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Embryo ethics

If we were to contemplate killing mentally handicapped infants to obtain transplantable organs, no one would characterize the controversy that would erupt as a debate about organ transplantation. The dispute would be about the ethics of killing handicapped children to harvest their vital organs. We could not resolve the issue by considering how many gravely ill people we could save by extracting a heart, two kidneys, a liver, etc., from each mentally handicapped child. Instead, we would have to answer this question: is it right to relegate a certain class of human beings – the handicapped – to the status of objects that can be killed and dissected to benefit others?

By the same token, strictly speaking ours is not a debate about stem cell research. No one would object to the use of pluripotent stem cells in biomedical

research or therapy if they could be obtained from non-embryonic sources, or if they could be acquired by using embryos lost in miscarriages.¹ The point of

¹ It appears that we will soon be able to obtain embryonic stem cells, or their equivalent, by means that do not require the destruction of human embryos. Important successes in producing pluripotent stem cell lines by reprogramming (or ‘de-differentiating’) human somatic cells have been reported in highly publicized papers by James A. Thomson’s research group, “Induced Pluripotent Stem Cell Lines Derived from Human Somatic Cells,” *Scienceexpress*, www.sciencexpress.org/22 November 2007/ 10.1126science.1151526, and Shinya Yamanaka’s research group, “Induction of Pluripotent Stem Cells from Adult Fibroblasts by Defined Factors,” *Cell* (published online, November 20, 2007). Citing these successes, Ian Wilmut of Edinburgh University, who is credited with producing Dolly the sheep by cloning, has decided not to pursue a license granted by British authorities to attempt to produce cloned human embryos for use in biomedical research. According to Wilmut, embryo-destructive means of producing the desired stem cells will be unnecessary: “The odds are that by the time we make nuclear transfer [cloning] work in humans, direct reprogramming will work too. I am anticipating that before too long we will be able to use the Yamanaka approach to achieve the same, without making human embryos.” Wilmut is quoted in Roger Highfield, “Dolly Creator Ian Wilmut Shuns Cloning,” *Telegraph.co.uk*, November 16, 2007. For a survey of possible non-embryo-destructive methods of obtain-

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controversy is the ethics of deliberately destroying human embryos to produce stem cells. The threshold question is whether it is right to kill members of a certain class of humans – those in the embryonic stage of development – to benefit others.

Supporters of embryo-destructive research insist, however, that human embryos are not human beings – or if they are human beings, that they are not yet ‘persons.’ It is therefore morally acceptable, they say, to ‘disaggregate’ them for the sake of research aimed at finding cures or treatments for juvenile diabetes and other horrible afflictions.

At the heart of the debate over embryo-destructive research, then, are two questions: is a human embryo a human being, and, if so, what is owed to an embryonic human as a matter of justice?

I will say nothing about religion or theology. This is not a tactical decision; rather, it reflects my view about how to think about the dispute over killing human embryos. It is sometimes said that opposition to embryo-destructive research is based on a controversial theology of ‘ensoulment.’ But one need not engage questions of whether human beings have spiritual souls in considering whether human embryos are human beings. Nor must one appeal to any theology of ensoulment to show that there is a rational basis for treating all human beings – including those at the embryonic stage – as creatures possessing intrinsic worth and dignity.²

ing pluripotent stem cells, see The President’s Council on Bioethics, “White Paper: Alternative Sources of Pluripotent Stem Cells,” May 2005, available at www.bioethics.gov.

2 It is worth pointing out that contrary to a common misunderstanding, the Catholic

We should resolve our national debate over embryo-destructive research on the basis of the best scientific evidence as to when the life of a new human being begins, and the most careful philosophical reasoning as to what is owed to a human being at any stage of development. Religious conviction can motivate us to stand up and speak out in defense of human life and dignity. And religious people should never hesitate to do that. But we need not rely on religious authority to tell us whether a human embryo is a new living member of the species *Homo sapiens* or whether all human beings – irrespective of not only race, ethnicity, and sex but also age, size, stage of development, and condition of dependency – possess full moral worth and dignity. The application of philosophical princi-

Church does not try to draw *scientific* inferences about the humanity or distinctness of the human embryo from *theological* propositions about ensoulment. It works the other way around. The theological conclusion that an embryo is ‘ensouled’ would have to be drawn on the basis of (among other things) scientific findings about the self-integration, distinctness, unity, determinateness, etc., of the developing embryo. Contrary to another misunderstanding, the Catholic Church has not declared a teaching on the ensoulment of the early embryo. Still, the Church affirms the rational necessity of recognizing and respecting the dignity of the human being at all developmental stages, including the embryonic stage, and in all conditions. For a clear statement of Catholic teaching and its ground, see the document *Donum Vitae*, issued by the Congregation for the Doctrine of the Faith on February 22, 1987, http://www.vatican.va/roman_curia/congregations/cfaith/documents/rc_con_cfaith_doc_19870222_respect-for-human-life_en.html: “[T]he conclusions of science regarding the human embryo provide a valuable indication for discerning by the use of reason a personal presence at the moment of this first appearance of a human life: how could a human individual not be a human person?” (Section 5, I, 1, para. 3)

ples in light of facts established by modern embryological science is more than sufficient for that task.³

