The Status of Early Embryos?
Does the possibility of twinning count against individualization before implantation occurs?
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Last month, the Atlanta Journal & Constitution, which is the largest newspaper in Georgia, published an article announcing that Atlanta had “become ground zero in a national debate over...when life begins.” The story is about The Shepherd Center, which is a top rehabilitation hospital in Atlanta that specializes in research and treatment for people with brain or spinal cord injury. What is so exceptional about this story is that, in the past, stem cell trials were conducted on mice. The Shepherd Center is the site of the first human trial using human embryonic stem cells. In response to this new development, Michael Adams, the president of the University of Georgia, assured the media that Georgia Tech, the University of Georgia and Emory University “would be united on a position that this kind of research should go forward.” Adams went on to say the following:

I have great respect for the people who have a different viewpoint than I do — especially those who see this on ethical and moral grounds. I’m concerned about life... and I’m a dedicated Christian. I don’t want to see any misuse of this science. But I believe that the good that comes to society far outweighs the negatives... I also tell them that, from where I sit, this has the ethical advantage of doing for other people in need what we would want done for ourselves (October 13, 2010, by Jim Galloway, Atlanta Journal and Constitution)

— adding that the possibility of ending diabetes or Parkinson’s Disease is too profound to ignore.

At issue is the ongoing question of when human life begins, and whether embryos, from the event of fertilization, deserve moral protection, or should moral protection be granted at some other designated stage of fetal development. How one answers the question of when life begins should have a significant bearing on what one thinks about stem cell research (as well as in vitro fertilization and abortion). Roman Catholics and conservative evangelicals have typically affirmed that individual human life (or personhood) begins at fertilization.
Consequently, Catholics and evangelicals have opposed abortion and embryonic stem cell research.

To set the stage, I am going to focus solely on the status of the “early embryo.” By “early embryo,” I will use the term interchangeably with “individual human life.” I want it to be clear that I am referring to the *preimplanted embryo* from the event of fertilization i.e., its first 12-14 days of existence.

The following continuum (Figure 1) presents the general 14-day development of an embryo:

<table>
<thead>
<tr>
<th>Fertilization</th>
<th>First 60 hours</th>
<th>5 days</th>
<th>12-14 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilization defined as the fusion of sperm &amp; egg into 8 cells resulting in a 1-cell zygote appears</td>
<td>Single cell divides Blastocyst stage Implantation Primitive streak</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[twinning may occur before implantation and rarely after implantation]

*Figure 1: Continuum showing 14-day development of an embryo*

By “status,” I’m raising the question of how we should define the early embryo. It seems clear, as I will attempt show, that if there is no essential difference between the early embryo and any person present in this room at this moment, then embryonic stem cell research is morally wrong. On the other hand, if it can be demonstrated that the early embryo is not an individual human, then perhaps one could argue that it isn’t entitled to moral protection to the same extent that you and I are entitled to moral protection, and therefore embryonic stem cell research is not ethically problematic.

For the sake of clarification, it is important to note that almost no one, not even Peter Singer, is suggesting that the early embryo is not a human being. In one interview, Singer explains, “My defense of abortion is unique because it does not try to draw a sharp distinction between the fetus and the infant… So I think the question about abortion we should ask is not, is the embryo or fetus a living human being, because I think the answer is undoubtedly yes, it is.” (BigThink website, accessed Nov. 13, 2010). So we can establish, without a lot of
controversy, that fertilization using human gametes produces a human being belonging to the species *Homo sapiens*.

The issue is not whether the early embryo is a member of the *human* race, which few deny, but whether it is an *individual* human being with the same status as more developed humans and, therefore, entitled to protection from destruction? It stands to reason that this question should be resolved *before* early embryos are subjected to a process, such as embryonic stem cell research, that results in their destruction.

This brings us to the question is whether it is possible to demonstrate conclusively that the early embryo is an individual human, or is there evidence to the contrary? Suppose we were trying to answer this question from a biblical standpoint? I think a biblical and theological case can be made for God’s involvement in early fetal development. For example, David writes of being created and knit together in his mother’s womb (Ps. 139:13ff). But it is difficult to make a biblical case for the status of an early embryo in the public arena. Opponents will simply dismiss it as a religious viewpoint that should not be imposed on others in a pluralistic society. I also think that, with the help of Aristotle, a *philosophical* case could be made for the status of the early embryo. But theological and philosophical approaches are typically not forceful enough to satisfy those who disagree, although it should be said that everyone approaches the issue with philosophical assumptions. Furthermore, it’s not just secular thinkers who deny that human life begins at conception. In a recent paper titled, “On the Personhood of Preimplantation Embryos,” one confessing Christian warned that the pro-life community is going too far in extending the status of personhood to early embryos. He writes,

