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DELAYED HOMINIZATION

REFLECTIONS ON SOME RECENT CATHOLIC CLAIMS FOR DELAYED HOMINIZATION

Though the Congregation for the Doctrine of the Faith has insisted that in the issues of abortion and reproductive technology the newly conceived human zygote should be treated as a human person,[1] respected Catholic theologians, because of data gathered from modern embryology, are wondering whether this caution is fully warranted.[2] Yet these theologians do not consider the question to be merely speculative, since they are concerned with how official teaching on this matter, together with theological meditation upon it, affects the circumstances that the moral agent takes into account when dealing with human reproduction issues. It is a *practical* issue as well, and thus associated in the Catholic tradition with questions of moral certitude, probabilism, etc.[3] This much is sure: if the CDF's insistence is not based in *fact,* then arguments against contraceptives that function solely or occasionally as abortifacients, together with arguments against the disposal of, or experimentation upon, conceived zygotes no longer needed for in vitro fertilization, really lose their sting. And when this is coupled with probabilism, which de facto reigns in those areas of moral conduct where there is disagreement between the official magisterium and theologians, the contention that the preembryo is not a human person will likely lead to action on the part of Catho-

[1] See the CDF's "Instructio de observantia erga vitam humanam nascentem deque procreationis dignitate tuenda (*Donum vitae*)," *Acta Apostolicae Sedis* 80 (1988) 70–102, para. 1, no. 1. Its earlier "Declaratio de abortu procurato," *AAS* 66 (1974) 730–47, explicitly avoided the issue of the moment of the newly-conceived zygote's animation with a rational soul, because there was no constant tradition on the subject, and authors disagree (738 n. 19).

[2] See Lisa Cahill, "The Embryo and the Fetus: New Moral Contexts," *TS* 54 (1993) 124–42, who refers to most of the authors dealt with here: Clifford Grobstein, *Science and the Unborn: Choosing Human Futures,* (New York: Basic Books, 1988); Norman M. Ford, *When Did I Begin? Conception of the Human Individual in History, Philosophy and Science* (New York: Cambridge University, 1988); Richard McCormick, "Who or What Is the Preembryo?," *Kennedy Institute of Ethics Journal* 1 (1991) 1–15; Thomas A. Shannon and Allan B. Wolter, "Reflections on the Moral Status of the Pre-Embryo," *TS* 51 (1990) 603–26; Carlos A. Bedate and Robert C. Cefalo, "The Zygote: To Be or Not To Be a Person," *Journal of Medicine and Philosophy* 14 (1989) 641–45. Cahill does not reveal her own position in the article.

[3] Shannon and Wolter ("Reflections on the Moral Status" 625) cite as a "masterful treatment" Carol Tauer, "The Tradition of Probabilism and the Moral Status of the Early Embryo," *TS* 45 (1984) 3–33. For Fr. McCormick the preembryo's not being a human person is "solidly probable"; see his "The Embryo Debate 3: The First 14 Days," *The Tablet* 224, no. 7808 (10 March 1990) 301–2.

lics.[4] Ongoing evaluation of the facts surrounding the preembryo is needed, along with dialogue among writers who disagree on what the facts mean.

This article addresses whether the recent trend among some Catholic moral theologians to consider the preembryo not to be a human person is dependent upon a misreading of the biological facts. My main question is this: Is distinguishing between "genetic individuality" and "developmental individuality" biologically or morally helpful with regard to the personhood of the preembryo? This distinction, the point of departure for most of the recent Catholic reflections I have seen, has its chief origin in Grobstein and Ford, and can be found in McCormick and in Shannon and Wolter.[5] What, and how well founded, are its underpinnings? And are there data that may not have been kept in mind when formulating and applying it?[6]

Focusing on the Embryological Data

The distinction between genetic and developmental individuality highlights some rock-bottom facts about embryonic development: at

[4] That "the preembryo is not hominized" may be a solidly extrinsic probability, since many accepted theologians (Rahner, Häring, Donceel, McCormick, Ford, Shannon, Wolter, and perhaps Cahill) hold this view. But, as I understand the tradition of probabilism, originating on this point with Gabriel Vazquez, this cannot lead to justifiable action contrary to the expressed, considered judgment of the official magisterium; only solidly intrinsic probability could do that. So at issue is whether "the preembryo is not a human person" enjoys solid intrinsic probability, which calls for an examination of the facts intrinsic to embryology. The standard account of probabilism remains that of Thomas Deman, "Probabilisme," *Dictionnaire de théologie catholique* 13.1, 417–619; see also A. R. Jonsen and S. Toulmin's *The Abuse of Casuistry: A History of Moral Reasoning* (Berkeley: University of California, 1988) 164–75.

[5] Although these writers on the subject depend upon embryological information reported during the 1980s, I suspect that their position is better formulated by James J. Diamond, M.D., "Abortion, Animation, and Biological Hominization," *TS* 36 (1975) 305–24. He notes, for instance, which Shannon and Wolter do not ("Reflections" 618–19), that in "spontaneous wastage" of zygotes it is likely that many are blighted ova, never were fully fertilized, thus allaying the issue of ensoulment (312–13).

[6] More recent bibliography includes Clayton W. Kischer, "Human Development and Reconsideration of Ensoulment," *Linacre Quarterly* 60 (1993) 57–63; Diane Nutwell Irving, "Scientific and Philosophical Expertise: An Evaluation of the Arguments of 'Personhood'," *Linacre Quarterly* 60 (1993) 18–46, an encyclopedic consideration of this question; and Anthony Zimmerman, "I Began at the Beginning," *Linacre Quarterly* 60 (1993) 86–92. I have been influenced by Albert S. Moraczewski, "Personhood: Entry and Exit," in *The Twenty-fifth Anniversary of Vatican II: A Look Back and a Look Ahead,* (Braintree, Mass.: The Pope John Center, 1990) 78–101; Benedict M. Ashley, "Delayed Hominization: Catholic Theological Perspective," in *The Interaction of Catholic Bioethics and Secular Society* (Braintree, Mass.: The Pope John Center, 1992) 163–79; idem, "A Critique of the Theory of Delayed Hominization," in *An Ethical Evaluation of Fetal Experimentation: An Interdisciplinary Study* (St. Louis: Pope John XXIII Center, 1976) 113–33; idem, and A. Moraczewski, "Is the Biological Subject of Human Rights Present from Conception?" in *The Fetal Tissue Issue: Medical and Ethical Aspects,* eds. P. J. Cataldo and A. S. Moraczewski (Braintree, Mass.: The Pope John Center, 1994) 33–59.

successful fertilization, the newly conceived zygote contains a genetic code distinct from that both of the mother and of the father, but it can, early in its development, become many (i.e. non-individual), either by means of twinning at the first cleavage, or by means of one of its cells being separated in the cell-cluster that is the morula, and itself becoming a separate organism. The genetic identity of the zygote is no guarantee that a single organism will develop, and since the traditional account of God's infusion of the rational soul requires it to be the form of a single, determined body, it seems that the soul's infusion cannot take place until the preembryo is irreversibly individual, around day 14 after conception.