The adult human being that is now you or me is the same being who, at an earlier stage, was an adolescent and, before that, a child, an infant, a fetus, and an embryo.⁴ Even in the embryonic stage, you and I were undeniably whole living members of the species *Homo sapiens*. We were then, as we are now, distinct and complete – though, in the beginning, developmentally immature – human organisms. We were not mere parts of other organisms.

A human embryo is not something different *in kind* from a human being, like a rock, or a potato, or a rhinoceros. A human embryo is a human individual in the earliest stage of his or her natural

development.⁵ Unless severely damaged or deprived of a suitable environment, an embryonic human being will, by directing his or her own integral organic functioning, develop himself or herself to each new stage of developmental maturity along the gapless continuum of a human life. The embryonic, fetal, infant, child, and adolescent stages are just that: stages in the development of a determinate and enduring entity – a human being – who comes into existence as a single-celled organism (zygote) and grows, if all goes well, into adulthood many years later.⁶

3 My point here is not to make light of, much less to denigrate, the important witness of many religious traditions to the profound, inherent, and equal dignity of all members of the human family. Religious conviction can, and many traditions do, reinforce ethical propositions that can be rationally affirmed even apart from religious authority.

4 Thus, “recollecting (at her birth) his appreciation of Louise Brown [the first IVF baby] as one or two cells in his petri dish, [Robert] Edwards [said]: ‘She was beautiful then and she is beautiful now.’” John Finnis, “Some Fundamental Evils in Generating Human Embryos by Cloning,” in Cosimo Marco Mazzoni, ed., *Etica della Ricerca Biologia* (Florence: Leo Olschki, 2000), 116. Edwards and his coauthor, Patrick Steptoe, accurately described the embryo as “a microscopic human being – one in its very earliest stages of development.” Robert Edwards and Patrick Steptoe, *A Matter of Life* (London: Hutchinson’s, 1981), 83. The human being in the embryonic stage of development is “passing through a critical period in its life of great exploration: it becomes magnificently organised, switching on its own biochemistry, increasing in size, and preparing itself quickly for implantation in the womb.” *Ibid.*, 97.

5 Keith Moore and T. V. N. Persaud, in *The Developing Human: Clinically Oriented Embryology*, perhaps the most widely used embryology text, make the following unambiguous statement about the beginning of a new and distinct human individual: “Human development begins at fertilization when a male gamete or sperm (spermatozoon) unites with a female gamete or oocyte (ovum) to form a single cell – a zygote. This highly specialized, totipotent cell marked the beginning of each of us as a unique individual.” Keith Moore and T. V. N. Persaud, *The Developing Human: Clinically Oriented Embryology* (Philadelphia: Saunders/Elsevier, 2008), 15 (emphasis added).

6 A human embryo (like a human being in the fetal, infant, child, or adolescent stage) is not a ‘prehuman’ organism with the mere potential to become a human being. No human embryology textbook known to me presents, accepts, or remotely contemplates such a view. Instead, leading embryology textbooks assert that a human embryo *is* – already and not merely potentially – a new individual member of the species *Homo sapiens*. His or her potential, assuming a sufficient measure of good health and a suitable environment, is to develop by an internally directed process of growth through the further stages of maturity on the continuum that is his or her life. Nor is there any such thing as a ‘pre-embryo.’ That concept was invented, as Lee Silver pointed out in his book *Remaking Eden* (New York: Avon Books, 1997), 39, for political, and not scientific, reasons.

By contrast, the gametes whose union brings into existence the embryo are not whole or distinct organisms. Each is functionally (and genetically) identifiable as *part* of the male or female (potential) parent. Moreover, each gamete has only half the genetic material needed to guide the development of an immature human being toward full maturity. They are destined either to combine with an oocyte or spermatozoon and generate a new and distinct organism, or simply to die. When fertilization occurs, they do not survive; rather, their genetic material enters into the composition of a new organism.

But none of this is true of the human embryo, from the zygote and blastula stages onward. The combining of the chromosomes of the spermatozoon and of the oocyte generates what human embryology identifies as a new, distinct, and enduring organism. Whether produced by fertilization, Somatic Cell Nuclear Transfer (SCNT), or some other cloning technique, the human embryo possesses all of the genetic material and other qualities needed to inform and organize its growth.⁷ The direction of its growth is not extrinsically determined, but is in accord with the information

within it.⁸ Nor does it merely possess organizational information for maturation; it actively uses that information in an internally directed process of development. The human embryo, then, is a whole and distinct human organism – an embryonic human being.

