

# Defining the Essence of Being Human

Efthimios Parasidis\*

## I. INTRODUCTION

For centuries, anthropologists have probed the planet to unearth evidence that assists in answering the fundamental question of what it means to be human. Embryologists and geneticists more recently joined the investigation and have meaningfully supplemented the rich history of anthropological research with detailed analysis based on contemporary medical data. Despite a plethora of significant findings that have resulted from these endeavors, lawmakers, and legal scholars have often neglected or misinterpreted scientific discoveries. These shortcomings have proven detrimental, as evidenced by regulatory deficiencies surrounding biomedical innovations and recent legislative proposals that ostensibly rely on scientific factors to define human life. The goal of this Article is to reframe the legal debate of defining what it means to be human by bridging the gap between science and law.

Accurately defining who or what qualifies as human has significant implications for a myriad of legal and regulatory matters.<sup>1</sup> These include identifying the constitutional protec-

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\* Efthimios Parasidis, Assistant Professor of Law, Center for Health Law Studies, Saint Louis University School of Law. This article was solicited by The Hague Institute for the Internationalisation of Law for its 2011 conference on emerging issues in comparative law, and this is a substantially revised version of a think piece that is included in a compilation of conference-related essays. I thank Monica Eppinger, Chad Flanders, Jeff Redding and Magdalen Sarrinikolaou for insightful comments on early drafts of this work, and Nathaniel Marschalk for exceptional research assistance. Special thanks to the editors and the staff of the *Minnesota Journal of Law, Science & Technology* for outstanding editorial assistance. Inspiration for this article came from my daughter, Anais Anastasia Parasidis, who was born during the course of my research.

1. For example, is there a point at which a genetically-engineered, physically-altered, or pharmacologically-enhanced person ceases to be a human? Should a distinction be recognized between an *in vitro* and *in vivo* human embryo? Ought a synthetically-created living organism ever be deemed a human?

tions that apply to human embryos and other developmental stages of human life,<sup>2</sup> delineating the scope of patent protection for inventions that encompass a human organism,<sup>3</sup> and characterizing the legal standing of human-animal chimeras and synthetically-created organisms.<sup>4</sup> Articulating clear legal standards for defining what it means to be human also facilitates the

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As Peter Singer explains, accurately defining life and death is not an “academic problem[] found in the abstract theories of philosophers who remain remote from the real world,” but rather has “direct consequences for human beings at the most deeply significant moments of their lives.” PETER SINGER, *RETHINKING LIFE AND DEATH* 3 (1994); see also ELIZABETH PRICE FOLEY, *THE LAW OF LIFE AND DEATH* 5 (2011) (“The lack of attention to the law of life and death is remarkable given law’s ubiquity and centrality to our lives.”).

2. An integral component of the abortion debate centers on defining where human life begins and explaining whether an embryo or fetus should be afforded the same protections as human beings. See, e.g., SINGER, *supra* note 1, at 5.

3. A provision of the America Invents Act of 2011—the most extensive amendments to U.S. patent law since 1952—prohibits patent protection for any “claim directed to or encompassing a human organism.” Leahy-Smith America Invents Act, H.R. 1249, 112th Cong. § 32(a) (2011); see also Efthimios Parasidis, *A Uniform Framework for Patent Eligibility*, 85 TUL. L. REV. 323, 400–01 (2010) (outlining history of patent protection for claims that encompass a human organism). While current law provides little guidance in defining the phrase “encompassing a human organism,” a number of patents arguably would qualify. *Id.* For example, the Wisconsin Alumni Research Foundation—which manages intellectual property created by scientists at the University of Wisconsin—“owns three patents that provide a property interest over a method of isolating human embryonic stem cells as well as the resultant stem cell lines . . .” *Id.* In addition, Johns Hopkins University owns a patent titled “Human Stem Cells.” *Id.*

4. In 2002, scientists created a microorganism entirely from synthetic gene sequences. ED REGIS, *WHAT IS LIFE?: INVESTIGATING THE NATURE OF LIFE IN THE AGE OF SYNTHETIC BIOLOGY* 130 (2008). During a two-week period of the following year, scientists created a synthetic virus. *Id.* at 132. In 2004, researchers at the Massachusetts Institute of Technology (MIT) set-up a Standard Registry of Biological Parts. *Id.* at 133. According to this online registry, these “genetic parts . . . can be mixed and matched to build synthetic biology devices and systems.” REGISTRY STANDARD BIOLOGICAL PARTS, [http://partsregistry.org/Main\\_Page](http://partsregistry.org/Main_Page) (last visited Jan. 29, 2012). The goal of the program is “to make biology easier to engineer.” *Id.* Coupled with research in synthetic biology, IBM has recently developed a computer chip that is programmed to mimic the human brain. Oliver Renick, *IBM Chip ‘Senses’ Events to React Like Brain*, BLOOMBERG (Aug. 17, 2011, 11:00 PM), <http://www.bloomberg.com/news/2011-08-18/ibm-chip-senses-events-to-react-in-ways-that-mimic-human-brain.html>. Called “cognitive computers,” the devices can “react to taste, touch, smells, and sound.” *Id.* Another IBM creation, Watson, is a “question answering machine” that uses natural language processing to compete with humans on the popular television show *Jeopardy!*. John Markoff, *Computer Wins on ‘Jeopardy!’: Trivial, it’s Not*, N.Y. TIMES, Feb. 16, 2011, at A1.

enactment of regulatory frameworks that properly delineate practical and ethically justifiable limitations of therapies and therapeutics.<sup>5</sup> The public debate galvanized by the 2011 ballot initiative in Mississippi—where voters were asked to consider amending the state constitution to define “person” as encompassing “every human being from the moment of fertilization, cloning, or the equivalent thereof”—underscores important public policy considerations and the need to accurately define what precisely is encompassed by the term human.<sup>6</sup>

Although the proposed amendment was written to further anti-abortion politics, had the measure passed, there would

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5. This concern is not a recent phenomenon. For example, in 1976, Cambridge, Massachusetts banned scientists from conducting particular recombinant DNA experiments within city limits for three months. REGIS, *supra* note 4, at 128. Genetic engineering, which in its early stages, was seen as “unnatural” and a “threat to humanity.” *Id.* at 127–28. This directly affected two major research institutions—Harvard University and MIT. SHANE CROTTY, *AHEAD OF THE CURVE: DAVID BALTIMORE’S LIFE IN SCIENCE* 122 (2001). Within a decade, the attitude towards genetic engineering had changed drastically, and by 1982, the FDA approved the first genetically engineered biological substance for human use. REGIS, *supra* note 4, at 128. More recently, the debate surrounding human enhancement provides an apt example. While a significant number of biomedical advancements have been applied to improve the health of patients and the general public, others have been utilized non-therapeutically to manipulate and enhance the structure and function of individuals. *See, e.g.*, Timothy D. Holze et al., “*Doctor, Would You Prescribe a Pill to Help Me...?*” *A National Survey of Physicians on Using Medicine for Human Enhancement*, *AM. J. BIOETHICS*, Jan. 13, 2011, at 3, 3. Notably, the dividing line between therapy and enhancement is, at best, ambiguous. *See, e.g.*, Paul Root Wolpe, *Treatment, Enhancement, and the Ethics of Neurotherapeutics*, 50 *BRAIN & COGNITION* 387, 388 (2002). Some bioethicists argue that all medical treatment should be deemed enhancements because such treatment involves altering the natural course of a human’s life. *See, e.g.*, John Harris, *Enhancements are a Moral Obligation*, in *HUMAN ENHANCEMENT* (Julian Savulescu & Nick Bostrom eds., 2009), at 131, 152–53. Others draw the line at whether a biomedical product results in a characteristic that is beyond that typical of human traits. *See, e.g.*, Inmaculada de Melo-Martín, *Defending Human Enhancement Technologies: Unveiling Normativity*, 36 *J. MED. ETHICS* 483, 483–84 (2010). For a provocative compilation of essays on the topic of human enhancements, see *HUMAN ENHANCEMENT*, *supra* note 5; *see also* ROBERT SPARROW, *A NOT-SO-NEW EUGENICS* 32, 33 (2011) (discussing preimplantation genetic diagnosis and embryo splitting); Holze et al., *supra* note, at 4 (analyzing physicians’ reactions to patients seeking enhancement).

