popular feast of the Bl. Virgin Mary's conception. Henry of Ghent, following common scholastic reasoning, distinguished between the "conception of the seed when fetal life begins" and the conception of the human soul some "35 or 42 days later [when], depending on the sex, a rational soul is created."[58] Such a position echoes St. Anselm's perceptive judgment, "No human intellect accepts the view that an infant has a rational soul from the moment of conception."[59]

Had this saint known of the empirical data on wastage, he would have considered such a claim not only irrational but blasphemous.[60] For only

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of the body was made by the Council of Vienne (DS 481) and that the fathers and theologians of that council did not subscribe to the immediate-animation theory. Dorlodot uses the definition of the council as the major premise of his argument vindicating the mediate animation theory; see Messenger, *Theology and Evolution* 259.

[57] Donceel, "A Liberal Catholic" 48 ff.

[58] *Quodlibet* 15, q. 13; cited in *John Duns Scotus: Four Questions on Mary*, tr. and intro. by Allan B. Wolter, O.F.M. (Santa Barbara, Calif.: Old Mission, 1988) 6. It is interesting to note that Henry breaks with the tradition and ascribes a longer period of gestation before animation to the male rather than the female as was customary since Aristotle.

[59] Anselm of Canterbury, *De conceptu virginali et de originali peccato*, c. 7 in *Anselmi Cantuariensis archiepiscopi opera omnia* 2, ed. F. S. Schmitt (Stuttgart-Bad Cannstatt, 1968) 148 (Anselm of Canterbury 3, ed. and tr. Jasper Hopkins and Herbert Richardson [Toronto: Edwin Mellen, 1976] 152). It is important to keep in mind that the Archbishop of Canterbury is arguing as to when it is possible to contract original sin, something that all theologians in his day agreed required only the existence of a human soul, not any consciousness or voluntary activity on the part of an infant. As he puts it, "Either from the very moment of his conception an infant has a rational soul (without which he cannot have a rational will) or else at the moment of his conception he has no original sin. But no human intellect accepts the view that an infant has a human soul from the moment of his conception. For [from this view] it would follow that whenever—even at the very moment of reception—the human seed perished before attaining a human form, the [alleged] human soul in this seed would be condemned, since it would not be reconciled through Christ—a consequence which is utterly absurd." Today we may have different conceptions as to the nature of original sin and how it is contracted, but we have even less reason than Anselm to believe that there is the remotest possibility of a human will present in what he calls "human seed" at the moment the zygote is formed, or that there is any less rather than a substantially greater amount of "human seed that perishes before attaining a human form."

[60] Those who see no insuperable difficulty for the theory of immediate animation in the fact that twins can come from a single fertilized egg should find considerable difficulty in the problem of wastage. To ascribe such bungling of the conceptual process to an all-wise creator would seem almost sacrilegious. One would have to assume that God in His foreknowledge would create souls only for those He foreknew would eventually be born, an

about 45% of eggs that are fertilized actually come to term. The other 55% miscarry for a variety of reasons. Some are related to the biochemistry of the uterus, others are a function of low levels of necessary hormones, while yet other reasons have to do with structural anomalies within the pre-embryo or embryo itself.[61] Such vast embryonic loss intuitively argues against the creation of a principle of immaterial individuality at conception. What meaning is there in the creation of such a principle when there is such a high probability that this entity will not develop to the embryo stage, much less come to term?

Also, given the fact that twinning and recombination is a possibility, what is one to say about the presence of immaterial individuality during that process? If this principle is initiated at fertilization and then a twin is formed, how does one explain the relation of the original principle to the zygote that splits off? And should recombination occur, how does one explain coherently the fate of such a principle of immaterial individuality? Should one freeze the pre-embryo, all organic processes stop for the duration. What is the status of immaterial individuation then? It is genuinely unclear what to think of that in terms of the standard theory of immediate ensoulment. Then there is the issue of whether a soul, in the classic sense of the form of the body, is needed for the fertilized egg to develop into its possible subsequent forms.

b. Commentary

The question of the moral significance of the morula and of embryonic wastage has been noted previously in the moral literature. In 1976, for example, Bernard Häring brought together much of the scientific literature and examined its moral significance. His conclusion concurs with one suggestion in our analysis and opens the door to other issues: "the argument that the morula cannot yet be a person or an individual with all the rights of the members of the human species seems to me to be convincing as long as we follow our traditional concept of personhood."[62] This conclusion opens up several areas for consideration.