If the embryo is not a complete organism, what can it be? Unlike the spermatozoa and the oocytes, it is not merely a part of a larger organism, namely, the mother or the father. Nor is it a disordered growth or gamete tumor, such as a complete hydatidiform mole or teratoma.

Someone might say that the early embryo is an intermediate form, something which regularly emerges into a whole human organism but is not one yet. But what could cause the emergence of the whole human organism, and cause it with regularity? As I have already observed, from the zygote stage forward the development of this organism is *directed from within*, or by the organism itself. So, after the embryo comes into being, no event or series of events occur that we could construe as the production of a new organism – that is, nothing extrinsic to the developing organism itself acts on it to produce a new character or a new direction in development.⁹

A supporter of embryo-destructive research might concede that a human

7 A cloned human embryo is not a subhuman organism. Cloning produces a human embryo by combining what is normally fused and activated in fertilization, that is, a properly epigenetically disposed human genome and the oocyte cytoplasm. Cloning, like fertilization, generates a new and complete, though immature, human organism. Cloned embryos therefore ought to be treated as having the same moral status, whatever that might be, as other human embryos. I respond to the arguments of my colleague on the President's Council on Bioethics, Paul McHugh, who claims that cloned embryos are not human beings but "clonotes," in the latter half of Robert P. George and Patrick Lee, "Acorns and Embryos," *New Atlantis* 7 (2005): 90–100.

8 The first one or two divisions, in the first thirty-six hours, occur largely under the direction of the messenger RNA acquired from the oocyte. Still, the embryo's genes are expressed as early as the two-celled stage and are required for subsequent development to occur normally. See Ronan O'Rahilly and Fabiola Mueller, *Human Embryology and Teratology* (New York: John Wiley & Sons, 2000), 38.

9 For a fuller explanation, see Patrick Lee and Robert P. George, "The First Fourteen Days of Human Life," *New Atlantis* 13 (2006).

embryo is a human being in a biological sense, yet deny that we owe human beings in the early stages of their development full moral respect, such that we may not kill them to benefit more fully developed human beings who are suffering from afflictions.

But to say that embryonic human beings do not deserve full respect, one must suppose that not every human being deserves full respect. And to do that, one must hold that those human beings who warrant full respect deserve it not by virtue of *the kind of entity they are*, but, rather, because of some acquired characteristic that some human beings (or human beings at some stages) have and others do not, and which some human beings have in greater degree than others do.

This position is untenable. One need not be *actually* or immediately conscious, reasoning, deliberating, making choices, etc., in order to be a human being who deserves full moral respect, for plainly we should accord people who are asleep or in reversible comas such respect. But if one *denied* that human beings are valuable by virtue of what they are, and required an additional attribute, it would have to be a capacity of some sort, and, obviously, a capacity for certain mental functions.

Of course, human beings in the embryonic, fetal, and early infant stages lack immediately exercisable capacities for mental functions characteristically carried out by most human beings at later stages of maturity. Still, they possess these very capacities *in principe vel radice*, that is, in radical or 'root' form. Precisely by virtue of the kind of entity they are, they are from the beginning actively developing themselves to the stages at which these capacities will (if all goes well) be immediately exercisable. Although, like infants, they have

not yet developed themselves to the stage at which they can perform intellectual operations, it is clear that they are *rational animal organisms*.¹⁰ That is the *kind* of entity they are.

Here, it is important to distinguish two senses of the 'capacity' for mental functions: an immediately exercisable capacity, and a basic natural capacity, which develops over time. We have good reason to believe that the second sense, and not the first, provides the basis for regarding human beings as ends in themselves, and not as means only – as subjects possessing dignity and human rights, and not as mere objects.

First, the developing human being does not reach a level of maturity at which he or she performs a type of mental act that other animals do not perform – even animals such as dogs and cats – until at least several months after birth. A six-week-old baby lacks the *immediately exercisable* capacity to form abstract concepts, engage in deliberation, and perform many other characteristically

10 For an entity to have a rational nature is for it to be a certain type of substance; *having a rational nature*, unlike, say, being tall, or Croatian, or gifted in mathematics, is not an accidental attribute. Each individual of the human species has a rational nature, even if disease or defect blocks its full development and expression in some individuals. If the disease or defect could somehow be corrected, it would perfect the individual as the kind of substance he is; it would not transform him into an entity of a different nature. Having a rational nature is, in Jeff McMahan's terms, a "status-conferring intrinsic property." So my argument is not that every member of the human species should be accorded full moral respect based on the fact that the more mature members have a status-conferring intrinsic property, as McMahan interprets the "nature-of-the-kind argument." See his "Our Fellow Creatures," *The Journal of Ethics* 9 (2005): 355 ff. Rather, my proposition is that having a rational nature is the basis for full moral worth, and every human individual possesses that status-conferring feature.