6. *See, e.g.*, Richard Fausset, *Mississippi Attempts to Define the Start of Personhood*, *L.A. TIMES* (Nov. 4, 2011), <http://articles.latimes.com/2011/nov/04/nation/la-na-mississippi-abortion-20111105>; Karen McVeigh, *Mississippi Votes Evenly Split over Controversial Abortion Ballot*, *GUARDIAN* (Nov. 7, 2011, 6:10 PM), <http://www.guardian.co.uk/world/2011/nov/07/mississippi-abortion-ballot-voters-split>. In Colorado, a similar proposal was considered and rejected in 2008 and 2010. Fausset, *supra*.

have been fundamental uncertainty as to what qualifies as a human being. By defining “person” as a “human being,” the Mississippi proposal begged the very question it sought to answer. For example, the amendment did not provide any guidance as to whether the term “human being” includes human-animal chimeras and, if so, what percent of human genetic material is necessary to classify a human-animal chimera as human.<sup>7</sup> The proposal also neglected to provide guidance as to whether a human blastocyst with removed stem cells would qualify as a human being, or what standing would be granted to the isolated cells.

The failed initiative in Mississippi serves as a helpful paradigm to illustrate the far-reaching implications that result from insufficiently defining what is encompassed by the term human.<sup>8</sup> The shortcomings of the Mississippi definition, however, are not unique. A few months prior to the Mississippi vote, the Ohio House of Representatives approved the “heartbeat bill,” which criminalizes abortion once a fetal heartbeat is detected on the theory that life begins (or is likely to begin) when

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7. The transfer of genes from one species to another has been possible since the 1980s, and transgenesis could be used to significantly enhance human beings. See Julian Savulescu, *The Human Prejudice and the Moral Status of Enhanced Beings: What Do We Owe the Gods?*, in HUMAN ENHANCEMENT, *supra* note 5, at 211–12 (discussing transgenic species and human-animal chimeras). In contrast to the Mississippi proposal, the German Ethics Council recently set forth limitations on research with human-animal chimeras. See *German Ethics Council Weighs in on Human-Animal Chimeras*, 333 SCIENCE 1806, 1806–07 (2011). The Council approved of mice carrying human genes, but not transgenic monkeys with human genes. *Id.* at 1806. The Council recommended that three things be forbidden: (1) the introduction of animal genes into the human germline; (2) the development of human sperm or egg in an animal; and (3) the implantation of an animal embryo into a human being. *Id.* According to the Council, “[p]utting human brain cells into animals should receive special attention.” *Id.* “The council failed to reach consensus on the creation of so-called cybrids,” which result from inserting the nucleus of a human cell into an animal oocyte. *Id.* This practice has been utilized to create embryonic stem cell lines. *Id.* at 1806–07.

8. As one example, the Supreme Court of Tennessee refused to characterize a human preembryo as a person, concluding that the “preembryos are not, strictly speaking, either ‘persons’ or ‘property,’ but occupy an interim category that entitles them to special respect because of their potential for human life.” *Davis v. Davis*, 842 S.W.2d 588, 597 (Tenn. 1992). Despite this characterization, the court found that those who have created the embryo can own and control it, thus deeming the human embryo, for all practical purposes, to be property.

the heart starts to function.<sup>9</sup> The legislation does not discuss if other human rights attach at this juncture of human development, whether a person whose heart temporarily stops beating should be deemed dead under the law, or the extent to which medical personnel must provide assistance to an individual whose heart has stopped beating.<sup>10</sup>

Equally deficient is a 2010 Nebraska law that focuses not on fertilization or cardiovascular functioning, but rather on the ability to experience pain. Titled the “Pain-Capable Unborn Child Protection Act,” this statute defines “human” simply as a member of the species *Homo sapiens* and restricts a woman’s ability to have an abortion once fetal pain is detected.<sup>11</sup> The goal of the measure is to limit abortion rights prior to the point at which a developing fetus is deemed to be viable.<sup>12</sup> By focus-

9. Bill Analysis, Ohio Legis. Serv. Comm’n, Am. Sub. H.B. 125, 129th Gen. Assemb. (Ohio 2011), as passed by the House, at 9; see Associated Press, *‘Heartbeat’ Bill Suspended as Amendments Pile Up on Ohio Senate*, CLEVELAND.COM (Dec. 15, 2011, 9:36 AM), [http://www.cleveland.com/open/index.ssf/2011/12/heartbeat\\_bill\\_suspended\\_as\\_am.html](http://www.cleveland.com/open/index.ssf/2011/12/heartbeat_bill_suspended_as_am.html); Erik Eckholm, *Fetal Heartbeat Bill Splits Anti-Abortion Forces*, N.Y. TIMES, Dec. 5, 2011, at A1. Detection of a fetal heartbeat typically occurs six to eight weeks into a pregnancy. *Concerns Regarding Early Fetal Development*, AM. PREGNANCY ASS’N, <http://www.americanpregnancy.org/pregnancycomplications/earlyfetaldevelopment.htm> (last updated Oct. 2008).

10. The account of one patient is telling:

Richard Selzer, the surgeon who took early retirement in order to write more of his cogitations on *Life*, died a few years ago but, fortunately for us all, rose again shortly thereafter. His EKG was flat for four and a half minutes, and no amount of resuscitation had any effect. The attending nurse wrote the time of death on the chart, and ten minutes later noted the characteristic “settling” of the body, “the fixity that is incontrovertible.” Then, unexpectedly, the body shuddered: “A moment later he draws his first breath. It is a deep sigh that might be interpreted as one either of sorrow or of satisfaction, as though one precious thing were being relinquished and another embraced.” Soon, a tracing returns to the electrocardiogram, and the breathing becomes regular. “The room, which had descended into a subaqueous silence emanating from the corpse, is now fiercely active. All the machinery is back in place, chugging, vibrating, clicking, ringing.” Later, at the weekly conference, people question the judgment of death, but the nurses persisted with their claim that the cardiogram was flat, and that there was neither a pulse nor blood pressure.

Margaret Lock, *Death in Technological Time: Locating the End of Meaningful Life*, 10 MED. ANTHROPOLOGY Q. 575, 575–76 (1996).

11. Pain-Capable Unborn Child Protection Act, Legis. Bill 1103, 101<sup>st</sup> Leg., 2d Sess. § 5 (Neb. 2010) (codified as amended in scattered sections of NEB. REV. STAT. §§ 28, 38, 53), available at <http://www.legislature.ne.gov/FloorDocs/101/PDF/Slip/LB1103.pdf>.

12. See, e.g., I. Glenn Cohen & Sadath Sayeed, *Fetal Pain, Abortion, Viability, and the Constitution*, 39 J.L. MED. & ETHICS 235, 236 (2011).

ing on fetal pain, however, the law fails to address how individuals who are incapable of feeling pain should be treated. For example, some anencephalic infants may not feel pain even after they are born.<sup>13</sup> Moreover, contrary to the “findings” of the legislature, which assert that fetal pain can be detected at twenty weeks,<sup>14</sup> the best available evidence suggests that a fetus may begin to experience pain at around twenty-nine or thirty weeks.<sup>15</sup>

The Ohio, Mississippi, and Nebraska proposals reflect a trend of political activism where conservative legislators have sought to restrict abortion rights through legal definitions of human that ostensibly reflect current medical knowledge.<sup>16</sup> Upon close analysis, however, these measures are more accurately characterized as normative assertions masked as medical certainties through specious interpretations of scientific research. While normative claims serve to inform the construction of legal frameworks,<sup>17</sup> the failure to faithfully in-

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13. *Anencephaly*, AM. ACAD. NEUROLOGY, [http://patients.aan.com/disorders/index.cfm?event=view&disorder\\_id=846](http://patients.aan.com/disorders/index.cfm?event=view&disorder_id=846) (last visited Feb. 20, 2012).