First, we concur with Häring and particularly with the analysis of Ford that, given the biological evidence, there is no reasonable way in which

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argument a prochoice advocate might well apply to aborted fetuses. On the other hand, Catholics, on the basis of rational argument, can hardly hope to argue for anything more than a suitable level of protection warranted by the development stage of the pre-embryo and its sequelae.

[61] C. Grobstein, M. Flower, and J. Mendeloff, "External Human Fertilization: An Evaluation of Policy," *Science* 222 (Oct. 14, 1983) 127–33.

[62] Bernard Häring, "New Dimensions of Responsible Parenthood," *TS* 37 (1976) 127. This article is also a good review of the scientific literature of that time period and contains references to other articles which discuss our theme.

the fertilized egg can be considered a physical individual minimally until after implantation. Maximally, one could argue that full individuality is not achieved until the restriction process is completed and cells have lost their totipotency. Thus the range of time for the achievement of physical individuality is between one and three weeks. One simply cannot speak, therefore, of an individual's being present from the moment of fertilization.

Second, given the standard definition of personhood used in Catholic moral theory—an individual substance of a rational nature—questions are raised about the rational nature. When might one consider such a rational nature to be present? Ford suggests the formation of the primitive streak, which coincides with the time of the formation of the neural tube, as an appropriate criterion.[63] Another criterion would be around eight weeks, when the first elicited responses have been recorded. These are the result of a simple three-neuron circuit. Thus, towards the end of the embryonic period some neural activity is present. A third answer would be the formation of a relatively integrated nervous system, which occurs around the 20th week of fetal development. Of critical importance here is the connection of neural pathways through the thalamus to the neocortex. This allows stimuli to be received, as well as activities to be initiated.

One can speak of a rational nature in a philosophically significant sense only when the biological structures necessary to perform rational actions are present, as opposed to only reflex activities. The biological data suggest that the minimal time of the presence of a rational nature would be around the 20th week, when neural integration of the entire organism has been established. The presence of such a structure does not argue that the fetus is positing rational actions, only that the biological presupposition for such actions is present.

Third, the pre-embryonic form as a system is not totally passive, the recipient only of actions from the outside as it were. It has its own activities arising from the released potencies of the novel combination of its constituent materials. Such potencies are released when these elements form a system, e.g. the embryo. This development of new systems gives rise to new activities and possibilities and serves as the foundation or presupposition for other stages of development. Philosophically speaking, we have every reason to believe that the dynamic properties of the organic matter—the elements of the fully formed zygote—owe their existence to their organizational form or the system. Important to note is that "where there are only material powers—that is, the ability to form

[63] Ford, *When Did I Begin?* 171 ff.

material systems—, there is only a material nature or substance."[64] Thus the material system or form of the developing body can explain its own activity. We conclude that there is no cogent reason, either from a philosophical or still less from a theological viewpoint, why we should assert, for instance, that the human soul is either necessary or directly responsible for the architectonic chemical behavior of nucleo-proteins in the human body.

Among the scholastic theologians and doctors of the Church, perhaps St. Bonaventure has given the most helpful model for what we have in mind. For in his interesting Aristotelian interpretation of how St. Augustine's theory of seminal reasons might be explained according to the science of his own day, he argued that if the potencies be understood as active rather than passive, then the Aristotelian formula that the new substantial *form is educed from the potency of matter* made sense. For "the philosopher of nature says that matter first receives the elementary form and by its means it comes to the form of the mineral compound and by means of the latter to the organic form, for he looks to that potency of matter according to which it is progressively actualized by the operation of nature."[65]

If we interpret this in more contemporary terms, it means simply that the new substantial form is nothing more than that of the organic system itself, and that its new and unique dynamic properties stem from the complementary interaction of elements that make up the system. All that is needed is some external agent to bring the elements of that system together, for, as Bonaventure puts it, "in matter itself there is something cocreated with it from which the agent acting in matter educes the form. Not that this something from which the form is educed is such that it becomes some part of the form to be produced, but it is rather that which can be and will become the form, even as a rosebud becomes a rose."[66]

These remarks suggest that the principle of immaterial individuality is indeed the ultimate actualization of all the potencies contained within

[64] Allan B. Wolter, "Chemical Substance," in *Philosophy of Science* (Jamaica, N.Y.: St. John's University, 1960) 108. This citation is an excerpt from a seminal article originally titled "The Problem of Substance." Its primary aim was to present a cosmological account of how mechanical and natural systems differ, why various forms of living substances arise from nonliving matter, and how traditional scholastic philosophical insights and theories such as both the pluriform and uniform hylomorphic conceptions might be helpful as partial insights to a more complex philosophical theory. The psychological role of the rational soul was only discussed peripherally to show how medieval scholastics fitted it into their theories of mediate animation.