human mental functions. If we owed full moral respect only to those who possess immediately exercisable capacities for characteristically human mental functions, it would follow that six-week-old infants do not deserve full moral respect.¹¹ Therefore, if we may legitimately destroy human embryos to advance biomedical science, then logically, subject to parental approval, the body parts of human infants should also be fair game for scientific experimentation.¹²

Second, the difference between these two types of capacity is merely a difference between stages along a continuum. The immediately exercisable capacity for mental functions is only the development of an *underlying* potentiality that the human being possesses simply by virtue of the kind of entity it is. The capacities for reasoning, deliberating, and making choices are gradually brought toward maturation, through gestation, childhood, adolescence, and so on. But the difference between a being that deserves full moral respect and a being that does not (and can therefore legitimately be killed to benefit others) cannot consist only in the fact that while both have some feature, one has *more* of it than the other. A mere *quantitative* difference cannot by itself provide a justification

11 Clear-headed and unsentimental believers that full moral respect is due only to those human beings who possess immediately exercisable capacities for characteristically human mental functions do not hesitate to say that young infants do not deserve full moral respect. See, for example, Peter Singer, "Killing Babies is Not Always Wrong," *The Spectator* 16 (September 1995): 20–22.

12 Not long ago, Peter Singer was asked whether there would be anything wrong with a society that bred children for spare parts on a massive scale. "No," was his reply. See "Blue State Philosopher," *World Magazine*, November 27, 2004.

for treating entities in radically different ways.¹³

Third, the acquired qualities proposed as criteria for personhood, such as self-consciousness or rationality, come in an infinite number of degrees. If human beings are worthy of full moral respect only because of such qualities, and those qualities come in varying degrees, humans should possess rights in varying degrees. The proposition that all human beings are created equal would be relegated to the status of a myth: since some people are more rational than others (that is, have developed that capacity to a greater extent than others have), some people would be greater in dignity than others, and the rights of the superiors would trump those of the inferiors.¹⁴

So it cannot be the case that some human beings and not others are intrinsically valuable by virtue of a certain de-

13 Michael Gazzaniga has suggested that the embryo is to the human being what Home Depot is to a house, i.e., a collection of unintegrated components. According to Gazzaniga, "it is a truism that the blastocyst has the potential to be a human being. Yet at that stage of development it is simply a clump of cells An analogy might be what one sees when walking into a Home Depot. There are the parts and potential for at least 30 homes. But if there is a fire at Home Depot, the headline isn't 30 homes burn down. It's Home Depot burns down." Quoted as "Metaphor of the Week" in *Science* 295 (5560) (March 1, 2002): 1637. Gazzaniga gives away the game, however, in conceding, as he must, that the term 'blastocyst' refers to a *stage of development* in the life of a determinate, enduring, integrated, and, indeed, self-integrating entity. If we must draw an analogy to a Home Depot, then it is the gametes (or the materials used in cloning to generate an embryo), and not the embryo, that constitute the "parts and potential."

14 This conclusion would follow regardless of the acquired quality we chose as qualifying some human beings (or human beings at some developmental stages) for full respect.

gree of development. Rather, *all* human beings are intrinsically valuable (in the way that enables us to ascribe to them equality and basic rights) because of the *kind* of being they are.

Since human beings are intrinsically valuable and deserve full moral respect by virtue of *what* they are, it follows that they are intrinsically and equally valuable *from the point at which they come into being*. Even in the embryonic stage of our lives, each of us was a human being and, as such, worthy of concern and protection. Embryonic human beings, whether brought into existence by union of gametes, SCNT, or other cloning technologies, should be accorded the respect given to human beings in other developmental stages.¹⁵

I wish to turn now to some arguments that advocates of embryo-destructive research have advanced to cast doubt on the proposition that human embryos deserve to be accorded full moral status.

In defending research involving the destruction of human embryos, Ronald Bailey, a science writer for *Reason* magazine, developed an analogy between embryos and somatic cells in light of the possibility of human cloning.¹⁶ Bailey claims that every cell in the human body has as much potential for development as any human embryo. Embryos therefore have no greater dignity or higher moral status than ordinary somatic cells. Bailey observes that each cell in the hu-

man body possesses the entire DNA code; each has become specialized (as muscle, skin, etc.) because most of that code has been turned *off*. In cloning, those previously deactivated portions of the code are reactivated. So, Bailey says, quoting Australian bioethicist Julian Savulescu, “if all our cells could be persons, then we cannot appeal to the fact that an embryo could be a person to justify the special treatment we give it.” Since plainly we are not prepared to regard all of our cells as human beings, we should not regard embryos as human beings.