14. Legis. B. 1103, §§ 3,4.

15. Cohen & Sayeed, *supra* note 12, at 238.

16. See, e.g., Tim Murphy, *The Most Radical Anti-Abortion Measures in America*, MOTHER JONES (Sept. 27, 2011, 2:00AM), <http://motherjones.com/politics/2011/09/abortion-mississippi-les-riley>. For example, the Mississippi ballot proposal was drafted by Les Riley, a supporter of the group *Christian Exodus*. *Id.*; McVeigh, *supra* note 6. *Christian Exodus* was founded “in response to the moral degeneration of the American culture,” and one of its primary goals is “to move thousands of Christian constitutionalists to South Carolina to accelerate the return to self-government based upon Christian principles at the local and State level.” *About Us*, CHRISTIAN EXODUS, [http://christianexodus.org/index.php?option=com\\_content&view=article&id=9&Itemid=37](http://christianexodus.org/index.php?option=com_content&view=article&id=9&Itemid=37) (last visited Feb. 20, 2012). Riley is also the Chairman of the Constitution Party of Mississippi, whose goal is to “restore American jurisprudence to its Biblical foundations.” *Constitution Party Platform*, CONST. PARTY, [http://www.constitutionparty.com/documents/2008CPPlatform .pdf](http://www.constitutionparty.com/documents/2008CPPlatform.pdf) (last visited Feb. 20, 2012).

17. One of the most salient features of interdisciplinary research is the interplay between normative and descriptive modalities of knowledge. Annelise Riles, *Representing In-Between: Law, Anthropology, and the Rhetoric of Interdisciplinarity*, 1994 U. ILL. L. REV. 597, 632–33; see also Svein Eng, *Fusion of Descriptive and Normative Propositions*, 13 *RATIO JURIS* 236, 236–39 (2000) (discussing the fusion of normative and descriptive propositions in legal and philosophical reasoning). As Riles explains, a defining aspect of this interplay “is that each slips effortlessly, almost uncontrollably, into the other . . . spawn[ing] a parallel transformation in the knowledge” produced. Riles, *supra*, at 644, 647. Whereas Riles’s observations stem from an interdisciplinary study of law and anthropology, *id.* at 650, her observations are particularly

tegrate scientific factors into legal definitions of human has frustrated judicious dialogue.<sup>18</sup> With an eye towards reframing the current debate and assisting policymakers in structuring appropriate definitions and regulations, this Article explores the essence of being human by synthesizing normative theories with research findings from anthropology, comparative genomics, embryology, and medicine.

Although my discussion in this Article focuses on the knowledge gained from exploring scientific findings related to the question of personhood, I am mindful of the fact that this approach may be characterized as reflecting a bias that emphasizes contemporary scientific knowledge over other epistemological lenses. For example, it is reasonable to assert that defining human is no less accurate if one adopts a religious or spiritual perspective, or one that is based on socio-cultural observations. Similarly, some may argue that an emphasis on descriptive factors, where there may not be agreement on the validity or significance of the factors, may not ultimately provide any meaningful guidance.

Indeed, the epistemology of what makes us human invariably reflects historical and cultural preconceptions.<sup>19</sup> The fact

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relevant to an analysis of legal definitions of human.

18. See, e.g., Oscar Schacter, *Human Dignity as a Normative Concept*, 77 AM. J. INT'L L. 848, 849 (1983). Apart from the difficulty in defining human life, scholars and scientists have struggled to find a definition of "life." See, e.g., REGIS, *supra* note 4, at 156–58. As Carl Sagan noted in 1970, "despite the enormous fund of information that [biologists] have provided, it is a remarkable fact that no general agreement exists on what it is that is being studied. There is no generally accepted definition of life." *Id.* at 156. More than three decades after Sagan's observation, Stephen Wolfram concluded that "every single general definition that has been given both includes systems that are not normally considered alive, and excludes ones that are." *Id.* at 158 (citing STEPHEN WOLFRAM, *A NEW KIND OF SCIENCE* (2002)).

19. See, e.g., DANIEL E. LIEBERMAN, *THE EVOLUTION OF THE HUMAN HEAD* 528 (2011) ("Perhaps the biggest challenge is to avoid the burden of pre-conceived biases and assumptions about what it is to be human . . . sometimes explicit, but often implicit . . ."). These assumptions include "how we test hypotheses about evolutionary relationships, and how we evaluate their functional and behavioral capabilities." *Id.* Although it may be difficult to resolve epistemological problems, information—including fossil, genetic, archaeological, and linguistic—allow inferences to be made and hypotheses to be tested. *Id.* Disagreements regarding human origins often stem from various assumptions about the significance of available information to the questions we pose—not from a lack of information. *Id.* Further, to what extent does limited evidence in the archaeological record for "modern" behaviors indicate an absence of the capability to think abstractly? *Id.* For Lieberman, the "best strategy is to be epistemologically cautious about any phylogenetic and behavioral

that lawmakers and theorists often define what it means to be human through reference to medical criteria is informative in its own right. Insofar as legal definitions of human have increasingly incorporated medical factors (as evidenced by the aforementioned anti-abortion measures), the framing of the debate has shifted away from a theological or philosophical inquiry and towards a scientific examination. That this shift is largely motivated by activists who typically support a religious conception of human life is somewhat ironic.<sup>20</sup>

Nevertheless, to the extent that a legal definition of human incorporates descriptive characteristics, there is a need to be truthful in accurately analyzing the implications of the characteristics and the extent to which contemporary science supports the underlying assertions.<sup>21</sup> It is likewise important to separate the question of personhood from the moral and legal obligations that may be owed to each individual. Doing so facilitates a nuanced analysis of personhood that is free from biases and com-

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hypotheses." *Id.*

20. See, e.g., Murphy, *supra* note 16. For example, anti-abortion advocates who supported the aforementioned legal definitions of human have mischaracterized scientific data in an effort to promote their belief in "the God-given legal personhood of all unborn human beings." See, e.g., CONST. PARTY, *supra* note 16.

21. Editorial, *A Look Within*, 455 NATURE 1007, 1008 (2008) (indicating that a "major challenge for researchers is being objective about a topic as philosophically, politically and ethically charged as human nature" and arguing that increased dialogue between disciplines is essential). Coupled with the lack of interdisciplinary collaboration, there is significant divergence as to how individual nations address the legal parameters of what it means to be human. See Alexander Morgan Capron & Leon Kass, *A Statutory Definition of the Standards for Determining Human Death: An Appraisal and a Proposal*, 121 U. PENN. L. REV. 87, 110 (1972); Jed Rubenfeld, *On the Legal Status of the Proposition that "Life Begins at Conception,"* 43 STAN. L. REV. 599, 600 (1991). These differences manifest in various areas of law and public policy, including regulations surrounding synthetic biology, stem-cell research, neurological enhancement and manipulation, abortion, and end-of-life issues. See generally SINGER, *supra* note 1, at 3. Although nations have successfully limited treatment and research in these and other areas, in some instances, these limitations have stimulated an underground market and encouraged therapeutic and non-therapeutic forum shopping. See John Goldenring, *The Brain-Life Theory: Toward a Consistent Biological Definition of Humanness*, 11 J. MED. ETHICS 198, 198 (1985). Importantly, the growing ease at which individuals are able to cross national borders, and thus avail themselves of competing legal and public policy frameworks, complicates and jeopardizes the practical reach of any individual legal standard. See Nick Bostrom & Julian Savulescu, *Introduction: Human Enhancement Ethics: The State of the Debate*, in HUMAN ENHANCEMENT, *supra* note 5, at 1, 12.



plexities that flow from deontological theories.