There may be reason to draw a distinction between these two types of individuality, but I must admit to some reservations about the importance given this distinction in support of its use in deliberations about the moral worth of the preembryo. Here I shall present the background biological data, data that give rise both to the distinction between genetic and developmental individuality, and to the difficulties that give the distinction persuasive power. Those difficulties, to which I believe all other related difficulties can be reduced,[7] are the following:[8] the problem of the hydatidiform mole, the zygote's requirement for maternal cytoplasm, and the problem of totipotentiality (including the issue of twinning).

[7] The list is essentially that of Moraczewski ("Personhood" 88), and close to what Cahill details ("The Embryo" 127–28).

[8] I avoid the issue of "wastage," which seems to be primarily theological in inspiration. How does the theologian who holds the personhood of the preembryo from conception explain that upwards of 50% of successful "conceptions" perish before the embryonic stage? (A. J. Wilson reduces this to 20% before implantation and 31% after implantation; see the *New England Journal of Medicine* 319/4 [28 July 1988) 189–94].) Karl Rahner finds this to be a negative argument against immediate animation ("The Problem of Genetic Manipulation," in *Theological Investigations* 9 [New York: Herder and Herder, 1972] 226 n. 2), as do Shannon and Wolter, who speak of "intuition" ("Reflections" 619). Cahill speaks of wastage as a "contrary indication" to immediate hominization ("The Embryo" 127). Yet these concerns already fall into the systematician's consideration of why God freely chose to create a world in which evil can occur, and they are really a subset of questions regarding the problem of evil. I do not find helpful the inference that such wastage would amount to bungling on the part of an all-wise creator (Shannon and Wolter, "Reflections" 618), since God's providence and predestination with respect to individuals are not knowable in this life with any reliability, and it seems at least in principle possible that God allows this evil to occur to draw a greater good out of it. Also, as Ashley notes, putting stock in wastage as an implicit argument for delayed hominization forgets that wastage occurs abundantly during the embryonic stage, and that throughout history, infant mortality rates could approach and even exceed the 50% that is so jarring ("A Critique" 126). Finally, I must admit a certain antipathy to the project of letting theological concerns dictate the direction that what is first of all a biological investigation should take. According to the usual interpretation, wasn't the problem in the Galileo affair the fact that the Holy Office in 1632 thought that Galileo's proposed heliocentrism would raise insuperable problems for the Church's traditional understanding of certain biblical passages, so it insisted, regardless of the intrinsically mathematico-physical arguments Galileo provided, that geocentrism must stand?

A chief reason for presenting the biological facts as I know them is to give the reader the means by which to assess my interpretations. After providing the data, I shall interpret them in relation to "hominization," turn to the three problems mentioned, and close with some comments about the genetic/developmental distinction.

The Embryological Data[9]

While both the ovum and the sperm contain half the nuclear genetic material of the future zygote in their haploid nuclei, the ovum contributes additional factors found in its cytoplasm (i.e. mitochondria, yolk granules, etc.), while the sperm contributes almost no cytoplasm. When the sperm penetrates the ovum, the ovum becomes impervious to other sperm within a few seconds, and its penetration initiates a new level of metabolic activity within the ovum, without which the ovum, together with the sperm, will not produce a viable organism. Fertilization also causes the ovum's cytoplasm to rearrange significantly, so that, in the single-cell zygote prior to its first cleavage, various elements of the cytoplasm move towards either pole of the cell; hence in the single-cell zygote there exists a certain polarity (i.e. differentiation) from the very outset. The result of this is that, after the first cleavage, these morphogenic determinants will activate or repress certain genes in the cells in which they are found, cells whose appropriate disposition is necessary to the development of the embryo. The zygote is constituted, and begins to function as a distinct organism under its own control, only when the process of the meeting of the paternal and maternal pronuclei has taken place. If this does not occur, organized development ceases.

The sperm's penetration of the egg, in addition to stimulating the egg's "sperm blocking" mechanism that prevents polyspermy, also initiates a series of changes that leads to a release of sequestered calcium ions, which in turn start the mechanisms producing the first cell's cleavage. The zygote then begins its first cleavage within twenty-four hours of the entry of the sperm. The orientation and timing of the cleavages of the zygote are species-specific and accordingly genetically determined—the delay in human first cleavage is one of the longest known. Before the zygote's nuclear genes become fully activated, the maternal cytoplasmic factors seem to control the orientation and timing of at least the first cleavage of the zygote, though it is now known that, in other mammals like the mouse and the goat, the zygotic genome is fully activated by the two-cell stage, and possesses control over the cleavage process from that time on.[10] Cleavage cannot take

[9] The presentation that follows is based upon the data in Scott F. Gilbert's *Developmental Biology*, 4th ed. (Sunderland, Mass.: Sinauer Associates, 1994) 121–98 and 575–618, for simplicity cited explicitly only rarely.

[10] Ibid. 177–78. From what is known of subhuman reproduction, it is likely that the

place normally if the zygotic nucleus is not present; so, despite the maternal cytoplasm's active role in at least the first cleavage in mammals, the nuclear genes must be playing some role in the initiation and control of whatever cleavages proceed under the direct influence of the maternal cytoplasm.

The second-cell cleavage of the mammalian embryo differs from that of lower life-forms, since the blastomeres (the two cells formed by the first cleavage) cleave asynchronously, so that the sequence of cellular cleavage is not "two-four-eight," but rather "two-three-four." Also, and possibly because of the different portioning of the cytoplasm in the single-cell zygote prior to its first cleavage, this asynchronous division also occurs along differing planes, called "rotational cleavage," where one cell divides meridionally (top-to-bottom), while the other divides equatorially (left-to-right). The genome of each cell is identically replicated through mitosis, and the cytoplasm is subdivided.

In the earliest stages of the embryo's development all its cells are considered to be "totipotent" primarily in the sense that, if cells are somehow lost from the organism, they and their functions can be replaced by others, through the process of "regulation." It is also known that if, at this stage, a cell should become separated from the cell-cluster, by reason of its possession of the complete genome it can become a complete, separate organism. In this sense as well each cell is considered "totipotent." But if cleavage continues unhindered, subsequent cleavages will simply divide the original cytoplasm and replicate the genome, without enlarging the original zygote's size. As the differentiation of the blastomeres continues through subsequent cleavages, however, they eventually lose the ability to be involved in regulation, and will only produce cells of their own type. This further differentiation into cells of a certain type is the result of the "cascading" effect, by which certain genes that are found in daughter-cells are "turned-off" and become inactive. Embryologists speak of "cell fate" on the basis of a cell's and its daughter cells' appropriation of certain portions of the zygotic cytoplasm found at the first-cell stage,[11] which determine a blastomere and its descendants, if uninterrupted, to become, say, musculoskeletal cells, or epidermal cells, or chorionic cells.

Although the blastomeres at first appear to be forcibly held together by the "zona pellucida," the jellylike, spherical substance that surrounds them, they are in direct communication with one another via "gap junctions," where ions and small molecules are transferred from one blastomere to another, and in contact with one another via "microvilli" and actin microfilaments, which are strands that bind the

human ovum already has a certain polarity, perhaps conditioned by the entry point of the sperm, which persists in the zygote, so that even before cleavage it has a certain polarity, and hence differentiation with respect to the placement of various parts of the zygotic cytoplasm.