> Is it really an indisputable scientific fact that from the moment of fertilization an embryo is a “growing, maturing human *person*?” I am concerned that the majority of Christians and others who oppose abortion seem to have simply accepted and propagated this dogma as unquestionable truth without ever really seeing any need to honestly consider the evidence for or against it (Edward Morris, [http://www.noble-minded.org/personhood.html](http://www.noble-minded.org/personhood.html))

Then in 2008, a book was published titled, *Sacred Cells? Why Christians Should Support Stem Cell Research*.¹ As indicated in the title of the book, the authors argue that Christians should support embryonic stem cell research because, from their perspective, science demonstrates that human “individualization” is not established during the first 12-14 days
of an embryo’s existence. In response, I have to show that the weight of the scientific evidence confirms that human life begins at fertilization in spite of the evidence to the contrary.

**The case against the view that individual human life begins at fertilization**

In logic, a sound argument should measure up to at least two criteria: 1) first, there should be convincing reasons to accept that the premises are true and, 2) second, the premises should establish the conclusion. In sum, any argument, to be considered good, should support its conclusion with compelling premises. I maintain that the arguments against human life at fertilization are thought provoking, but are not compelling. Thus, I contend that the case against life at fertilization fails the first test of a good argument.

There are a variety of ways that one could reconstruct the argument. For the purposes of this paper, I will summarize two central premises and the conclusion:

- **P1** Scientific evidence (e.g., the possibility of twinning before implantation) demonstrates that the early embryo is not an *individual* human.²
- **P2** There is no obvious and indisputable theological proof that “ensoulment”³ occurs at fertilization or before implantation.⁴

*Conclusion:* Therefore, human embryonic stem cell (hESC) research is morally permissible from a Christian standpoint because the destruction of early embryos does not kill individual humans.

In sum, if science establishes that human life does not begin before implantation, and if there is little persuasive theological support for the belief that a soul is present at fertilization,⁵ then it would appear that embryonic stem cell research may be morally permissible. If this line of reasoning is sound, then it presents a formidable challenge to the traditional view that individual human life begins at fertilization.⁶ As a matter of fact, if humans will profit from embryonic stem cell research, then perhaps Christians *should* support it because it may lead to significant advances in healthcare. To respond to this challenge, I have to demonstrate that the
scientific evidence, specifically the embryo’s potential to twin, does not count decisively against the human status of the preimplanted embryo.

My focus will be on P1 i.e., that scientific evidence (e.g., the possibility of twinning before implantation) demonstrates that the preimplanted embryo is not an individual human. Because of time limitations, I will only address the phenomenon of twinning because I think that twinning is the strongest evidence against the view that individual human life begins at fertilization.

We can begin with the fact that it is not until implantation that the embryo’s “primitive streak” appears. The primitive streak is significant because this is where the backbone and central nervous system will begin to develop. Once the primitive streak appears, the embryo generally cannot twin. However, in the first 12-14 days of the early embryo’s existence, it may split into two separate embryos, each with the potential to develop into more mature humans. As a matter of fact, not only is twinning possible before implantation, it is also possible for the twins to recombine into one single embryo. Thus, the argument underscores twinning as evidence against human individuality before implantation by raising an interesting scientific and philosophical question: If the preimplanted embryo is truly a distinct individual human, then how can it become two (or more) individuals? In other words, how can something that is supposed to be one complete and integrated human person become two distinct humans? This possibility alone seems to count against the intrinsic individuality of the original embryo. As one proponent put it,

If we say a zygote is one of us, then we are also saying that one of us can become two of us, and that two of us can become one of us. This makes no sense. The possibility of the zygotes’ splitting or fusing suggests the zygote is not yet what we mean by one of us. (Raymond Devettere)

In short, it seems unlikely that the preimplanted embryo is an individual person deserving moral protection if it can twin. Needless to say, this argument puts the conservative pro-life position on the defensive.
What can be said in response to this argument?

Defenders of early embryos have to show compelling evidence that although twinning is possible before implantation, there is nonetheless greater scientific evidence for human individuality at fertilization.