With these reflections as a background,<sup>22</sup> I divide the inquiry of this Article into two questions: (1) at the population level, what distinguishes humans from other species; and (2) how precisely do we define the life and death of an individual human being? In discussing a population-level definition, I focus my analysis on an examination of anthropological findings and comparative genomics. With respect to the second inquiry, I advocate a definition of human that is linked to a population-based perspective coupled with an “organism-as-a-whole” conception of life and death. Specifically, an individual human being is properly deemed to be alive so long as it is functioning as an organism-as-a-whole, irrespective of the functionality of any particular physiological trait. Thus, an individual’s life commences when the being begins to function as an organism-as-a-whole and ends when the being stops functioning as an organism-as-a-whole.<sup>23</sup>

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22. In writing this Article, I am mindful of a statement made by Nobel Laureate Erwin Schrodinger in his classic 1944 book, *What is Life?*:

A scientist is supposed to have a complete and thorough knowledge, at first hand, of *some* subjects and, therefore, is usually expected not to write on any topic of which he is not a master. This is regarded as a matter of *noblesse oblige*. For the present purpose I beg to renounce the *noblesse*, if any, and to be freed of the ensuing obligation. My excuse is as follows:

We have inherited from our forefathers the keen longing for unified, all-embracing knowledge. The very name given to the highest institutions of learning reminds us, that from antiquity and throughout many centuries the *universal* aspect has been the only one to be given full credit. But the spread, both in width and depth, of the multifarious branches of knowledge during the last hundred odd years has confronted us with a queer dilemma. We feel clearly that we are only now beginning to acquire reliable material for welding together the sum-total of all that is known into a whole; but, on the other hand, it has become next to impossible for a single mind fully to command more than a small specialized portion of it.

I can see no other escape from this dilemma (lest our true aim be lost forever) than that some of us should venture to embark on a synthesis of facts and theories, albeit with second-hand and incomplete knowledge of some of them—and at the risk of making fools of ourselves.

ERWIN SCHRODINGER, *WHAT IS LIFE?: THE PHYSICAL ASPECT OF THE LIVING CELL* vii (1945). In dispensing with the practice of *noblesse oblige*, I have endeavored to maintain a respectable understanding of the disciplines discussed herein.

23. Throughout the Article, I use the words “human,” “human being,” and “person” interchangeably.

## II. DISTINGUISHING HUMANS AS A UNIQUE SPECIES

Examining the physical, cognitive, and cultural evolution of humans as a species provides relevant insights into a population-level definition of human. Nature does not provide us with unambiguous boundaries between species. Rather, the boundaries reflect our method of classifying living organisms. Although a number of disciplines provide relevant insights into factors that distinguish humans from other species, there remains significant disagreement on what characteristics are uniquely human.<sup>24</sup> Further, the lack of discussion between disciplines has resulted in duplicated efforts and foregone opportunities to exchange relevant insights.<sup>25</sup> In this Part, I explore a population-level definition of human by drawing upon findings from anthropology<sup>26</sup> and comparative genomics.<sup>27</sup>

### A. THE ANTHROPOLOGICAL RECORD

Modern-day humans are classified as belonging to the species *Homo sapiens*, which is part of the genus *Homo*.<sup>28</sup> Anthro-

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24. Science does not provide us with an “agreed-upon yardstick for how much morphologic or genetic difference separates species.” Ann Gibbons, *The Species Problem*, 331 *SCIENCE* 394, 394 (2011) (“The question of how to define a species has divided researchers for centuries.”). As Charles Darwin observed more than a century ago, “[n]o one definition has satisfied all naturalists.” *Id.* (citing CHARLES DARWIN, *ON THE ORIGIN OF SPECIES: BY MEANS OF NATURAL SELECTION, OR THE PRESERVATION OF FAVOURED RACES IN THE STRUGGLE FOR LIFE* (1859)); see also PAUL RABINOW, *ANTHROPOS TODAY: REFLECTIONS ON MODERN EQUIPMENT* 4 (2003) (“The fact that there is a problem in thinking about human things, and that part of that problem lies in the inability to provide a stable solution, is coexistent and contemporaneous with the practice itself.”).

25. See Editorial, *supra* note 21, at 1008.

26. The field of anthropology is often characterized as containing four subfields: archaeology, biological anthropology, linguistics, and socio-cultural anthropology. *What is Anthropology?*, AM. ANTHROPOLOGICAL ASS’N, <http://www.aaanet.org/about/WhatisAnthropology.cfm> (last visited Jan. 30, 2012). Each subfield provides considerable insight into the fundamental question of what distinguishes humans as a species. See *id.*

27. Comparative genomics is a field of biological research that compares the genome sequences of different species. *Comparative Genomics*, NAT’L HUM. GENOME RES. INST., <http://www.genome.gov/11509542> (last updated Oct. 13, 2011). Identifying differences allows scientists to understand the structure of the human gene and to develop mechanisms to fight human disease. *Id.*

28. Colin Renfrew, *Introduction: Becoming Human: Changing Perspectives on the Emergence of Human Values*, in *BECOMING HUMAN: INNOVATION IN PREHISTORIC MATERIAL AND SPIRITUAL CULTURE* 1, 1 (Colin Renfrew & Iain Morley eds., 2009) [hereinafter *BECOMING HUMAN*].

pological data suggests that *Homo sapiens* emerged in Africa approximately 150,000–200,000 years ago, dispersed to Arabia around 60,000 years ago, and reached Europe 20,000 years thereafter.<sup>29</sup> *Homo sapiens* evolved from earlier hominins,<sup>30</sup> either *Homo erectus*<sup>31</sup> or *Homo ergaster*, who were themselves descendants of *Australopithecus*.<sup>32</sup> Recent studies further suggest that *Homo neanderthalensis*—commonly referred to as Neanderthal Man<sup>33</sup>—co-existed with *Homo sapiens* in Europe and elsewhere for thousands of years.<sup>34</sup> Although the extent to which each group interbred or exchanged ideas is unknown, the fact that interbreeding occurred raises interesting hypotheses as to how one species viewed the other.<sup>35</sup> As will be discussed, interbreeding between *Homo sapiens* and *Homo neanderthalensis* has complicated our ability to classify mod-

29. *Id.*; Christopher Henshilwood, *The Origins of Symbolism, Spirituality, and Shamans: Exploring Middle Stone Age Material Culture in South Africa*, in *BECOMING HUMAN*, *supra* note 28, at 29, 30–31.

30. A *hominin* is a term describing an organism that is more closely related to a human than to a chimpanzee. LIEBERMAN, *supra* note 19, at 3 n.1. *Hominid*, the old term, was used in taxonomic nomenclature and differentiated humans (in the family *Hominidae*) from chimps and gorillas (in the family *Pongidae*). *Id.* Chimps and humans are closely related to each other and, because of this, those species more closely related to humans than to chimps are classified into the family *Hominini*, which means the correct term is *hominin*. *Id.*

31. Notably, fossil evidence suggests that the bones that we currently include as *Homo erectus* may actually belong to two species, *Homo erectus* and *Homo heidelbergensis*. *Id.* at 484–85. Furthermore, while most paleoanthropologists favor an African origin for *Homo erectus*, some argue that the species originated in Asia. *See, e.g.*, Bruce Bower, *Homo May Have Originated in Asia*, *SCI. NEWS*, July 2, 2011, at 8.

32. *See* Colin Renfrew, *Situating the Creative Explosion: Universal or Local?*, in *BECOMING HUMAN*, *supra* note 28, at 74, 76

33. In 1863, William King—an Irish anatomist—suggested to call the species *Homo neanderthalensis* after the type species from the Neander valley. LIEBERMAN, *supra* note 19, at 541 n.3. The German word for valley at that time was “Thal.” *Id.* In 1901, the “h” in the word was eliminated because of German spelling reform. *Id.* This resulted in differing opinions concerning whether the English name for the species should be “Neanderthal” or “Neandertal.” *Id.*

34. *See* Ludovic Slimak, *Late Mousterian Persistence Near the Arctic Circle*, 332 *SCIENCE* 841, 844 (2011).

35. *See* David Lewis-Williams, *Of People and Pictures: The Nexus of Upper Palaeolithic Religion, Social Discrimination, and Art*, in *BECOMING HUMAN* *supra* note 28, at 135, 139; Jane M. Renfrew, *Neanderthal Symbolic Behaviour?*, in *BECOMING HUMAN*, *supra* note 28, at 50, 59; Paul S.C. Taçon, *Identifying Ancient Religious Thought and Iconography: Problems of Definition, Preservation, and Interpretation*, in *BECOMING HUMAN*, *supra* note 28, at 61, 70.

ern-day humans as, genetically speaking, strictly *Homo sapiens*.