[11] Ibid. 155–58, 493–505.

blastomeres together before "compaction," the process by which the cells of the eight-cell zygote huddle together to produce the solid morula. At compaction a glycoprotein called "uvomorulin," which was being synthesized since the two-cell stage, and which had hitherto been evenly distributed on the cells' membranes, migrates to those areas on the membrane that are in contact with adjacent blastomeres. The migration to the junctions of adjacent blastomeres affects the microvilli, which help to produce compaction and its flattening of the blastomeres together by a shortening of the microvilli through actin depolymerization. The cell-junctions on the external surface of the now-solid morula are called "tight junctions," since together they seal off the inside of the ball that is now the morula from the outside. The cells inside the morula do not have tight junctions, but continue to have gap junctions, and intercellular communication continues there.

At this point the difference between being "outer" and "inner" cells, which was primarily, but not exclusively, one of position before compaction, begins to have significant importance for the cells that comprise the morula. Most of the descendants of the morula's external cells form the trophoblast, a group of cells that does not become part of the embryo proper, but rather becomes the "chorion," the embryonic portion of the placenta. The chorion enables the growing embryo to obtain oxygen and nutrition from the mother via the placenta, secretes the hormones that make the mother's uterus keep the growing embryo, and produces regulators of the mother's immune response, so that the mother's body will not reject the implanting embryo as it tries to do with an organ graft. Descendants of the inner cells will form the "inner cell mass," which will in turn give rise to the embryo proper, that portion of the embryo that matures to live outside the mother.[12] These inner cells differ from the outer cells not only in visibility but also in activity, since they produce different proteins from those produced by the outer cells. The inner cell mass and trophoblast form two distinct cell layers by the sixty-four-cell stage, neither contributing cells to the other. The newly formed morula itself begins to change, as the cells that comprise its trophoblast secrete a fluid which, because of the tight junctions between the trophoblastic cells on the morula's external wall, remains inside the morula, causing by this "cavitation" a fluid-filled cavity called the "blastocoel" to exist inside the morula. The inner cell mass is at one side of the sphere, and the morula now is the "blastocyst."

All of these changes have been taking place within the zona pellucida, in which the cell divisions and differentiations from the zygote to blastocyst stage occur without increase of the size of the whole. At the

[12] Gilbert notes that it now seems that, despite the possibility that mere position is responsible for which cells become the inner cell mass, the inner cell mass, destined to become the embryo proper, comes most frequently from the first cell to divide at the two-cell stage (ibid. 181–83).

blastocyst stage, however, sodium pumping on the part of the trophoblast results, through osmosis, in the drawing of water into the blastocoel, enlarging the blastocyst within the zona pellucida. The zona prevents the blastocyst from implanting in the fallopian tube as it travels, moved by the tube's cilia, towards the uterus. But when the blastocyst is in the uterine cavity, it lyses a small hole in the zona pellucida, eventually "hatches" from the zona pellucida, and implants in the uterine wall. It does this by secreting protein-digesting enzymes that digest the outermost portion of the uterine wall, enabling it to bury itself there, with the side containing the inner cell mass, the "blastoderm," coming into contact first.

Once the blastocyst is imbedded into the uterine wall, the process of "gastrulation" begins. During this process the cells of the inner cell mass migrate to certain places within the blastocyst so as to produce the cell-sheets from which all of the organs of the adult organism will arise. This migration occurs along the anterior-posterior portions of the epiblast—a portion of the inner cell mass—and the concentration of migrating cells results in the visible "primitive streak," which, while having a polarity ("cephalic," or head, and "caudal," or tail), is at this point merely a transitory part of the epiblast. Only at the end of the cells' migration through the primitive streak to their appropriate places within the embryo does a structure emerge, called the "neural fold." The neural fold marks the beginning of the central nervous system. The fold soon closes, forming the "neural tube" and its protective epidermis, and the longitudinal axis of the embryo is fixed. The other portions of the blastocyst have been busy producing a small yolk sac, establishing the basis for the placenta, and synthesizing the enzymes necessary to having the mother's body support, and not reject, it. Implantation is complete, and it is now a matter of the embryo's further self-construction through organogenesis.

Principles in Interpreting the Data

Since the present discussion concerns moral theology, theological terms and categories are used in interpreting the embryological data. Yet these terms and categories are primarily derived from philosophical concepts, with additional considerations drawn from biblical revelation and church tradition. Hence it is important to identify the philosophical framework providing the terms and principles for interpreting the biological data. For my part I shall employ terminology of an Aristotelian-Thomistic, or scholastic, type, both because of my training in historical Thomistic theology, and because, for historical reasons, this terminology correlates well with traditionally received Catholic theological terminology and, I believe, with biology.[13]

[13] Although I shall raise concerns about the positions of McCormick, Shannon and Wolter, and others, at the outset I note my agreement with them in their focusing upon

In traditional Catholic philosophy the notion of "living material substance" correlates with the biological term "organism," and refers to a biochemically complex, material reality, composed of qualitatively different parts, yet unified in itself, and capable of relatively independent existence.[14] As "living," an organism or living substance differs from nonliving substances in its ability to assimilate nourishment from its environment, develop itself into its mature form, reproduce itself, and, most of all, maintain the homeostasis upon which all of these other functions depend. Since these "functions" are not possible without differentiated structures of the living substance's body, an organism is both a static system of ordered, differentiated parts and a dynamic system of the functions performed by those parts. Performing the function of self-development, the organism gradually elaborates and coordinates its structure so that the life-functions it performs through its parts become more effective and precise. Because of the process of evolution, some species of living substances possess much more complex life-systems than others. The more complex these systems become, the more necessary becomes the integration or unification of each system; so higher organisms necessarily undergo a lengthy development process from a very simple and relatively independent structure to a highly complex and tightly interdependent structure. In a complex living substance the unification of the functions of its differentiated parts or "organs" must be under some type of "central control," or else the harmonious, organism-serving activity of these organs would fail. Since in organisms every function proceeds through an appropriately structured organ, it must be the case that this "central controlling" function proceeds through some "organ of central control," which serves to unify the functions of the other organs.[15] This

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the preembryo's status as an individual biological reality, for far too often discussion about the personhood of the human embryo is indebted to the subjective, self-aware *res cogitans* of Descartes. Fruitful dialogue on this issue is possible precisely because the participants are speaking about the same general thing.

Unfortunately, there is a subjective streak in Grobstein's *Science and the Unborn,* and in his "A Biological Perspective on the Origin of Human Life and Personhood," in *Defining Human Life,* ed. M. W. Shaw and A. E. Doudera (Washington: Association of University Programs in Health Administration, 1983) 1–11, since he defines personhood by means of "subjective awareness." The same is true of Thomas J. Bole, III, in his "Zygotes, Souls, Substances, and Persons," *Journal of Medicine and Philosophy* 15 (1990) 637–52, and of Harold J. Morowitz and James S. Trefil, *The Facts of Life: Science and the Abortion Controversy* (Oxford: Oxford University, 1992).