1. First, it should be noted that there is no conclusive scientific explanation of how and why twinning occurs. It could be genetically determined at fertilization but it is not known whether this is a built-in feature of the original zygote. Robert George (former member of the President’s Council of Bioethics) observes that it could be that:

   twinning is a type of asexual reproduction in which the second embryo is reproduced asexually... In those cases, the growth trajectory of the original embryo continues, though the separation of some of the cells from the inner cell mass generates another embryo, with a distinct development trajectory.

Cathleen Kaveny disagrees with the notion of asexual reproduction. She writes:

   human beings reproduce sexually, not asexually... They don’t split neatly into two twins with no loss, cost, or remainder (as in twinning), nor do they merge fluidly into one another (as in combination).

George responds,

   Asexual reproduction is not the norm in humans, but embryological evidence shows that human beings in the early embryonic stage possess the capacity for asexual reproduction...

In any case, merely because some early embryos, for unknown reasons, twin, does not prove that all original zygotes lack individuality. It is worth mentioning that, in rare instances, twinning may occur shortly after implantation. Should we then also deny the individuality of implanted embryos based on rare instances of post-implantation twinning? Furthermore, should we proceed with the destruction of early embryos based on mere assumptions about the mystery of twinning, and ignore the scientific evidence that demonstrates that the original zygote is a whole integrated organism when fertilization occurs?

2. Second, suppose the embryo has the built-in genetic potential to twin? One could then argue that by destroying the preimplanted embryo, one potentially terminates not just one, but
two individual human lives. In other words, if the original zygote has a built-in capacity to twin, wouldn’t its destruction prevent two human beings from continuing their existence?

In sum, the early embryo’s potential to twin is, admittedly, a thought-provoking argument against the view that human life begins at fertilization. On the other hand, it is also fair to question why the mystery of twinning, an event that no one fully understand, should be the decisive issue to justify an act, such as stem cell research, that destroys early embryos. It is far from obvious that twinning proves that zygotes are not individuals. What we have instead is a comparatively rare event that is difficult to explain but inconclusive in its implications. 

I have examined the strongest evidence against the status of the early embryo. Now I will consider whether the scientific evidence confirms the status of the early embryo and whether fertilization is more significant in defining human life than the mere possibility of twinning.

Scientifically speaking, what occurs at fertilization? In the book *Embryo: A Defense of Human Life*, authors Robert George and Christopher Tollefsen observe that fertilization occurs, “when a sperm cell penetrates and fertilizes a female egg” and the twenty-three chromosomes from the male and female gametes merge. With this merger, which is known as “syngamy,” the one-celled zygote forms and can begin to divide and develop further.

What exactly is the ‘zygote’ at the moment of fertilization? Does it make more sense to refer to a zygote as a potential human? If you look at an image of a zygote, you will notice that, as a single-cell organism, it doesn’t appear to be an individual human. But this is the way we all looked at the beginning of our existence. The human zygote appears as a human zygote should appear at its earliest stage. It would be strange if you could look through a microscope and see tiny little people with arms and legs. But the essential question is whether the zygote is an individual human life entitled to protection from destructive procedures such as embryonic stem cell research.

There are at least four scientific reasons to accept human individuality at fertilization based on genetics (I realize that not everyone is convinced by the genetic argument). However, I think the weight of the genetic evidence is stronger than the twinning argument.
1) First, fertilization results in the embryo’s genetic uniqueness. At fertilization, the resulting zygote becomes a genetically unique male or female belonging to the species Homo sapiens.

Edwin Hui, professor of bioethics at Regent College, describes fertilization as “the most biologically significant event in the whole process of the transmission of human life.” William Cheshire, professor of neurology at the Mayo Clinic, adds, “The extraordinarily detailed genetic montage of a new human embryo resulting from the recombination of maternal and paternal DNA forms a living entity that differs from every other entity that has ever existed.

A helpful way to think of this is to distinguish between things that are constructed by adding parts, and things that develop. A car is constructed by adding a variety of parts together until it becomes a complete unit designed for transportation. An embryo, on the other hand, does not develop over time by a process of adding parts to it. All the genetic information for the development of the embryo is already contained in the embryo.

George and Tollefsen agree:

Human embryos are not...some other type of animal organism, like a dog or cat. Neither are they a part of an organism, like a heart, a kidney, or a skin cell. Nor again are they a disorganized aggregate, a mere clump of cells awaiting some magical transformation. Rather, a human embryo is a whole living member of the species Homo sapiens in the earliest state of his or her natural development... who comes into existence as a single-celled organism (the zygote)... An early embryo is thus a complete integrated whole, not a collection of a unconnected and unrelated parts. Furthermore, there is no scientific evidence that the difference in the early embryo’s appearance or the subsequent development of its organs results in any changes to an embryo’s genetic identity.