The paleoanthropological record reveals that many traits that historically have been associated with modern humans are, in fact, shared by earlier hominins and other animals.<sup>36</sup> For example, *Homo erectus* exhibited behaviors such as tool manufacture and the use of fire,<sup>37</sup> while *Homo neanderthalensis* fed and looked after severely handicapped members of their communities.<sup>38</sup> Findings further indicate that *Homo erectus* deliberately buried their dead<sup>39</sup> and that *Homo neanderthalensis* treated their dead in a “varied, complex, and multidimensional” manner.<sup>40</sup> These traits are significant for many reasons. They indicate activity beyond physical necessity, a heightened sense of respect for both the living and dead, and patterned group behavior which may be referred to as culture. They also indicate a means to communicate, and provide us with hints that some communicating may have concerned the symbolic or semiotic.

In addition to the similarities within the genus *Homo*, a variety of traits—such as the development and use of communicative practices and tools, the ability to teach and learn, and the establishment of intricate social groups—are found throughout the animal kingdom.<sup>41</sup> Moreover, an early human

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36. See Paleanthropology: Hominid Family History, COGWEB, <http://cogweb.ucla.edu/ep/Paleoanthropology.html> (last updated Feb. 20, 2007) (“Here we see the first signs of hominins (human ancestors from the tribe *Hominini*) whose bodies, jaws and teeth begin to resemble those of modern humans, the type broadly labeled *Homo erectus*.”).

37. Renfrew, *supra* note 28, at 3.

38. Renfrew, *supra* note 35, at 51.

39. Renfrew, *supra* note 28, at 3.

40. Renfrew, *supra* note 35, at 54.

41. See A.I. DAGG, THE SOCIAL BEHAVIOR OF OLDER ANIMALS 28 (2009); Stanley Ambrose, *Paleolithic Technology and Human Evolution*, 291 SCIENCE 1748, 1748 (2001). Researchers have reported that chimpanzees, monkeys, seals, and birds have been observed using tools, while gorillas also have been observed to bury their dead. SINGER, *supra* note 1, at 175. Chimpanzees, gorillas, and orangutans have learned to use American Sign Language can recognize spoken words. *Id.* See also Bruce Bower, *Chimpanzee has an Ear for Talk*, SCI. NEWS, Aug. 13, 2011, at 16. Dolphins can recognize their own image, learn foreign languages, comprehend human pointing, use tools, and maintain cultural traditions, while captive dolphins have been observed to commit suicide. See David Grimm, *Are Dolphins Too Smart for Captivity*, 332 SCIENCE 526, 526–27 (2011). Bonobo children have been diagnosed with autism and act in ways that resemble autism in human children. See Nina Bai, *Autism in An-*

embryo is morphologically similar to embryos of other animals, including dogs, cows, mice, reptiles, amphibians, and fish.<sup>42</sup> At one point in its development, the human embryo possesses four gill-like slits, which is the same number of slits found in fish, salamanders, tortoises, chickens, pigs, and other species.<sup>43</sup>

Coupled with research into various species-specific traits,<sup>44</sup> researchers often focus on cognitive and anatomical differences between members of the genus *Homo*. For instance, the brain of *Homo sapiens* includes a developed frontal lobe, which is an area that is intimately involved in functions essential to symbolic thought.<sup>45</sup> Symbolic thought, which may be defined as the representation of reality through language, imagery, or abstract concepts, has long been viewed as a trait that is uniquely human.<sup>46</sup> In addition to *Homo sapiens*, however, recent findings suggest that *Homo neanderthalensis* also demonstrated abstract thought and symbolic behavior, and that *Homo neanderthalensis*, *Homo erectus*, and *Homo ergaster* each “questioned their position in the universe.”<sup>47</sup>

A study of head anatomy provides an additional comparison point. Variation in head anatomy between hominins and great apes is subtle,<sup>48</sup> and the majority of differences between *Homo erectus* and *Homo sapiens* appear to involve only “minor tinkering.”<sup>49</sup> Notably, *Homo sapiens* from 150,000 to 10,000 years ago are more similar to other like-aged *Homo* skulls than they are to those of current populations.<sup>50</sup> Research further suggests that many features that differentiate today’s humans in various parts of the world are the result of recent phenome-

*other Ape*, SCI. AM. MIND, Sept. 2011, at 11.

42. See REGIS, *supra* note 4, at 111.

43. See *id.*

44. See, e.g., Christopher S. Henshilwood & Curtis W. Marean, *The Origin of Modern Human Behavior*, 44 CURRENT ANTHROPOLOGY 627, 627-28 (2003) (outlining use of behavioral traits to identify and distinguish modern humans).

45. Henry de Lumley, *The Emergence of Symbolic Thought: The Principal Steps of Hominisation Leading Towards Greater Complexity*, in BECOMING HUMAN, *supra* note 28, at 10, 10.

46. See *id.* at 24. New evidence suggests that *Homo sapiens* practiced abstract thought and had lunar literacy between 164,000 and 120,000 years ago. See Bruce Bower, *Water’s Edge Ancestors*, SCI. NEWS, Aug. 13, 2011, at 23.

47. Taçon, *supra* note 35.

48. LIEBERMAN, *supra* note 19, at 58. While the heads have the same basic plan with the same components, arranged in essentially the same way, there are discernable and significant morphological differences. *Id.*

49. *Id.* at 527.

50. *Id.* at 529.

na that may simply reflect random and unselected evolutionary changes.<sup>51</sup>

Some evidence suggests that the ability of *Homo sapiens* to interpret their own mental state began to appear approximately 75,000 years ago.<sup>52</sup> Insofar as the ability to think introspectively is commonly believed to be a defining characteristic of humans, the timing of the development is significant. Specifically, it appears that early *Homo sapiens* did not have the cognitive capacity for this type of mental activity or that they did not utilize their cognitive capacity in this way.<sup>53</sup>

On the other hand, the earliest evidence of jewelry and bodily adornments dates back approximately 164,000 years.<sup>54</sup> However, *Homo neanderthalensis* also produced bodily adornments, such as “grooved and perforated animal teeth.”<sup>55</sup> These aspects are significant, as the notion of beautifying one’s body through material objects is often cited as uniquely human. For this and other reasons, some anthropologists argue that *Homo neanderthalensis* appears to share the capacity and manifestation of traits that are often characterized as modern human behavior.<sup>56</sup> Given these and other similarities, including genomic comparisons, some paleoanthropologists have argued for inclusion of *Homo neanderthalensis* under the species *Homo sapiens*, defined as a subspecies *Homo sapiens neanderthalensis*.<sup>57</sup>

Evidence suggests that the development of a distinct vocal

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51. *Id.* at 527–29.

52. See Christopher S. Henshilwood et al., *Engrave Ochres From the Middle Stone Age Levels at Blombos Cave, South Africa*, 57 J. HUM. EVOLUTION 27, 28 (2009).

53. See Henshilwood & Marean, *supra* note 44, at 635 (“The key criterion for modern human behavior is not the capacity for symbolic thought but the use of symbolism to organize behavior.”).

54. See Bruce Bower, *Tool Finishing Technique Arose Before Humans First Left Africa*, SCI. NEWS, Nov. 20, 2010, at 6; see also Renfrew, *supra* note 32, at 77.

55. Trenton W. Holliday, Comment on Henshilwood & Marean: *The Origin of Modern Human Behavior*, 44 CURRENT ANTHROPOLOGY 639, 640 (2003).