[14] I speak of "relative independence" because all things in the world are related in some way, and no organism can continue to exist if it is in not in a proper environment, or is not in some sense "part" of a larger whole. Still, we are distinct from the air we breath, the sun that keeps us warm, the food we eat, and so on.

[15] Two points of importance. First, claiming that there must be some central organizer is not an a priori deduction, but rather an a posteriori induction made in response to the factual presence of organization within the living thing. Second, this organizer's activity is not "autocratic," such that the organism's other organs are not cooperative at all. The

organ's complexity differs depending upon the kind of living thing of which it is the organ of central control, since animals differ from plants in that, in addition to the functions of homeostasis, self-nutrition, growth, and reproduction, they take in information from the environment (i.e. sensation) and respond to that information by adaptive self-movement (e.g. seeking food, avoiding enemies, finding mates, etc.). These capacities of sensation and self-movement will, in turn, require appropriate organs, adding to the unifying tasks of the organ of central control. Thus in animals the organ of central control must eventually oversee not only the vegetal functions of homeostasis, self-nutrition, growth, and reproduction, but also the animal functions of the attaining, storing, processing, and accessing of sense information, along with the motive responses to that information. It need not be the case that this organ first exist and function as a fully mature organ, since at the beginning of life the organism's differentiation will be minimal, and its actual functions few. Hence, for reasons of developmental economy it is to be expected that the organ of central control will also undergo gradual differentiation and unification before its maturity is reached, a maturity that is proportionate to the maturity of the differentiated organism.

From this it follows that an organism comes into existence at that point when the complex matter of which it is composed is functionally organized to form a relative unity distinct from other substances in its environment and begins to perform at least some of the functions characteristic of living substances, of which the most fundamental is the capacity to maintain homeostasis while at the same time developing itself towards maturity. It would therefore be misleading to claim, on the one hand, that the processes that lead to this critical point are themselves activities of the organism, and, on the other, that the organism that emerges at this critical point is only potential life; it is actually a living substance, but as yet potentially a mature living substance.

How are we to determine that a particular body is an *organism,* that is, that a particular complex material body is alive? Our determination will rest upon empirical evidence that it is carrying on life-functions, at the very least the function of homeostasis, and, if it is still immature, the function of self-development. Medicine's dependence today upon brain-death criteria, when it must assess whether a mature organism is alive, helps to illustrate this. In the mature human organism it is clear that the brain is the organ of central control, and when it

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organ of central control harmonizes and guides the activities of the other organs by facilitating their working with one another. For instance, the human heart pumps on its own, but it is the brain that controls the rapidity of the heart's pumping, by means of specific neural signals. Hence it need not be the case that all of the functions of the organs have their seat in a central organizer, only those functions that need mediation for the good of the whole.

totally ceases to function, the functional unity of the other bodily organs, that is, the body's homeostasis, likewise ceases to exist. At the death of the brain some organs, like the heart, might function for a while, but they in turn depend upon the functions of other organs that do cease to function. If the same sort of criterion analogously holds true for the immature organism, then the empirical question is this: *When is there an organism in the matter out of which the human being is constituted, dependent upon a "brain-like" organ that is functioning as the organ of central control, which maintains homeostasis, and which exercises through the organism's parts a unifying, directive role in subsequent development?*[16]

Correlating the Biological Data with Interpretive Principles

Until the pronuclei of the ovum and the sperm have met to produce the zygote, there is no evidence that indicates the presence of an organism. The ovum and sperm on their own are not organisms, since neither has the capacity for any kind of development without the other, and neither seeks nutrition through differentiated parts. Hence their short functional duration. They are the separated reproductive instruments of the parents, possessed perhaps of a certain residual "life," not unlike that present in the organs and tissues of a recent corpse, which can still be put to use if certain conditions are met favoring their instrumentality, i.e. transplantation into an organism of its species and the access to nutrition and organization which that affords. The sperm and the ovum differ here, too, since together they have the ability to produce the whole functioning organism, something not possessed by any individual organ.

Conception, which is the terminus of fertilization, is the "beginning" of the life of a new organism. As a "beginning," it is that moment before which there was nothing in a particular genus, but after which there was something in that genus—the genus here being "life." After

[16] This is really the question that led to Aristotle's and Thomas's teaching of delayed-hominization. Since they thought that the heart, not the brain, was the central organ of sensation, and hence for them the organ of central control, they maintained that the human organism comes into existence only with the appearance and activity of the primordial heart in the embryo, which of course took place long after what each considered conception to be. See Ashley, "A Critique" 115–21; Stephen J. Heaney, "Aquinas and the Presence of the Human Rational Soul in the Early Embryo," *The Thomist* 56 (1992) 19–48; Michael Allyn Taylor, *Human Generation in the Thought of Thomas Aquinas: A Case Study on the Role of Biological Fact in Theological Science* (Ann Arbor: University Microfilms International, 1982); Jean de Siebenthal, "L'animation selon Thomas d'Aquin: Peut-on affirmer que l'embryon est d'abord autre chose qu'un homme en s'appuyant sur Thomas d'Aquin?" in *L'Embryon: Un Homme. Actes du Congrès de Lausanne 1986* (Lausanne: Société suisse de bioéthique, 1986) 91–98; and A. Regan, C.SS.R., "The Human Conceptus and Personhood," *Studia Moralia* 30 (1992) 97–127. The embryology of Thomas's contemporary Giles of Rome is treated in detail by M. Anthony Hewson, *Giles of Rome and the Medieval Theory of Conception: A Study of the "De formatione corporis humani in utero"* (London: Athlone, 1975).

the meeting of the haploid nuclei of the sperm and ovum the zygote possesses the all-important genetic contributions of both the male and the female.[17] There may well be activity occurring within the newly constituted zygote's nuclear and cytoplasmic structures immediately after that point, but our first observation of activity begun on the zygote's part is its first cleavage, which takes place within twenty-four hours of the fusion of the sperm and ovum's pronuclei.

With this in mind, I would urge that *the first activity of the zygote, preparatory to, but not to be identified with, its first cleavage, marks the beginning of a distinct, human organism.* Under the influence of the zygotic nucleus, which is not merely the container of the genetic program or "blueprint" of the organism,[18] but which is also an agent that effects differentiation by directing the production of proteins that cause cleavage, this organism possesses homeostasis, and, because of its immaturity relative to its mature form, immediately sets about the business of producing the organs necessary for its survival inside, and, eventually, outside of the mother. These "organs" are the blastomeres, which, though relatively undifferentiated at first, differ from one another not only by position—a significant condition in the zygote in its own right[19]—but also with respect to the different portion of cytoplasmic material kept after cleavage, which helps to determine the fate of a particular cell and its daughter cells.[20] The result of the cooperation of these blastomeres is that the organism soon is structured so as to attach itself to the uterine wall, to generate tissue that becomes the

[17] Gilbert, *Developmental Biology* 146–49, 240. The importance that the zygotic genome be constituted from both parents will be noted below, in addressing hydatidiform moles. To anticipate, maternal and paternal pronuclei have distinct roles: the maternal pronucleus has a special relationship to the body of the embryo proper, and the paternal pronucleus has a special relationship to the embryo's chorion.