2) Second, there is genetic continuity from fertilization to further embryonic development. In other words, one’s unique genetic makeup remains constant, barring any outside interference, from the event of fertilization. There is a sense that who I am now is genetically identical to the zygote that I once was. Just because our cells multiply does not in any way
change our genetic makeup. As Cheshire observes, “the continuity of human genetic identity is maintained throughout an individual’s lifetime. The genome seated within the zygote, the first cell of the human life span, is the very same genome a person will have in old age.”

In other words, there is more scientific evidence for the embryo’s seamless continuity of existence, from zygote to adulthood, than any attempt to raise doubts about its continuity due to rare events such as twinning. Again, even Singer agrees with pro-lifers that “there is simply a gradual development of the human being that continues during the first months of life after birth, as well as beforehand.” Hence, the appearance of the primitive streak, or any additional attributes of the body, does not alter the original genetic makeup of the zygote. The development of the primitive streak and subsequent organs will eventually allow the embryo to achieve different levels of awareness, but they do not in any way alter the embryo’s genetic identity.

3) Third, fertilization produces a zygote with the intrinsic capacity for self-development. As Hui explains, the zygote “possesses an inherent and naturally active capacity, encoded in its genome, to control and coordinate all its systematic development and differentiation throughout the entire life process from fertilization onward.” This is important to note because some say that in vitro fertilized eggs, if not implanted, will not develop into a mature person. Thus, it is claimed, ex vivo zygotes are not individual persons because they cannot actualize their capacities. On the contrary, the act of implantation has no bearing on the status of the zygote. In other words, the location of the zygote does not determine the ontological or moral status of the zygote. Hence, it is not a question of whether the zygote depends on its mother to develop but whether the zygote has the intrinsic capacity to self-develop before implantation. According to Hui, the intrinsic capacity for self-development justifies the belief that individualization occurs at fertilization. J. P. Moreland adds that, at the point of conception, a human embryo is an actual living human embryo that has potential, unless the potential is removed, to become a more mature human baby. Perhaps it is helpful to make a distinction between “the possession and the actualization of one’s capacities.” Thus, Moreland continues, “Simply because an embryo has not actualized its capacities does not make it any less intrinsically valuable.”
4) The embryo, from the point of fertilization functions as an integrated whole organism with specific tasks. For example, after fertilization, it begins a self-directed journey into the mother’s uterus so that it can be implanted (George and Tollefsen, p. 151). It also begins to structure itself in such a way that it makes itself suitable for implantation (e.g., the self-directed ability to “burrow”), and to protect itself from outside threats) and, at the same time, allow for nourishment so that it can continue to develop. In other words, the early embryo begins to accomplish several complex tasks in its early growth in order to carry out its own development. George and Tollefsen ask, “What is the subject of this sort of activity? Is it the activity of a unified substance (i.e., a single, species specific, self-directed entity), or is it the activity of a collection of substances?” Scientifically speaking, it seems that the early embryo functions as a self-directed and coordinated unit. George and Tollefsen contend that the “evidence suggests... that at the end of the first week, the same organism that came into being at fertilization has continued to grow and pursue its important biological goals.” If this were not the case, if the early embryo was not a unified organism right from the start, then why does it develop on its own? (George and Tollefsen, p. 156). George and Tollefsen conclude that “...the fact of twinning does not show that the embryo is a mere incident mass of cells...”

They continue - it is important to understand that from the event of fertilization, the embryo is “dynamically developing himself or herself to the further stages of maturity of the distinct organism—the human being—that he or she already is.”22 In sum, an embryo is genetically complete; it has “an active disposition to develop itself to its next, more mature stage.”23 A scientific case can be made that at the stage when the male and female gametes become “a single entity, the human embryo is certainly complete... [and] [T]he zygote is now genetically unique and its sex is established.24 The zygote is now a “distinct organism directing its own process of growth and development.”25

Conclusion
In conclusion, I have considered one of the key arguments for stem cell research based on the denial of human individuality of the early embryo, i.e., the potential for twinning as evidence that the early embryo is not an individual human being. However, I do not consider the mere
possibility of twinning or the appearance of the primitive streak to be a more impressive stage-of-life milestone than the act of fertilization itself. To justify the destruction of early embryos, the counter argument has to demonstrate conclusively, I believe, that the mere possibility of twinning carries more scientific and moral weight than the overwhelming genetic evidence for the early embryo’s genetic individuality.