56. *See id.*

57. Bruce Bower, *Defining Neandertals*, SCI. NEWS, Jan. 15, 2011, at 31. This debate has existed for over a century. *Id.* In the mid-twentieth century, scientists drastically altered their view of *Homo neanderthalensis*, and proposed that a well-dressed Neanderthal would go unnoticed in the subway. LIEBERMAN, *supra* note 19, at 544. A study of head anatomy prompted this change. *Id.*

cord, which is present in modern-day humans and allows for the development of language, occurred approximately 100,000 years ago, while the vocal ability found in modern-day humans has been present for less than 50,000 years ago.<sup>58</sup> For many anthropologists, language (which includes grammar and syntax) is a uniquely human phenomenon and, thus, may be properly characterized as *the* defining characteristic of humans.<sup>59</sup> On the other hand, research has challenged a linguistic-centered definition of human and has revealed that other animals, such as birds and non-human mammals, maintain language-specific traits that were once characterized as uniquely human.<sup>60</sup> In any event, the capacity for language must be distinguished from the manifestation of language in material culture.<sup>61</sup>

Up through the 1990s, there was widespread agreement that modern human behavior appeared between 50,000 and 40,000 years ago.<sup>62</sup> This position was challenged by theorists who argued that behavioral and technological differences between humans were, at least in part, the result of environmental differences.<sup>63</sup> Insofar as hunter-gatherer technological complexity decreases from arctic to tropical environments, this could be the result of need (hunter-gatherers in cold environments must invest more time and effort to hunt and store food), rather than any difference in ability or species-specific characteristics.<sup>64</sup>

Indeed, until about 10,000 years ago, most *Homo sapiens* lived as hunter-gatherers.<sup>65</sup> Accordingly, the advancements

58. See Leanord E. Newton, *What Makes Us Human?*, 27 BIOSCI. REP. 185, 186 (2007).

59. See, e.g., Jacques Mehler et al., *Why is Language Unique to Humans?*, in PERCEPT, DECISION, ACTION: BRIDGING THE GAPS 251, 254–55, 276–77 (2005). For a comprehensive account of linguistic anthropology, see TERRENCE W. DEACON, *THE SYMBOLIC SPECIES: THE CO-EVOLUTION OF LANGUAGE AND THE BRAIN* (1998).

60. See, e.g., W. Tecumseh Fitch & David Reby, *The Descended Larynx is Not Uniquely Human*, 268 PROC. R. SOC. LONDON 1669, 1669 (2001); Timothy Q. Gentner et al., *Recursive Syntactic Pattern Learning by Songbirds*, 440 NATURE 1204, 1204 (2006).

61. See Henshilwood & Marean, *supra* note 44, at 635 (“The capacity for language probably existed in humans well before it was manifested in material culture.”).

62. See *id.* at 629.

63. See *id.*

64. See *id.* at 632.

65. See, e.g., Kim R. Hill et al., *Co-Residence Patterns in Hunter-Gatherer Societies Show Unique Human Social Structure*, 331 SCIENCE 1286, 1286

that contemporary humans are heralded for—which include the development of diverse disciplines in the arts and sciences, the quest for exchange of information and ideas, the ability to manipulate and alter their environment, and the creation of global systems of social networks and regulations—are recent accomplishments that are not found throughout the existence of *Homo sapiens*.<sup>66</sup> As anthropologists highlight, however, human behavior and human culture is cumulative, and thus the passage of time “is in itself a powerful explanator (through the buildup of social knowledge and population numbers) of differences between human societies separated by tens of thousands of years.”<sup>67</sup>

Just as farming and computers were not invented by humans who suddenly evolved novel cognitive capabilities, one cannot infer that the invention of tools or adornments, or the practice of abstract thinking, occurred because of an evolutionary shift in brain structure or function.<sup>68</sup> Insofar as there are over twenty definitions for that which is encompassed by the species *Homo sapiens*, use of this term provides little guidance in defining what it means to be human.<sup>69</sup>

In reviewing the anthropological record, we must be mindful not to read our own ways of thinking into the enigmatic records of the past.<sup>70</sup> There is significant debate as to how research findings ought be analyzed, thus the findings summarized herein should not be taken as the definitive position of the discipline as a whole.<sup>71</sup> Rather, the aforementioned

(2011) (indicating that “humans lived as foragers for [ninety-five percent] of our species’ history”).

66. See J. Wentzel van Huyssteen, *Interdisciplinary Perspectives on Human Origins and Religious Awareness*, in BECOMING HUMAN, *supra* note 28, at 235, 237 (discussing the emergence of early religion); Keith Ward, *Innovation in Material and Spiritual Culture: Exploring Conjectured Relationships*, in BECOMING HUMAN, *supra* note 28, at 253, 256.

67. See Joao Zilhao, Comment on Henshilwood & Marean, *The Origin of Modern Human Behavior*, 44 CURRENT ANTHROPOLOGY 642, 643 (2003).

68. LIEBERMAN, *supra* note 19, at 584.

69. See Savulescu, *supra* note 7, at 242.

70. See Taçon, *supra* note 35, at 61.

71. See Savulescu, *supra* note 7, at 242 (indicating that there are over twenty definitions of the species *Homo sapiens*); Christopher S. Henshilwood & Curtis W. Marean, Reply to Comments on Henshilwood & Marean, *The Origin of Modern Human Behavior*, 44 CURRENT ANTHROPOLOGY 643, 646 (2003) (“There is no single paradigm, and there may never be one, for defining exactly when, where, and how humans became behaviorally modern.”).



findings are intended to highlight the difficulty that researchers face in arriving at a precise population-level definition of human. Though the work of humans has provided humans with an intricate understanding of our place in the universe, much additional work is needed to unearth new information and analyze relevant findings in an effort to gain an improved understanding of this age-old question.

#### B. COMPARATIVE GENOMICS

As with every organism, humans have a unique genome that is shaped by our evolutionary history. Although the Human Genome Project was “completed” over a decade ago, no one really knows exactly how many genes make up the human genome or the genetic components necessary to make a human.<sup>72</sup> For example, research suggests that each person not only has a unique genetic blueprint, but that each person has a different number of genes.<sup>73</sup> Furthermore, significant portions of a genome can be missing from, or added to, a person’s genome, sometimes with no apparent ill effects.<sup>74</sup>

Genetic research supports some of the anthropological studies highlighted in the previous subpart.<sup>75</sup> The mapping of

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72. See Tina Hesman Saey, *Scientists Still Making Entries in Human Genetic Encyclopedia*, SCI. NEWS, Nov. 6, 2010, at 5 [hereinafter Saey, *Scientists Still Making Entries in Human Genetic Encyclopedia*]. For instance, the RefSeq database, which is maintained by the U.S. National Institutes of Health, estimates that humans have 22,333 genes that encode proteins. *Id.* On the other hand, the Gencode database, maintained by the Wellcome Trust Sanger Institute in England, currently sets the number at 21,671. *Id.* These figures vary drastically from earlier estimates. For instance, between 1990 and 1996, estimates placed the human gene count between 80,000 to 100,000 genes. *Id.* at 6. Between 2000 and 2001, the number dropped to 30,000 to 40,000. *Id.* Furthermore, the number of genes in a species’ genome does not necessarily correlate with the complexity of the species. For example, grapes are estimated to have 30,434 genes, chickens 16,736 genes, and fruit flies 14,889 genes. *Id.*; see also Tina Hesman Saey, *Missing Lincs: Lesser-Known Genetic Material Helps Explain Why Humans are Human*, SCI. NEWS, Dec. 17, 2011, at 22–23 (detailing the role of lincRNAs, which were once thought by many scientists to be “worthless”); Tom Siegfried, *Turns Out that ‘Junk DNA’ Wasn’t Just Talking Trash*, SCI. NEWS, Dec. 17, 2011, at 2 (indicating that non-coding DNA sequences, though once characterized by many scientists as “junk” DNA, contain codes for making non-protein molecules).

73. Saey, *Scientists Still Making Entries in Human Genetic Encyclopedia*, *supra* note 72, at 6.

74. *Id.*

75. See Renfrew, *supra* note 32, at 76 (“The impact of DNA studies . . . now documents in a much more detailed way the out-of-Africa expansion of our species around sixty thousand years ago.”).

the chimpanzee genome has also provided an important reference point for comparative genomic analysis. Interestingly, once the extent of the similarity between the human and chimpanzee genomes was published, some scholars advocated for the merger of the genus *Pan* (of which the chimpanzee and bonobo are species) with the genus *Homo*.<sup>76</sup>

In fact, Swedish biologist Carl Linnaeus, who devised our modern-day system of classifying plants and animals into kingdom, phylum, order, family, genus, and species, originally found that he had developed a set of criteria that put human beings in the same genus as chimpanzees.<sup>77</sup> Since this went against the religious notion that humans were created as a separate entity—an idea staunchly upheld by the Swedish Lutheran Church, as well as many other religions—Linnaeus altered the application of his own criteria and placed humans alone in the genus *Homo*.<sup>78</sup> Some years later, in 1788, perhaps not proud of what he had done, he remarked:

I demand of you, and of the whole world, that you show me a generic character . . . by which to distinguish between Man and Ape. I myself most assuredly know of none. I wish somebody would indicate one to me. But, if I had called man an ape, or vice versa, I would have fallen under the ban of all the ecclesiastics. It may be that as a naturalist I ought to have done so.<sup>79</sup>

Charles Darwin shared Linnaeus's scientific view that humans and chimpanzees were closely related. In *The Descent of Man*, published in 1871, Darwin argues that the differences between humans and some non-human animals are “differences of degree, not of kind.”<sup>80</sup> Indeed, from a genetic perspective, humans are more closely related to chimpanzees than gorillas

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76. See Newton, *supra* note 58, at 185; see also SINGER, *supra* note 5, at 177–178. Despite the close genetic match, divergence between humans and chimps occurred between five and ten million years ago. LIEBERMAN, *supra* note 19, at 5.