Bailey’s analogy between somatic cells and human embryos collapses, however, under scrutiny. The somatic cell is something from which (together with extrinsic causes) a new organism can be *generated* by the process of somatic cell nuclear transfer, or cloning; it is certainly not, however, a distinct organism. A human embryo, by contrast, already is a distinct, self-developing, complete human organism.

Bailey suggests that the somatic cell and the embryo are on the same level because both have the ‘potential’ to develop to a mature human being. The kind of ‘potentiality’ possessed by somatic cells that might be used in cloning differs profoundly, however, from the potentiality of the embryo. A somatic cell has a potential only in the sense that something can be done to it (or done with it) so that its constituents (its DNA molecules) enter into a distinct whole human organism, which is a human being, a person. In the case of the embryo, by contrast, he or she already is actively – indeed dynamically – developing himself or herself to the further stages of maturity of the distinct organism – the human being – he or she already is.

True, the whole genetic code is present in each somatic cell; and this code can

15 For a more complete presentation of this argument, see Patrick Lee and Robert P. George, “The Wrong of Abortion,” in Andrew I. Cohen and Christopher Wellman, eds., *Contemporary Debates in Applied Ethics* (New York: Blackwell Publishers, 2005), 13–26.

16 Ronald Bailey, “Are Stem Cells Babies?” available at <http://www.reason.com/rb/rb071101.html>.

guide the growth of a new entire organism. But this point does nothing to show that a somatic cell's potentiality is the same as a human embryo's. When scientists remove the nucleus of an ovum, insert the nucleus of a somatic cell into the remainder of the ovum, and give it an electric stimulus, they are doing more than merely placing the somatic cell in an environment hospitable to its continuing maturation and development. They are generating a wholly distinct, self-integrating, entirely new organism – an embryo, in other words. The entity – the embryo – brought into being by this process is radically different from the constituents that entered into its generation.

Somatic cells, in the context of cloning, then, are analogous not to embryos, but to the gametes whose union results in the generation of an embryo in the case of ordinary sexual reproduction. You and I were never either a sperm cell or an ovum. Nor would a person who was brought into being by cloning have once been a somatic cell. To destroy an ovum or a skin cell whose constituents might have been used to generate a new and distinct human organism is not to destroy a new and distinct human organism – for no such organism exists or ever existed. But to destroy a human embryo is precisely to destroy a new, distinct, and complete human organism – an embryonic human being.¹⁷

17 Lee and I replied to Bailey in a series of exchanges on *National Review Online* here: 1) (Our critique) <http://www.nationalreview.com/comment/comment-george072001.shtml>; 2) (Bailey's response) <http://www.nationalreview.com/comment/comment-bailey072501.shtml>; 3) (Our response) <http://www.nationalreview.com/comment/comment-george073001.shtml>.

We have responded to similar arguments recently advanced by Lee Silver in his book *Challenging Nature* here: 1) (Our critique) <http://article.nationalreview.com/?q=OTNiYWM2ZjJ>

Michael Gazzaniga, a psychologist and neuroscientist at the University of California, Santa Barbara, has proposed a different argument. While agreeing that a human embryo is an entity possessing a human genome, he has suggested that a 'person' comes into being only with the development of a brain. Prior to that point we have a human organism, but one lacking the dignity and rights of a person.¹⁸ We may therefore legitimately treat human beings in the earliest stages of development as we would treat organs available for transplantation (assuming, as with transplantable organs, that proper consent for their use is given, etc.).

In presenting his case, Gazzaniga observes that modern medicine treats the death of the brain as the death of the person – authorizing the harvesting of organs from the remains of the person, even if some physical systems are still functioning. If a human being is no longer a person with rights once the brain has died, then surely a human being is not yet a person prior to the development of the brain.

This argument suffers, however, from a damning defect. Under prevailing law and medical practice, the rationale for brain death is not that a brain-dead body

iYwVlN2IyMzFjOWYwMDZmMTc4MzU2MGU=; 2) (Silver's response) <http://article.nationalreview.com/?q=Mjg2Y2RkNDM1MzlkMGMyMjI3NjhkYmEoZTRjOTgyZDE=>; 3) (Our response) <http://article.nationalreview.com/?q=MjNmZmYyN2NhNjFkYWRhNmExMDA2YzhiMDY5YzMyYTI=>; 4) (Silver's second response, followed by our second response) <http://article.nationalreview.com/?q=ZDk5ZTE4MjBiMDFmZjcoM2EyNjEoMDc2ZjA4YmRmN2U=>.