[18] An unfortunate side effect of the polarized abortion debate has been the codification of the claim that the zygote possesses a "blueprint" for the eventual human being. But in the instance of a blueprint both the form and the agent of building are really distinct from the thing built, the very opposite of which is the case in the organism. Also, such a shorthand argument can give rise to the conviction that *all* of the information necessary for the organism's self-building is located at conception in the zygotic genome, which is not true, since the genome instrumentally uses maternal mRNA and other factors. This in turn gives rise, I think, to the main "shape" of the argument put forward by Bedate and Cefalo, that until the embryo is operating only on its own information—which they contend to occur just after implantation ("The Zygote" 643)—it cannot be considered to be an individual, and perforce not a person.

[19] Gilbert notes how important placement is in the formation and further differentiation of the blastula (*Developmental Biology* 181–88); see n. 12 above.

[20] Is it correct to consider blastomeres to be organs? When we compare them to the mature organism's more obviously differentiated organs of the heart, lungs, skin, and so on, it would seem not. Yet the Greek term *organon* means "instrument," and an instrument is a distinct part in a whole that is ordered to the fulfillment of functions that serve the life and activity of the whole. If the blastomeres are ordered to successive differentiation of the whole, and produce structures like the tight junctions, the blastocyst, trophoblast, and so on, which serve the life and maturation of the whole, then can't they count as organs?

chorion, and to remodel the uterine blood vessels so that the maternal blood bathes fetal blood vessels. Possessing life, the human organism seeks to preserve its life, through the instrumentality of biochemically differentiated parts, parts that reveal themselves to be operating under the direction of an overarching plan.[21]

Three Problems

Now I address three problems for the suggestions I am making: (1) the hydatidiform mole, (2) the zygote's requirement for maternal cytoplasm, (3) and the problem of totipotentiality (including twinning). While the third problem, the most difficult, is primarily indebted to metaphysical and theological sources, I shall emphasize its biological character, because I believe that, paradoxically, the zygote's biological "totipotency" is quite restricted, so that claims against the individuality of the preembryo on the basis of totipotency are also attenuated.

Problem One: Hydatidiform Moles

If one contends that at conception one has a human organism, on the basis that organization is present, and that the zygote immediately becomes active and directive with respect to the development of the mature organism, then how does one explain the phenomenon of hydatidiform moles, which cannot possibly develop into the mature human organism? Doesn't this indicate that something that occurs *after* conception is required for the growth and development of the human organism? Raised by Bedate and Cefalo, this problem is used by them as an argumentative corollary to their broader contention that the zygote's dependence upon extra-zygotic factors speaks against its being a human organism.[22]

[21] How can one suggest that the zygote has an organ of central control when at cleavage not only is the cytoplasm divided but also the genome is replicated through mitosis? Doesn't that result in several separate organs of central control, as would seem to follow from the position of Ford (*When Did I Begin* 63)? Two better hypotheses are available, I think: (1) at the very first cleavage one of the blastomeres, the one that is empirically the first to cleave at the two-cell stage, is dominant, and from its subsequent divisions the inner cell mass arises in which the organ of central control is found, either in one cell or, perhaps more likely, through several cells in the inner cell mass acting in concert (Gilbert, *Developmental Biology* 181–83); (2) the cleavages that occur from the first-cell stage onward result in a group of cells that work together in the further differentiation of cells until such a time as some cells emerge, most likely in the inner cell mass and assuredly not in the trophoblast, as the primordium of a "brain." In either case it is important to note that at issue here is the orderly procedure of embryogenesis, which requires *some* principle of cooperation among the cells; scientific research may help us one day to pinpoint the precise mechanisms involved in carrying out the orderly plan of embryogenesis. Perhaps then we will be able to identify clearly what cell, or cells, are exercising the "brain-like" functions whose effects are manifested to us through the timing, etc., of the blastomeres' activities.

[22] I am puzzled by Bedate's and Cefalo's article, "The Zygote: To Be or Not To Be a Person." The authors, a molecular biologist and an obstetrician respectively, assert

The hydatidiform mole is a uterine tumor that occasionally develops in which the fetus is absent and the placental tissue is abnormally large, arising most often from a sperm's fertilizing an ovum in which the female pronucleus is absent. With the maternal genomic contribution missing, the sperm's chromosomes replicate themselves, so that the genome of this "zygote" is entirely derived from the father.[23] Cells divide, but even upon implantation no orderly development takes place.[24]

To begin, characterizing a hydatidiform mole as "biologically perfect" seems wide of the mark, since the hydatidiform mole has a root defect that precludes organized development because of its lack of a nucleus derived from the maternal and paternal pronuclei. Hence, though the cytoskeletal structure of the ovum, and the maternal cytoplasm may produce cell cleavage and even some rudimentary differentiation, such activity is *not organized,* for lack of an organizer; so we could contend that no organism was ever present. Even if we insist that some central control is present in the hydatidiform mole—a possibility that makes more sense, perhaps, in the hydatidiform mole that suffers from polyspermy, since the presence of the maternal pronucleus allows for the possibility of the development of the body of the embryo

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without comment or explanation that "the zygote can give rise to a biological entity that is not a person, e.g. hydatidiform mole. Therefore, an individual zygote, even when biologically perfect, does not possess in itself all the necessary, and surely not sufficient, information to become a human person" ("The Zygote" 644). Their five-page article is largely comprised of undocumented assertions and conclusions that appear to them to follow intuitively upon those assertions. Bedate and Cefalo raise the objection that the zygote's dependence upon extra-zygotic information is a telling sign against its humanity—the second problem I shall discuss—and there, too, the movement from premise to conclusion is swift.

[23] Can we really call a hydatidiform mole a "zygote" if it lacks the basic chromosomal structures characteristic of all mammalian reproduction? Since such a "zygote" is by no means "biologically perfect," as Bedate and Cefalo claim—indeed, it possesses rock-bottom defects in its genetic structure—it seems best to say that "zygote" should be reserved for successful fertilizations (i.e. the meeting and first activity of one maternal and one paternal pronucleus), though the success of a fertilization might only be knowable to us after some time, through the ordered activity of the preembryo.

[24] Gilbert, *Developmental Biology* 148–49, 240. According to Antoine Suarez, "Hydatidiform Moles and Teratomas Confirm the Human Identity of the Preimplantation Embryo," *Journal of Medicine and Philosophy* 15 (1990) 627–35, the description just given refers to a "complete hydatidiform mole," while another type, the "partial hydatidiform mole," results from a seemingly normal ovum fertilized by two or more sperms. Suarez is responding to Bedate and Cefalo, and moves too quickly from dismissing their problem to the assertion of the humanity of the zygote. Perhaps allied to this, Gilbert notes that in mammalian development, the paternal and maternal pronuclei appear to have different roles in the zygote. Through experiments on mouse embryos it has been discovered that male-pronuclei-derived embryos (called "androgenones") eventually fail with gross defects in the embryo proper, while female-pronuclei-derived embryos (called "gynogenones") fail with defects in their chorions. Could this be why, in a complete hydatidiform mole, there is no embryo, and why, in "parthenogenic" embryos (ones experimentally produced), the embryo dies because of insufficiency in the placenta?

proper—we would have to note that this controller is profoundly defective, so that the developing organism is doomed to die. In this respect the problem of the hydatidiform mole is like the problem of "wastage," which itself embraces cases of anencephaly or other profound genetic defects of the postembryonic stage. The issue of the hydatidiform mole seems addressable either because no organism is actually present, or because it is a melancholy reminder that God freely chose to create a world that is biologically messy.