77. SINGER, *supra* note 5, at 170.

78. *Id.*

79. *Id.* (citing ANN DRUYAN & CARL SAGAN, SHADOWS OF FORGOTTEN ANCESTORS 274 (1992) (citing GEORGE SELDES, THE GREAT THOUGHTS (1985))). This view was shared by one of Linnaeus's contemporaries, Lord Monboddo, a Scottish anthropologist who described the similarities between humans, chimpanzees, and orangutans, and concluded that “it appears certain” that the three are of the same species. *Id.* (citing LORD J. B. MONBODDO, OF THE ORIGIN AND PROGRESS OF LANGUAGE (1774)).

80. *Id.* at 171.

are to chimpanzees.<sup>81</sup> Similarly, “all of the African apes—chimpanzees, gorillas, and humans—are more closely related to each other than any of the three is related to orang-utans.”<sup>82</sup>

Although comparative genomics reveals that humans and chimpanzees share approximately 98.4% of their genes,<sup>83</sup> and that *Homo neanderthalensis* and *Homo sapiens* are approximately 99.5% equivalent, these figures provide little guidance as to the functional significance of the genetic distinctions between the species.<sup>84</sup> Notably, the order of magnitude of the divergence between humans and chimpanzees is less than that between mice and rats.<sup>85</sup> As most would agree, however, what separates us from chimpanzees is far more profound than what separates the two rodents. In this respect, the question becomes the extent to which comparative genomics can supply helpful information in deciphering what genetic factors are uniquely human.<sup>86</sup>

Recent findings reveal that modern-day humans in Europe and Asia have inherited between one and four percent of their

81. *Id.* at 177.

82. *Id.* Recent legislation aims to phase-out research on great apes, which would encompass chimpanzees. Great Ape Protection and Cost Savings Act of 2011, H.R. 1513, 112th Cong. (2011); see Roscoe G. Bartlett, *Stop Using Chimps as Guinea Pigs*, N.Y. TIMES, Aug. 11, 2011, at A23. As the sponsor of the bill explains, “chimpanzees experience pain, stress and social isolation in ways strikingly similar to the way humans do.” *Id.* The United States and Gabon are the only two countries that conduct invasive research on chimpanzees. See James Gorman, *Chimps’ Days in Labs May Be Dwindling*, N.Y. TIMES, Nov. 15, 2011, at D4. An international movement—The Great Ape Project—aims to protect the rights of non-human primates. See GREAT APE PROJECT, <http://www.greatapeproject.org> (last visited Feb. 9, 2012); see also Adam Kolber, *Standing Upright: The Moral and Legal Standing of Humans and Other Apes*, 54 STANFORD L. REV. 163, 164 (2001).

83. SINGER, *supra* note 1, at 177. The degree of difference between humans and chimpanzees is less than that between the red-eyed and white-eyed vireos, which are two closely-related North American bird species. *Id.* Nevertheless, humans and chimps differ by approximately thirty-five million base pairs. LIEBERMAN, *supra* note 19, at 7.

84. See, e.g., Pennisi, *Ancient DNA: No Sex Please, We’re Neandertals*, 316 SCIENCE 967, 967 (2007) (discussing the difficulties in using genetic sequencing to determine whether species interbreeding ever occurred).

85. Geoff Spencer, *New Genome Comparison Finds Chimps, Humans Very Similar at the DNA Level*, NAT’L HUM. GENOME RES. INST., <http://www.genome.gov/15515096> (last visited Feb. 9, 2012).

86. See generally T.S. Mikkelsen, *What Makes us Human?*, 5 GENOME BIOLOGY 238 (2004) (discussing a comparative genomics study involving chimpanzees).

genes from *Homo neanderthalensis*.<sup>87</sup> These genetic similarities are not found in modern-day Africans, suggesting that *Homo neanderthalensis* interbred with *Homo sapiens* in select regions of the world.<sup>88</sup> Genetic analysis of 40,000-year old bones found in a Siberian cave suggest the existence of a third species—neither *Homo neanderthalensis* nor *Homo sapiens*—that split from the line that led to modern-day humans over one million years ago.<sup>89</sup> Called Denisovans (after the Denisova Cave in which the bones were found), their genome share four to six percent of genes with the modern-day Melanesian population of Papua New Guinea and Bougainville Island.<sup>90</sup> Remains of *Homo neanderthalensis* and *Homo sapiens* were found along with the Denisovan bones found in the Denisova Cave.<sup>91</sup> Taken together, these findings suggest that the lineage of modern-day humans is much more intertwined than originally believed.<sup>92</sup>

Despite the limited information currently available, and to the extent that the evolution of a species has a genetic footprint, comparative genomics provides an important framework for identifying relevant genetic differences between species. It is equally as important to arrive at an understanding of how the genetic basis (genotype) relates to observable characteristics (phenotype).<sup>93</sup> Given the immense complexity of an organ-

87. *Reading the Neandertal Genome*, 330 SCIENCE 1605, 1605 (2010).

88. *Id.* But see Pennisi, *supra* note 84, at 967 (addressing the difficulties with proving that such interbreeding actually occurred).

89. Ann Gibbons, *Tiny Time Machines Revisit Ancient Life*, 330 SCIENCE 1616, 1616 (2010); Laura Sanders, *Genes Reveal Mysterious Group of Hominids as Neandertal Relatives*, SCI. NEWS, Jan. 15, 2011, at 10.

90. Sanders, *supra* note 89, at 10.

91. *Id.*

92. *Id.*; Ann Gibbons, *Aboriginal Genome Shows Two-Wave Settlement of Asia*, 333 SCI. 1689, 1689 (2011); *A New Ancestor for Homo?*, 332 SCIENCE 534, 534 (2011); Ann Gibbons, *A New View of the Birth of Homo Sapiens*, 331 SCIENCE 392, 393 (2011).

93. “Until we better understand the relationship between genotype and phenotype, we can adopt several strategies to mitigate the effects of ignorance.” LIEBERMAN, *supra* note 19, at 529. These include: “avoid picking unjustifiable null hypotheses”—for instance, “[t]here is no logical reason to assume a priori that an important trait such as language is either unique to modern humans or shared by all large brained hominins unless proven otherwise”; second, “evaluate whether skeletal features contain phylogenetic or functional information before assuming they do (or don’t)” — “[f]or a given feature, this means knowing something about its developmental bases, how it covaries with other features, and how it affects performance”; “and [t]hird, . . . be careful about variation.” *Id.* “[M]ore than 85% of our species’ genetic variation

ism's phenotype, however, evolutionary changes are quite difficult to detect at this level.