18 President's Council on Bioethics, Session 5 meeting, January 18, 2002, transcript available at <http://bioethics.gov/transcripts/jan02/jan18session5.html>.

is a living human organism but no longer a person. Rather, brain death is accepted because the irreversible collapse of the brain is believed to destroy the capacity for self-directed integral organic functioning in human beings who have matured to the stage at which the brain performs a key role in integrating the organism. In other words, at brain death a unitary organism is believed no longer to exist.¹⁹ By contrast, although an embryo has not yet developed a brain, it is clearly exercising self-directed integral organic functioning, and so it is a unitary organism. Its capacity to develop a brain is inherent and progressing, just as the capacity of an infant to develop its brain sufficiently for it actually to *think* is also intrinsic and unfolding.

Unlike a corpse – the remains of what was once a human organism but is now dead, even if particular systems may be artificially sustained – a human organism in the embryonic stage of development is a complete, unified, self-integrating human individual. It is not dead but very much alive, even though its self-integration and organic functioning are not brain-directed at this stage. Its future lies ahead of it, unless it is cut off or not permitted to develop its inherent capacities. Therefore, defenders of embryonic human life insist that the embryo is not a ‘potential life,’ but is rather a life *with potential*. It is a potential *adult*, in the same way that fetuses, infants, children, and adolescents are potential adults. It has the potential for agency, just as fetuses, infants, and small

children do. Just like human beings in the fetal, infant, child, and adolescent stages, human beings in the embryonic stage are already, and not merely potentially, human beings.²⁰

In an essay in the *New England Journal of Medicine*, Harvard political theorist Michael Sandel claimed that human embryos are different *in kind* from human beings at later developmental stages. This argument truly takes us to the heart of the matter: is a human embryo a human being? At its core is this analogy:

Although every oak tree was once an acorn, it does not follow that acorns are oak trees, or that I should treat the loss of an acorn eaten by a squirrel in my front yard as the same kind of loss as the death of an oak tree felled by a storm. Despite their developmental continuity, acorns and oak trees are different kinds of things.

He maintains that just as acorns are not oak trees, embryos are not human beings.

Sandel’s argument begins to go awry with his choice of analogates. The acorn is analogous to the embryo, and the oak tree (he says) is analogous to the human being. But in view of the developmental continuity that science fully establishes and Sandel concedes, the proper analogate of the oak tree is the *mature* human being, viz., the adult. Sandel’s analogy has its apparent force because we feel a sense of loss when a mature oak is felled – assuming it is a magnificent or beautiful oak. But while it is true that we do not feel the same sense of loss at the de-

19 Recent research has raised questions about whether ‘brain death’ is always equated with the irreversible loss of integral organic functioning. See D. Alan Shewmon, “The Brain and Somatic Integration: Insights into the Standard Biological Rationale for Equating ‘Brain Death’ with Death,” *The Journal of Medicine and Philosophy* 26 (2001): 457–478.

20 Lee and I have replied to other arguments that identify the human ‘person’ as the brain or brain activity, and the human ‘being’ as the bodily animal, in Robert P. George and Patrick Lee, “Dualistic Delusions,” *First Things* 150 (2005).

struction of an acorn, it is also true that we do not feel the same sense of loss at the destruction of an oak *sapling*. But clearly the oak tree does not differ in kind from the oak sapling.

This example shows that we value oak trees not because of the kind of entity they are, but because of their magnificence. The magnificence of an oak tree reflects either accidental properties or instrumental worth; a mature tree provides our house with shade and is aesthetically pleasing to behold. Neither acorns nor saplings are magnificent, so we do not experience a sense of loss when they are destroyed. If oak trees were valuable by virtue of the *kind* of entity they are, then it would follow that it is just as unfortunate to lose an acorn as an oak tree.

But the basis for our valuing human beings is profoundly different from the basis for valuing oak trees. As Sandel concedes, we value human beings precisely because of the *kind* of entities they are. Indeed, that is why we consider all human beings to be equal in basic dignity and human rights. We most certainly do not believe that especially magnificent human beings – such as Michael Jordan or Albert Einstein – are of greater *fundamental* worth and dignity than human beings who are physically frail or mentally impaired. We would not tolerate the killing of a handicapped child or a person suffering from, say, brain cancer in order to harvest transplantable organs to save Jordan or Einstein.

And we do not stand for the killing of infants, *which on Sandel's analogy would be precisely analogous to the oak saplings whose destruction we do not necessarily regret*. Managers of oak forests freely kill saplings, just as they might destroy acorns, to ensure the health of the more mature trees. No one gives it a second thought. This is precisely because we do not value mem-

bers of the oak species – as we value human beings – because of the *kind* of entity they are. If we did value oaks in this way, then we would have no less reason to regret the destruction of saplings, and possibly even acorns, than that of mature oak trees. Conversely, if we valued human beings in a way analogous to the way we value oak trees, then we would have no grounds to object to killing human infants or even mature human beings who are ‘defective.’