Problem Two: The Need for Maternal Cytoplasm

This problem, too, has its origin in the article of Bedate and Cefalo, who claim that extra-nuclear genetic information is required for the development of the embryo, so that the usual assertion that the zygote's genome possesses all the information necessary for producing a complete human being is simply not true.[25] Given that the zygote does use extragenomic material, this claim is unremarkable in itself, since in the zygote there exist extranuclear materials in its cytoplasm, derived from the mother, which cause cell cleavage. The zygote's use of this material in its cleavage and organized self-differentiation is not at all incompatible with the contention that the zygote is a biologically human organism. But Bedate and Cefalo go further, and think that the zygote contains insufficient information to account for the whole developmental process, so that it depends upon the mother at the time of implantation and afterwards for subsequent, necessary genetic "messages." It is hard to follow their reasoning on this, and they provide no precise documentation, but they seem to make the claim mainly because embryonic differentiation occurs *after* implantation, when the now-embryo is dependent upon the mother. Seemingly dependent upon a notion of each blastomere's radical indeterminacy and totipotentiality, Bedate and Cefalo think that cell differentiation into cells that have functional, and not material or positional, difference cannot be accounted for unless we look outside of the zygote for maternal factors. Understandably, then, implantation and the fact that embryonic differentiation occurs thereafter is, for them, clinching proof of the embryo's genetic dependence upon the mother.

This seems to be a very static view of the zygote and of the changes it undergoes, and they never allude to the possibility that it is the zygote, through its genome and cytoplasm and eventually differentiated blastomeres, that produces, in accordance with its diverse molecular chemistry, the proteins that trigger certain cell-differentiation, positioning, and so on. If I read the biology correctly, this is what happens.[26] It would be misleading to liken the zygote to a patient in embryogenesis, since the embryology shows that the zygote is, through

[25] Bedate and Cefalo, "The Zygote" 642–43.

[26] Gilbert notes that only certain cells in the epiblast migrate through the primitive streak, ones marked with a sulfated form of glucuronic acid. Other cellular action during and after migration through the primitive streak is controlled by various compounds produced by the ectoderm (*Developmental Biology* 234–41).

its parts, active and directive with respect to the changes it undergoes, changes that range from the continuous subdivision of its cytoplasm during early cell-cleavages, from its self-compaction at the morula stage, to the momentous change of attaching itself to the uterine wall, where it initiates the production of the chorion and placenta, necessary for its access to nutrition, and, finally, to the similarly important changes associated with gastrulation, where the embryo begins to form that portion of itself that will eventually be born.

Yet even if it is true that the zygote received extrazygotic genetic information before or after implantation—the latter seems to be true[27]—this would not necessarily constitute an objection to the zygote's status as a distinct organism, since it could well be the case that subsequent genetic information received from the mother would be subordinate to the dominant role played by the zygote's directive structures. In the case of the maternal cytoplasm that exists outside of the nucleus in the zygote, for instance, it seems reasonable to say that even if, for the first cleavage at least, materials in the cytoplasm are the proximate cause of the cleavage, that cleavage would not even take place if the nucleus were absent, so even here the extragenomic material plays a correlative role. If the zygote has a central controller for the organism, which ultimately coordinates its parts and their activities, such as producing proteins, then it is understandable that it should wait until those parts are constructed by means of the subdivision of the maternal cytoplasm through cleavage.[28]

This objection of Bedate and Cefalo, in order for it to have force, requires us to think that the zygote has only passive potential, not active potential, for being a fully formed human organism, and that it is accordingly the mother, and not the embryo, which is principally responsible for the directed development of the organism. Yet the biological data shows that highly specific functional differentiation has taken place within the zygote long before implantation, differentiation that would be unaccounted in the scheme offered by Bedate and Cefalo.

Problem Three: Totipotentiality

The "totipotentiality" of the cells during the zygote's early cleavages, together with the resulting possibility of monozygotic twinning, is the crucial biological fact for all of the authors who use the distinction between genetic individuality and developmental individuality as

[27] Scott Gilbert informs me in correspondence that a mouse embryo, when attached to an extrauterine site still favoring its growth (usually beneath the kidney capsule in a male's scrotum), malforms into a teratoma or a teratocarcinoma. It does seem that mammalian embryos receive important genetic information in the uterus. But this fact does not account for the ordered growth and differentiation before implantation.

[28] This is the point made by Ashley, "Delayed Hominization" n. 14; see also Nutwell-Irving, "Scientific and Philosophic Expertise" 26–27. As is clear from Gilbert, the interaction between the nucleus and cytoplasm is not yet very well known, though it is known that at the two-cell stage in mice and goats it is the genome that is producing the proteins that bring about cleavage (*Developmental Biology* 177–81).

the basis for denying that the preembryo meets the criteria of personhood.[29] For them, the fact that the blastomeres are undifferentiated duplicates of the original zygote, subject to the possibility that from any particular one of them a whole separate organism may arise, means that the "entity" they comprise cannot be considered developmentally singular, and hence, individual. Their contention is that, until the preembryo has reached a stage at which it cannot be the source of more than one individual, it is, while genetically individual because of the uniqueness of its DNA, not developmentally individual. It is not an "ontological" individual.[30]

Some clarification is in order about the parameters of the discussion: "totipotentiality," twinning, and individuality. First, regarding totipotentiality, it is extremely important to note that while the blastomeres can, it is true, become the source cells for a separate organism, they can do so only when they have been somehow separated from the whole of which they were parts. Excessive focus upon this "plastic" character of the early blastomeres can give rise to the idea that the blastomeres have no real relation to one another in the morula (Ford's hypothesis), and that together they constitute, if anything, an incidental unity. But in fact when the blastomeres are part of the embryo they are ordered both by their position on the morula and by their portion of the maternal cytoplasm to become certain types of cells, and to perform certain functions. And even early on there exist the junctions, by which

[29] Allied to the issue of monozygotic twinning, but subsequent to it in importance, I think, is the possibility that after this twinning has taken place—really accidental asexual reproduction—the twins might recombine into a single embryo. "Recombination" does not present a difficulty to those who deny the personhood of the preembryo, since, by denying the personhood, and hence ensoulment, of the preembryo or monozygotic preembryos, they are not compelled to explain how two souls could inform what becomes one body, a difficulty that proponents of the personhood of the preembryo must consider. Moraczewski's proposal to the difficulty ("Personhood: Entry and Exit" 95), seems reasonable: either one or both of such preembryos dies—since there are no longer two primary organizers—and a new single organism remains, either possessing one soul that was informing the preembryo that in fact absorbed the other's body, or receiving a newly-created soul, since the material present would be proximately formed for the reception of the rational soul. "Chimeras," where two or more embryos at a 4-cell stage are fused, seem to be a similar situation, since, although the cells are from different parents, a single organism results and self-organizes, which suggests *some* controlling mechanism in the thing that manages the different cells. Mouse chimeras have been produced, and there is evidence that it has taken place in humans (Gilbert, *Developmental Biology* 68–70, 182, 185).