[65] See J. F. Wippel and A. B. Wolter, *Medieval Philosophy: From St. Augustine to Nicholas of Cusa* (New York/London: Free Press and Collier Macmillan, 1969) 325.

[66] Ibid. 320.

the forms or systems that constitute the organic life of the human being. Thus, finally, we can say that while it is necessary to recognize the distinctions between higher and lower vital functions in the human being, nonetheless there may be "an area where the biochemical theory is the more plausible explanation, and another area where the animistic position seems to be the only tenable view."[67]

The question of when such a principle comes into being is dependent on which level of the system of the human being one is examining and what activities are performed here. The strong implication of these suggestions is that immaterial individuality comes into existence late in the development of the physical individual.

CONCLUSIONS

1. Biological Data

a. Physical Individuality

Two biological data mandate a revision of our understanding of the beginning of individuality: (1) the possibility of twinning, which lasts up to implantation, which occurs about a week after fertilization begins, and (2) the completion of the restriction process, which prevents individual cells from forming another individual, about three weeks into the pregnancy. While one can speak of genetic uniqueness, in that the fertilized egg has its own genetic code distinct from any other entity (except an identical twin, triplet, etc.), we simply cannot speak of an individual until in fact that individual is present, and the earliest that can be is about two or three weeks after fertilization begins.

b. Neural Development

Three markers are significant in neural development: (1) gastrulation, the development of the various layers in the pre-embryo which give rise to the whole organism; (2) organogenesis, the presence of all major systems of the body, occurring around the eighth week, and (3) the development of the thalamus, which permits the full integration of the nervous system, around the 20th week.

Critical here is the necessity of a functioning and probably integrated nervous system for the possibility of rational activity. For if there is no nervous system functioning, it is not clear that the rational part of the definition of a person can be fulfilled, even though the individual part might be. The functioning nervous system is a necessary condition for the possibility of a new stage of development to emerge and is also a sign

[67] Wolter, "Chemical Substance" 125–26.

that the organism is prepared for this. Thus any of the three markers noted immediately above could serve as an indicator of the capacity for rationality, though not necessarily its actuality.

c. Developmental Autonomy

Given the philosophical discussion on nature and substance, it is reasonable to argue that the developing body as an organized system is a new substance or nature and has the capacity to elicit the potencies within its own reality. That is, a fully formed zygote is a new nature because it has its own actuality and potentiality. It is in itself a sufficient explanation of its own development and activities. The same is true on each new level of development as the zygote becomes an embryo and, finally, a fetus. On a genetic level, the clearest marker of the presence of self-directing activity which would manifest such a new nature would appear in the zygote after it developed the capacity to manufacture its own messenger RNA and thus be developmentally, though not physically, independent of the mother.

2. Moral Implications

a. Physical Individuality

We find it impossible to speak of a true individual, an ontological individual, as present from fertilization. There is a time period of about three weeks during which it is biologically unrealistic to speak of a physical individual. This means that the reality of a person, however one might define that term, is not present at least until individualization has occurred. Individuality is an absolute or necessary condition for personhood.

We conclude that there is no individual and therefore no person present until either restriction or gastrulation is completed, about three weeks after fertilization. To abort at this time would end life and terminate genetic uniqueness, to be sure. But in a moral sense one is certainly not murdering, because there is no individual to be the personal referent of such an action.

Since the zygote is living, has the human genetic code, and indeed possesses genetic uniqueness, this entity is valuable, and its value does not depend on the presence or absence of any or a particular quality or characteristic such as intelligence or capacity for relationships.[68] Thus

[68] For a further discussion of this concept, see James J. Walter, "The Meaning and Validity of Quality of Life Judgments in Contemporary Roman Catholic Medical Ethics," *Louvain Studies* 13 (1988) 195–208. Another discussion can be found in Thomas A. Shannon

the zygote and the blastomers derived from it, because they are living, possess ontic value and are in themselves valuable. Thus the general argument made here is not a so-called "quality of life" argument.