Sandel's defense of human embryo-killing on the basis of an analogy between embryos and acorns collapses the moment one brings into focus the profound difference between the basis on which we value oak trees, and that on which we ascribe value to human beings. We value oaks for their accidental properties and their instrumental worth. But we value human beings because of the intrinsic worth and dignity they possess by virtue of the kind of entity they are.²¹

I now consider a final objection. Some have claimed that the phenomenon of monozygotic twinning shows that the embryo in the first several days of its gestation is not a human individual. The suggestion is that as long as twinning can occur what exists is not yet a unitary human being, but only a mass of cells – each cell being totipotent and allegedly independent of the others.

It is true that if a cell or group of cells is detached from the whole at an early stage of embryonic development, the detached part can become an organism with the potential to develop to maturity as distinct from the embryo from which it was detached. But this does nothing to show that before detachment the cells

21 Lee and I responded to Sandel in George and Lee, “Acorns and Embryos.”

within the human embryo constituted only an incidental mass.²²

Consider the parallel case (discussed by Aristotle) of the division of a flatworm. Parts of a flatworm have the potential to become a whole flatworm when isolated from the present whole of which they are a part. Yet no one would suggest that prior to the division of a flatworm, the original flatworm was not a unitary individual. Likewise, at the early stages of human embryonic development, before specialization by the cells has progressed very far, cells or groups of cells can become whole organisms if they are divided and exist in an appropriate environment after the division. But that fact does not in the least indicate that prior to the twinning event, the embryo is other than a unitary, self-integrating, actively developing human organism. It certainly does not show

that the embryo is a mere “clump of cells.”

Based on detailed studies of other mammals, it is highly likely that in the first two weeks, the cells of the developing embryonic human being already manifest a degree of specialization and differentiation. From the beginning, even at the two-celled stage, the cells of mouse embryos differ in their developmental fates; they will ultimately contribute to distinct tissues within the embryo.²³ By the four-celled stage, there are clear molecular²⁴ and developmental²⁵ differences between cells of the developing mouse. At no time is the embryo a mere ‘ball of cells,’ i.e., a collection of homogeneous cells that do not function together as an organismic whole.

Now some people have claimed that the human embryo does not become a human being until implantation, be-

22 William Hurlbut of Stanford University has pointed out that “[m]onozygotic twinning (a mere 0.4 percent of births) does not appear to be either an intrinsic drive or a random process within embryogenesis. Rather, it is a disruption of normal development by a mechanical or biochemical disturbance of fragile cell relationships that provokes a compensatory repair, but with the restitution of integrity within two distinct trajectories of embryological development.” He goes on to explain that “the fact that these early cells retain the ability to form a second embryo is testimony to the resiliency of self-regulation and compensation within early life, not the lack of individuation of the first embryo from which the second can be considered to have ‘budded’ off. Evidence for this may be seen in the increased incidence of monozygotic twinning associated with IVF by Blastocyst Transfer. When IVF embryos are transferred to the uterus for implantation at the blastocyst stage, there is a two- to tenfold increase in the rate of monozygotic twinning, apparently due to disruption of normal organismal integrity.” *Human Cloning and Human Dignity: An Ethical Inquiry*, Report of the President’s Council on Bioethics, Washington, D.C., July 2002, personal statement of William Hurlbut.

23 For example, the plane of cleavage of the zygote predicts which cells will contribute to the inner cell mass and which will contribute to the trophectoderm; B. Plusa et al., “The First Cleavage of the Mouse Zygote Predicts the Blastocyst Axis,” *Nature* 434 (7031) (March 17, 2005): 391–395; R. L. Gardner and T. J. Davies, “The Basis and Significance of Pre-Patterning in Mammals,” *Philosophical Transactions of the Royal Society B: Biological Sciences* 358 (2003): 1338–1339; J. Rossant and P. P. Tam, “Emerging Asymmetry and Embryonic Patterning in Early Mouse Development,” *Developmental Cell* 7 (2004): 155–164.

24 M. E. Torres-Padilla et al., “Histone Arginine Methylation Regulates Pluripotency in the Early Mouse Embryo,” *Nature* 445 (7124) (January 11, 2007): 214–218; J. A. Stanton, A. B. Macgregor, D. P. Green, “Gene Expression in the Mouse Preimplantation Embryo,” *Reproduction* 125 (2003): 457–468.