[30] Shannon and Wolter, following Ford (*When Did I Begin?* 212), claim that "neither the zygote nor the blastocyst is an ontological individual, even though it is genetically unique and distinct from the parents" ("Reflections" 613). But when speaking of a living thing, is it wise to speak of it as an "ontological" being in a way that does not have its root in the life of that being? Don't we do well to hold that *vivere est esse viventibus,* "life in living things is their being" (Aristotle, *De anima* 2.4, 415b13)? Isn't the distinction in biological realities between "living" and "existing," in the language of scholasticism, actually a "distinction of reason," and not a "real distinction" (*secundum rem*)? It is troubling to see metaphysical language direct the consideration of the preembryo, prescinding from its organic, biological dynamism.

the cells communicate with, and regulate, one another. Hence, when speaking of the blastomeres as part of the preembryo it is actually, if paradoxically, better to term them "potentially totipotential," since their ability to self-regulate and self-develop can occur only on the condition of their being separated from the whole.

Second, as regards the problem of twinning, it is important to note that monozygotic, or identical, twins occur in only about one quarter of one percent of human births.[31] Thus, while monozygotic twinning increases our awareness of the regulatory ability of the preembryo's cells, its extreme infrequency should caution us against making it a norm in our interpretation of other biological data that always, or usually, occur. Also, since twins of any type in humans are maladaptive from an evolutionary point of view—as witnessed by the fact that all mammals with very long periods of gestation usually yield one birth per pregnancy—it seems that the most biologically cogent explanation of monozygotic twinning is one that emphasizes its accidental character (i.e., experimental intervention, genetic defects that thwart proper early intercellular communication, etc.),[32] not one asserting a radical indeterminacy of the cells. After all, if we hold that the blastomeres are unrelated to one another because of their "totipotentiality," then wouldn't monozygotic twins—or triplets or quadruplets or even more—be a common occurrence? Yet that almost all humans who presently exist came from a single-cell zygote is a preliminary indication at least, apart from the documented fact of early embryonic cellular communication, that nature in human beings intends to produce a single offspring, and that it does this through the concerted efforts of the differentiated cells of the zygote.[33] The issue of

[31] Dr. John Opitz of the Shodair Clinic emphasizes to me in correspondence that it may occur more frequently than this, but that we are able to observe it less than we do because of the frequent death, before implantation, or shortly thereafter, of one of the twins. Could this be because of a genetic defect the twin possesses? See the next note, on the cause of monozygotic twinning.

[32] Dr. Judith Hall of the University of British Columbia, in studying identical twins, argues that identical twinning results from a flaw found on a chromosome of one of the cells caused by mutation during mitotis, and which causes the other cells to reject it. If this happens before day 14 in the pregnancy, the rejected cell could, because of its inherent regulatory ability, and if the mutation that brought about its rejection by the other cells is not too severe, become a second fetus, bearing this chromosomal mutation. See "A New Theory on the Origin of Twins (Mutations within Embryo)," *Science News* 146/6 (8 August 1992) 84; John Horgan, "Double Trouble: When Identical Twins Are Not Identical," *Scientific American* 262/6 (December, 1990) 25–26.

[33] On the mechanics of twinning, see Gilbert, *Developmental Biology*, 184–85. Monozygotic twinning, when it occurs, happens in two-thirds of the cases between day 5 and day 9 (why not earlier, if the blastomeres are unrelated at the outset?) in the blastocyst stage, during the formation of the chorion and the amnion. The other third occurs before day 5. A small portion of monozygotic twinning occurs after day 9 and implantation, potentially resulting in "Siamese twins." Nutwell-Irving claims, without however providing a reference ("Scientific and Philosophical Expertise" 30), that monozygotic twinning can occur even after, sometimes long after, the formation of the primitive streak that serves as a "point of no return" for Grobstein, Ford, McCormick,

twinning, it seems, is the exception to cellular interdependence and operation that proves the rule of their organismic relatedness and cooperation.

Third, regarding individuality, we must be explicit about what the precise focus is when we call something an "individual." If something is "not divided" (*in* + *dividuum*), then that suggests that there is some principle of unity that is being kept in mind, in virtue of which we consider a thing to be united in itself in some way, yet distinct from other things. To speak of the newly conceived zygote as genetically individual makes sense because our focus upon the DNA of the zygote's nucleus alerts us to a certain unity it possesses, one it does not share with the mother or the father. Yet if we insist that the preembryo in its many stages is not a developmental individual, we are really insisting that the preembryo, up until whatever time it is considered to be a developmental individual, has no real, intrinsic principle of unity other than the genetic unity all agree upon. And that claim is hard to see.

In fact, to address "totipotentiality" directly, it seems that for all the discussion of developmental individuality, and inability to twin after implantation, the position of those who use the distinction between genetic and developmental individuality is, at root, that the totipotency of the blastomeres means that from conception to the formation of the primitive streak there really is no organism, no single living thing, present.[34] Why make so strong a suggestion? Because those who use the distinction focus so much upon the "totipotency" of the preembryo's cells that they do not acknowledge that the cells are not merely material parts of a whole, but are functional, qualitatively differentiated and ordered parts of a whole, which benefits from the mutual cooperation of those parts. Furthermore, the activity that occurs within that whole—the synthesis of proteins, timing of cell division, formation of the blastocyst, hatching from the zona pellucida, on and on—all bear the signs of an order that must derive from within it, originating in some controlling center. If it is true to say that the preembryo "acts" or "causes," then that must be because it is an established, unified, living reality. The alternative is to say that the events scientists observe are actually unrelated, disorganized states of affairs that result from the haphazard activity of individual cells, cells that form, at best, an incidental unity with no intrinsic principle

and Shannon and Wolter. Precise information on this is desirable, since, if Nutwell-Irving's claim is well-founded, it could call for a potentially significant postponing of the timing of personhood for those who posit developmental individuality.