Nonetheless, until the completion of restriction or gastrulation, the zygote and its sequelae are in a rather fluid process and are not physical individuals and therefore cannot be persons. The pre-embryo at this state, we conclude, cannot claim absolute protection based on claims to personhood grounded in ontological individuality. Yet, since the pre-embryo is living and possesses genetic uniqueness, some claims to protection are possible. But these may not be absolute and, if not, could yield to other moral claims.

b. Immaterial Individuality

If one assumes, as we think correct to do, that the potencies actualized in the formation of the new nature of the fertilized egg have the inherent capacity to ground its growth and development, then there is no need to posit a principle of individual immateriality, understood as the Aristotelian *nous* or as the entelechy of the body, in pre-embryonic development.

Since the evidence for such a principle comes from the internal evidence of those who experience it, it is difficult at best to ground any speculation as to when it comes into existence. We would make this argument. On the one hand, the developing pre-embryo as a new nature has within it the potential for future development. On the other hand, if the will as a rational potency is what genuinely distinguishes the person from a nature, then one needs to look to biological presuppositions which enable such a potency to exist. We would argue that the earliest time is around the eighth week of gestation, because then the nervous system is fully integrated.

3. Summary

We have reviewed some of the salient biological data about the initial stages of the development of human life, with a view to evaluating the philosophical and theological claims made of them. Reflecting on these from a historico-theological perspective, we have tried to discover whether there exists some rational justification for the absolute value that is attributed to the zygote or pre-embryonic state based on claims to personhood, or whether our earlier long-standing Catholic tradition of mediate animation by a rational soul does not provide a more satisfactory

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and James J. Walter, "The PVS Patient and the Forgoing/Withdrawing of Medical Nutrition and Hydration," *TS* 49 (1988) 623–47.

philosophical and theological account. For if we consider judiciously what the great scholastic doctors had to say about the "moment of conception," we seem to have good reason to reintroduce, in interpreting the data of present-day science, the theological distinction between active and passive conception made by Pope Benedict XIV in discussing Mary's immaculate conception.

We thus affirm that any abortion is a premoral evil. That is, it is the ending of life. Consequently we do not want to be understood as proposing or supporting an "abortion on demand" position or assuming that early abortions are amoral. Abortion is a serious issue, because life is involved and one needs always to respect life. We have made one major argument, however, in this essay. Given the findings of modern biology, there is no evidence for the presence of a separate ontological individual until the completion of either restriction or gastrulation, which occurs around three weeks after fertilization. Therefore there is no reasonable basis for arguing that the pre-embryo is morally equivalent to a person or is a person as a basis for prohibiting abortion. That is, there is no biological support for the position that the fertilized egg is from the beginning of the process of fertilization a distinct individual needing no outside agency to develop into a person. Neither is there good philosophical evidence that the principle of immaterial individuality need be present from the beginning to explain the physical development of the pre-embryo.

This position obviously does not support the argument that abortion is to be prohibited because a person is present from the beginning of fertilization. The earliest such an argument could reasonably be made is after the completion of gastrulation. We recognize that this argument will dismay many and comfort others. Our intention in proposing the argument of this essay is to gain a greater coherence between moral theology and modern embryology.

In this sense we are complementing the work of the Roman Congregations and bringing it up to date. We also wish to test the strength of our argument, already subjected to review by several colleagues, in review by a wider and more diverse audience. Additionally, our intention is to develop a position that is reasonable and can be reasonably defended in the public sector.[69] Finally, we think our position on the pre-embryo and embryo can stand rigorous scrutiny and we propose it as a factor in developing a feasible state and/or national policy on abortion.

[69] We suggest that something of the violence between the extreme prolife or proabortionists might be defused, and the political dilemma of Catholic politicians seeking some rational options might be solved, if one were to recognize that the moral status of, and hence the protection appropriate for, a fetus changes with its developmental stages.

One is reminded here of Henry de Dorlodot's evaluation of immediate animation made over 50 years ago in his seminal work *Darwinism and Catholic Thought:* "We are not exaggerating in the least when we regard the fact that this theory [of immediate animation] should still find defenders long after the experimental bases on which it was thought to be founded have been shown definitely to be false, as one of the most shameful things in the history of thought."[70]

[70] Quoted by Messenger, *Theology and Evolution* 219.