Then again, it is less than obvious what twinning means for the preimplanted embryo. First, it raises the question of how a preimplanted embryo is to be understood if it is, as Peter Singer admits, a human being. Again, no one denies that it is a human zygote. Yet, if implantation is what determines the beginning of human life, then exactly what is the status of the early embryo. It seems that it is left in some kind of intermediate state of existence. In effect, fertilization gives rise to a “subhuman” embryo that, with a mere change of location, transforms it into an individual human. I argue that implantation changes the location of the embryo but not its status. Moreover, if we follow the twinning argument, then what proof do we have that implantation guarantees the beginning of individual human life? As a matter of fact, I see nothing to prevent the introduction of additional criteria (e.g., self-awareness, ability to feel pain, etc) as requirements for moral protection.

I have countered with scientific evidence for the embryo’s genetic uniqueness, its genetic continuity, its capacity for self-development, and its genetic completeness — all of which are present when fertilization occurs.

In sum, the embryo at fertilization is:

* human — it belongs to the species Homo sapiens and is not another species
* living i.e., it has all the qualities of life
  - it reacts to stimuli
  - converts food to energy (metabolism)
  - exhibits cellular growth
* genetically complete (a single, self-contained organism) and unique from fertilization

If my reasoning is correct, then the arguments denying human individualization at fertilization are unsuccessful. We can thus affirm with confidence that human life begins at fertilization and, is indeed, sacred.
2. I remind the reader that no one questions whether the zygote is a *human zygote*. The authors also note the amount of “fetal wastage” (i.e. the number of fertilized eggs flushed from the womb before implantation) whereby nature, under God’s oversight, eliminates 50-80% of naturally fertilized eggs. If fertilized eggs are truly individual humans, they observe, then it appears that God has created the reproductive process with a natural tendency to destroy a significant percentage of human life. Ibid., 121.
3. “Ensoulment” is perhaps a loaded term, but the writers use the term to suggest that ensoulment occurs at implantation rather than fertilization. Ibid., 149.
4. Ibid., 96ff.
5. The writers prefer to explain the soul in terms of “our relationships with God” that “affords our dignity and our eternal destiny.” Ted Peters, et al, 148. But then, if this is true, is it accurate to suggest that even an implanted embryo has a *relationship* with God?
6. Many Protestants and the official position of the Roman Catholic and Orthodox Churches.
7. Ibid., 69.
8. The phenomenon of “fetal waste” does not necessarily prove that the early embryo is not an individual. First, it should be said that miscarriages are common before and after implantation. So if the point is to deny individualization due to the number of early miscarriages, then why stop at implantation? If one follows the logic of Peters, et al, then one could argue that individualization does not happen until after 8 weeks (It is estimated that 1/3 of the miscarriages occur during the first 8 weeks). Second, there are a variety of causes of miscarriages. For example, sometimes a “pregnancy sac” appears in the first 8 weeks, but there is no embryo inside the sac. For whatever reason, the egg was fertilized, the cells began to divide, but the embryo did not form. Other causes are health-related. Smoking, excessive use of alcohol, drugs, sexually transmitted diseases, diabetes, fever, age, levels of progesterone, and even caffeine may adversely affect the pregnancy. Frequently there are random “chromosomal abnormalities” in the embryo (One study found that of more than 8000 miscarriages, 41 percent had chromosomal abnormalities. “Patient Information: Miscarriage,” UpToDate For Patients, http://www.uptodate.com/patients/content/topic.do?topicKey=pregnancy/5386 (accessed July 24, 2009). In any case, it is difficult to make the case that preimplanted embryos are not individual humans based on the extreme number of miscarriages when many miscarriages occur after implantation.
10. Ibid., 37.
12. Ibid., 59.
15. Hui, 61.
17. Hui, 60.
18. As J. P. Moreland observes, “Being in the wrong environment does not result in loss or non-possession of these [higher-order] capacities.” Moreland, 270-272.
19. Hui, 60.
20. Moreland, 274.
21. Ibid., 274.
22. Ibid., 161.
23. Ibid., 163.
24. Ibid., 37-38. George and Tollefson believe that the “definitive moment” actually transpires earlier when the sperm enters the egg, 38.
25. Ibid., 38.
Bibliography


“Patient Miscarriage: Information.” UpToDate For Patients.

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