[34] To be fair, Shannon and Wolter do term the preembryo an "organism" (e.g. "Reflections" 607), but in reciting the facts about it they never address what it is *within* the preembryo that accounts for the ordered development of its parts before implantation; their presentation of the biological data is done primarily in "middle voice." But isn't the preembryo itself producing these changes, and aren't they produced in an organism-serving sequence and manner?

of order. In short, either the preembryo is an organism, or it is a heap.[35]

But, given the biological information, from conception to compaction to gastrulation to embryonic differentiation there is a remarkable, even symphonic, cooperation of the cells of the zygote. Immediately upon conception, since the zygote begins the cell division necessary to produce differentiated parts that will, in turn, form the structures necessary for its further development, the zygote is operating in a most measured, economical way. For instance, since the preembryo is at first a closed system with no external source of food, a source upon which any hope of future survival and embryonic development depends, the very first order of business for it is the production in itself of the "organs" it will use to attach itself to the uterine wall, where it will develop the placenta that is its organ of nutrition. Until such time that the cell differentiation necessary to produce those structures (i.e. the trophoblast) has taken place, there is little need to direct attention to, and expend energy upon, the formation of the embryo proper. So it should come as no surprise that at implantation the inner cell mass is fairly undifferentiated relative to the other structures in the trophoblast that effect implantation into the uterine lining, since without the trophoblast's successful differentiation and activity the whole will inevitably fail. When implantation has occurred, and the syncytiotrophoblast (the part of the trophoblast that first invades the endometrium) grows larger and establishes quasi-connections with the mother's uterine blood vessels, the business of the inner cell mass's differentiation through gastrulation can take place with the assurance that the structures now being produced—the amnion, the umbilical vessels, and the placenta proper—can perform their proper functions. And then it is that we begin to see the ever-so-gradual "construction" of the embryo proper, since it now has the food necessary to serve as fuel for that task.

The ordered functioning of the preembryo suggests to me that it meets any reasonable criteria for considering it an organism, and since there can be no real difference in living things between their biological individuality and their "ontological" individuality, I think that the preembryo is an ontological individual.

Conclusion

My hesitation at the work of Grobstein, Ford, McCormick, and Shannon and Wolter, is not with the biology found it their writings. My

[35] Ford's definition of an "ontological individual" is instructive. For him, and for Shannon and Wolter who explicitly follow him ("Reflections" 613, cited n. 30 above), 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). They would presumably not deny that the preembryo is a distinct being, since they maintain that it is genetically distinct from either parent. Nor do they think that the preembryo is "part" of the mother. The only reason left to deny the preembryo "ontological individuality" is because it is, for them, "an aggregation of smaller things," a heap.

hesitation is rather that, in a real way, their work was not biological enough. Instead of examining the minute structures that manifest the intercellular communication occurring within the preembryo, and the corresponding real differentiation of character and function of the cells, they turn too quickly, I believe, from the fact of a cell's so-called "totipotency" to raise questions about the "ontological" unity of the preembryo, and in doing so import metaphysical intentionalities into the discussion that do not fully correlate with the biological activity that is occurring in the preembryo.

I would rather suggest that in our deliberations about the human status of the preembryo we consciously focus upon its dynamic, *biological* character, for by doing this we will speak about the *preembryo* the biological organism, and not about metaphysical concerns that can all too easily sidetrack our understanding. We might "think like a zygote," for then we would gain an appreciation of nature's dynamic strategy in constructing the large, highly differentiated, multifunctioning reality that human beings are. And I believe that if we do "think like a zygote" we will come to the conclusion that, although there may be a distinction between the genetic unity and the developmental unity in the preembryo,[36] there is no reason to deny that the preembryo possesses a *biological unity* from conception forward, so that it is an individual substance (i.e. an organism) of a rational nature (i.e. of the human species).[37]

[36] Even here one might hesitate, for "genetic individuality" is predicated first of the *cells* of which the preembryo is composed, while "developmental individuality" is predicated, or denied, of the *whole preembryo,* such that the distinction between "genetic" and "developmental" individuality is based upon the distinction between a part and the whole of which it is the part. We hesitate to consider the preembryo as a whole to be a "developmental individual" not because we fear that the preembryo *as a whole* will become more than one—which it cannot—but because *a part* of the preembryo, because its capabilities have not been completely restricted, might be separated in function and eventually in location from the whole of which it once was a part, and become another whole. Hence it is in virtue of a developmental elasticity of a *part* that another whole may develop, not because the whole, as a whole, does not enjoy a unity of structure and function. I am concerned that the subject of which "developmental individuality" is predicated oscillates between being a part (i.e. the not-fully-restricted cell) and a whole (i.e. the preembryo itself).

[37] My last-second use of the Boethian definition of "person" here might appear quite forced, but I am comfortable with using it this way. The reason I would give is this. Once one has granted, as I think one must, that the preembryo is a substance—and for me "ontological individual" and "substance" are functional equivalents—then one next turns to address the issue whether this substance is "of a rational nature." If one insists, as some ethicists do, that "rationality" consists in the ability of a being to think "right here and now," then of course the preembryo fails to meet that criterion. But then, the postimplantation embryo, and even the newborn would fail to meet the criterion, and would therefore be denied "personhood" (coming from a Thomistic point of view, I would insist that human intellection cannot take place until sufficient sense experience has been garnered by the knower to provide the "matter" for intellective cognition [*Summa theologiae* 1, q. 84, a. 6 corp.]) As far as I know none of my interlocutors would claim that personhood should be reserved to those who possess that active capacity to think

I would suggest that the claim that "the preembryo is not a human being" does not enjoy probability. To my mind the arguments put forth to substantiate the claim fall short because they do not fully appropriate the biological activity of the preembryo, on the one hand, and because of an exaggeration of the importance of certain biological data, on the other. Instead, the case could be made that it is probable that the preembryo is a human being, since it is an organism (i.e. individual living substance) of the human species (i.e. of a rational nature). It is difficult to find certitude in biology, and even more difficult to apply biology with certitude to theology, but I find the data and their application persuasive enough to suggest that recent Catholic claims of delayed hominization cannot be used to justify proposed action, whether from the probabiliorist, aequiprobabilist, or even probabilist, traditions of Catholic moral theology.

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INDIVIDUALITY, PERSONAL IDENTITY, AND THE MORAL STATUS OF THE PREEMBRYO: A RESPONSE TO MARK JOHNSON

Mark Johnson has placed us all in his debt by his judicious evaluation of recent arguments for the delayed hominization of the preembryo. While he defends the view that the zygote itself should be considered to be a human person in the full sense, sometimes called immediate hominization, he also acknowledges that, unless this view can be defended on the basis of sound biological and philosophical arguments, it will not be practically effective. Indeed, his main criticism of the defenders of delayed hominization is that their work is "not biological enough."[1]

Because Johnson believes that the defenders of delayed hominization have not adequately understood the relevant biological data, much of his article consists in a careful review of this data. His presentation of these data is clear and generally convincing, although, as he himself points out, we still do not know the answers to some important questions.[2] I do not find Johnson's philosophical interpretation

"right here and now." For me, and I believe for them, the question is whether the substance of which we speak is a member of that species of living things to which cognition and intellective appetite (i.e. the will) pertain as a proper characteristic. We all share the contention that the human preembryo is constituted of material (i.e. genes) that biologically classifies it as being of that species of animal to which intellect and will pertain. Our disagreement is that they hold, which I think they should not, that there is no substance present until implantation, or soon thereafter. My contention is that an organism, and hence a substance, is present, so there does exist an "individual substance of a rational nature," a person.

[1] Mark Johnson, "Reflections on Some Recent Catholic Claims for Delayed Hominization" (above 743–63, at 762).

[2] See Johnson's footnotes 21, 24, 31 and 32.