25 K. Piotrowska-Nitsche et al., “Four-Cell Stage Mouse Blastomeres Have Different Developmental Properties,” *Development* 132 (3) (February 2005): 479–490.

cause (they assume) the embryo cannot establish a basic body plan until it receives external maternal signals at implantation. Only then is it a self-directing human organism. According to this view, these signaling factors somehow transform what was hitherto a mere bundle of cells into a unitary human organism.

However, embryologists argue about whether any such maternal signaling actually occurs. As Hans-Werner Denker observed, it was once assumed that in mammals, in contrast to amphibians and birds, polarity in the early embryo depends upon some external signal, since no clear indications of bilateral symmetry had been found in oocytes, zygotes, or early blastocysts.²⁶ But this view has been revised in the light of emerging evidence: “[I]ndications have been found that in mammals the axis of bilateral symmetry is indeed determined (although at first in a labile way) by sperm penetration, as in amphibians. Bilateral symmetry can already be detected in the early blastocyst and is not dependent on implantation.”

Denker refers specifically to the work of Magdalena Zernicka-Goetz and her colleagues at Cambridge University, and that of R. L. Gardner at Oxford University, which show that polarity exists even at the two-celled stage. In contrast, Davor Solter and Takashi Hiiragi of the Max Planck Institute for Immunobiology in Freiburg argue that in the early embryo (prior to compaction and differentiation into inner cell mass and trophoblast), external factors determine the fate of each cell, rather than an internal

polarity.²⁷ In other words, the issue is not definitively settled. However, whichever of the two is true, it is less than candid for anyone to assert the older view without acknowledging that credible scientists from leading universities have published research contradicting it in major peer-reviewed scientific journals.

Moreover – and here is the most important point – even if it is the case that polarity does not emerge until a maternal signal is received at implantation, that would *not* provide any evidence that such a signal transformed a bundle of cells into a unitary, multicellular human organism. Just as the lungs begin to breathe at birth only in response to certain external stimuli, so it would make sense (if the older view is true) that differentiation into the rudiments of the distinct body parts (basic bilateral polarity) would begin only in response to some external stimuli. And this is exactly how embryology texts interpreted such signals, even prior to the publications of Zernicka-Goetz and Gardner and their teams.

There is much evidence that the human embryo is from the first day onward a unitary organism, and never a mere bundle of cells. Development in the embryo is complex and coordinated, including compaction, cavitation, and other activities in which the embryo is preparing itself for implantation.

And here is the clearest evidence that the embryo in the first two weeks is not a mere mass of cells but a unitary organism: if each cell within the embryo before twinning were independent, there would be no reason why each would not develop on its own. Instead, these allegedly independent, noncommunicating

26 Hans-Werner Denker, “Early Human Development: New Data Raise Important Embryological and Ethical Questions Relevant for Stem Cell Research,” *Naturwissenschaften* 91 (1) (2004): 21 ff.

27 See Gretchen Vogel, “Embryologists Polarized Over Early Cell Fate Determination,” *Science* 308 (May 6, 2005).

cells regularly function together to develop into a single, more mature member of the human species. This fact shows that the cells are interacting from the very beginning (even within the zona pellucida, before implantation), restraining them from individually developing as whole organisms and directing each of them to function as a relevant part of a single, whole organism continuous with the zygote. The evidence indicates that the human embryo, from the zygote stage forward, is a unitary human organism.²⁸

Supporters of embryo-destructive research have advanced other arguments against the proposition that human embryos are embryonic human beings bearing basic dignity and full moral worth. I have focused in this essay on the strongest arguments against my position and laid aside the weaker ones, such as those proposing to infer something of moral relevance from the fact that human embryos are tiny and not yet sentient; or from the fact that a high percentage of human embryos are naturally lost early in pregnancy; or from the claim that people typically either do not grieve for the loss of embryos in early miscarriages, or grieve but not as intensely as they do for children who die later in gestation or as infants.

If there is a valid argument to show that human embryos are something other than human beings in the embryonic stage of development, or that embryonic human beings lack the basic dignity and moral worth of human beings in later developmental stages, it is one of the arguments I address here. I have given my reasons for believing that none of

these arguments can withstand critical scrutiny.

The debate about the value of embryonic human life is sure to continue. But if that debate is informed by serious attention to the facts of embryogenesis and early human development, and of the profound, inherent, and equal dignity of human beings, then we, as a nation, will ultimately reject the deliberate killing of embryonic humans, regardless of the promised benefits.

This does not necessarily mean we must sacrifice such benefits. Scientists have already made tremendous progress toward the goal of producing fully pluripotent stem cells by non-embryo-destructive methods. If such methods are pursued with vigor, the future might see the promise of stem cell science fulfilled, with no stain on our national conscience.

²⁸ Lee and I presented this information in George and Lee, "The First Fourteen Days of Human Life."