The role of epigenetic factors further complicates the calculus. Epigenetic mechanisms are heritable changes in gene expression that are not coded in the DNA sequence itself.<sup>94</sup> Internal and external environmental factors impact epigenetic mechanisms, which, in turn, gradually alter gene expression.<sup>95</sup> In other words, non-genetic factors cause the genes to behave differently, and this expression may be passed down to future generations. Examining the relationship between genetic and epigenetic factors has led to new concepts on disease and the heritability of traits, further complicating the process of unraveling the genomic evolution of humans.<sup>96</sup>

Comparative genomics provides great promise for bringing to light genetic factors that are uniquely human.<sup>97</sup> Given the complexity of phenotypic plasticity and the role of epigenetic factors, however, significant research must be conducted to better understand the significance of genetic variation. Current efforts to unravel this information are often borrowed from genetic information derived from studies of human disease, mutational analysis of model organisms, and gene expression profiles. Since these methods rely on indirect inference, rather than experimental validation, they do not address the functional consequences of specific evolutionary changes.<sup>98</sup> Furthermore, intellectual property protection has hindered the use of much of this information and has stunted the development of the field.<sup>99</sup>

### III. IDENTIFYING THE LIFE AND DEATH OF AN INDIVIDUAL HUMAN

Although an examination into defining what it means to be human is often linked to one's religious views—and it is im-

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exists with any given population." *Id.* Further, about 90% of the craniometric variation is present within any given population. *Id.*

94. Andrew P. Feinberg, *Phenotypic Plasticity and the Epigenetics of Human Disease*, 447 *NATURE* 433, 433 (2007).

95. *Id.*

96. See Gerda Egger et al., *Epigenetics in Human Disease and Prospects for Epigenetic Therapy*, 429 *NATURE* 457, 457 (2004).

97. Nitzan Mekel-Bobrov & Bruce T. Lahn, *What Makes us Human: Revisiting an Age-old Question in the Genomic Era*, 1 *J. BIOMED. DISCOVERY & COLLABORATION* 18, 24 (2006).

98. *Id.* at 24.

99. See Parasidis, *supra* note 3, at 328.

portant to be mindful of varying religious perspectives—this Article will not explore or critique religious notions in great detail.<sup>100</sup> Apart from religious perspectives, a number of scholars have classified humans as living beings possessing bodily continuity, cognitive continuity, or genetic continuity.<sup>101</sup> Despite the intuitive appeal of these perspectives, each fails to sufficiently account for the continuity of all humans. For example, throughout the course of a lifetime, a person may lose his or her arms or legs or may have a transplanted heart, liver, eye, or face. Identifying a person's life as a continuous body fails to account for these factors. Similarly, the fact that each person begins as an unthinking embryo, may enjoy a productive life, and then may end up as an unthinking person with severe cognitive impairment demonstrates that no sort of mental continuity is necessary.<sup>102</sup> Furthermore, through germline gene therapy, the genetic makeup of an individual may be altered, thus breaking any sort of life-long genetic continuity.<sup>103</sup> Additionally, one's genes may be altered by environmental factors such as radiation, chemicals, or viruses.<sup>104</sup>

To the extent that each of these theories fails to account for the continuity of an individual over time, a more accurate barometer is preferred. I support a notion of continuity, proposed by various scholars, that is linked to a biological basis for iden-

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100. One traditional view, proposed by theologians and described by Rene Descartes, claims that the continuation of an immaterial soul is what accounts for human identity. See John P. Lizza, *Introduction*, in *DEFINING THE BEGINNING AND END OF LIFE 1, 2* (John P. Lizza ed., 2009). Often referred to as a dualist perspective, dualists claim that “a person could acquire a completely new body or continue to exist with no body at all.” *Id.* Building on the notion that human identity is linked to a soul, St. Thomas Aquinas sets forth an alternative view and classifies humans as “biological organism[s] informed by a rational soul”. *Id.* Under this perspective, “[p]ersonal identity” lies in the “continuation of an ensouled body.” *Id.* The soul and body “are inextricably linked,” and the soul is what unifies and individuates a human. *Id.*

101. See Derek Parfit, *The Unimportance of Identity*, in *DEFINING THE BEGINNING AND END OF LIFE* *supra* note 100, at 117, 118–25 (describing various continuity theories proposed over time).

102. See Eric T. Olson, *An Argument for Animalism*, in *DEFINING THE BEGINNING AND END OF LIFE*, *supra* note 100, at 80, 86.

103. See *Gene Therapy*, GENETICS HOME REFERENCE (Feb. 20, 2012), <http://ghr.nlm.nih.gov/handbook/therapy?show=all> (“Gene therapy is an experimental technique that uses genes to treat or prevent disease.”).

104. See *generally* Feinberg, *supra* note 94, at 433 (discussing how cells may be altered “in response to internal or external environmental cues”).

tifying a person as an “organism-as-a-whole.”<sup>105</sup> This is a holistic approach that reflects the coherent unity of an organism, and views each person as a complex and integrated organism whose existence is dependent on the emergent functioning of many physiological components.<sup>106</sup>

The organism-as-a-whole is not necessarily the whole organism—one may continue to exist as an organism-as-a-whole without continuity as a whole organism.<sup>107</sup> For example, during the course of one’s lifetime, physical, cognitive, or genetic traits may come and go, and continuity of existence may remain intact, so long as there exists an identifiable organism-as-a-whole throughout the course of each change. Within this framework, this Article will focus on delineating the beginning and end of an individual human life. Elucidating clear boundaries for life and death permits a more informed discussion of legal, ethical, and regulatory issues related to medical treatments.

#### A. INTERPRETING EMBRYOLOGICAL DEVELOPMENT

From at least the time of the ancient Greeks, scholars have debated the proper moment at which human life comes into existence.<sup>108</sup> This subpart of the Article will critically examine a number of these perspectives, which range from the moment of conception to birth. Many claim that human life begins at conception, which occurs when a human egg becomes fertilized with human sperm and becomes a zygote.<sup>109</sup> Conception,<sup>110</sup> however, does not occur in an instant, but rather is a process that lasts approximately twenty-four hours.<sup>111</sup> This process culminates in syngamy, which is where the genetic material of

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105. See James L. Bernat, *The Biophilosophical Basis of Whole-Brain Death*, in *DEFINING THE BEGINNING AND END OF LIFE*, *supra* note 100, at 413, 420.

106. *Id.*

107. *Id.* at 420; see, e.g., JAMES L. BERNAT, CHARLES M. CULVER & BERNARD GERT, *DEFINING DEATH IN THEORY AND PRACTICE* 5 (Hastings Ctr. 1982).

108. See generally William A. Wallace, *St. Thomas on the Beginning and Ending of Human Life*, in *DEFINING THE BEGINNING AND END OF LIFE*, *supra* note 100, at 469, 470 (indicating that Aristotle contemplated the point at which human life begins).

109. See, e.g., PATRICK LEE, *ABORTION & UNBORN HUMAN LIFE* 71–107 (2d ed., 2010) (“[F]ertilization generates a new human organism, for it produces a distinct organism with the active disposition, or ability. . . to develop itself in accord with its own genetic and epi-genetic information.”).

110. I use the terms “conception” and “fertilization” interchangeably.

111. See SINGER, *supra* note 1, at 94–95.

the sperm and egg merge.<sup>112</sup>

Proponents of a conception-based definition must be specific as to when, precisely, a human life begins. Is it when the sperm begins to fuse with the egg, when the fertilization process is complete, or somewhere in between? For those who claim that human life begins once an egg is fertilized—a position that many religious scholars adhere to<sup>113</sup>—to be consistent, they must adopt the position that the completion of the fertilization process marks the beginning of a human life. If so, then contraceptives such as the morning-after pill do not destroy a human life, so long as the pill is taken prior to the completion of the fertilization process.

Complicating this analysis is the phenomenon of parthenogenesis, where an embryo is produced without sperm.<sup>114</sup> While parthenogenesis occurs naturally in various species, scientists have used parthenogenesis to create human embryos.<sup>115</sup> Using fertilization as the moment when human life begins leads to the absurd conclusion that some human embryos (i.e., those produced through fertilization) are alive while others human embryos (i.e., those produced through parthenogenesis) are not because there is no fertilization process for parthenogenetically-produced human embryos.

Following fertilization, the zygote begins to divide, with each division occurring approximately every twenty-four hours.<sup>116</sup> Up to the eight-cell stage, each single cell may properly be viewed as an individual entity in the sense that there is no fusion between the cells.<sup>117</sup> Rather, the zygote is a loose collection of distinct cells held together by the zona pellucida,

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112. *Id.*

113. See, e.g., John T. Noonan, Jr., *An Absolute Value in History*, in *THE MORALITY OF ABORTION: LEGAL AND HISTORICAL PERSPECTIVES* (John T. Noonan, Jr. ed., 1970).

114. H. M. Fangerau, *Can Artificial Parthenogenesis Sidestep Ethical Pitfalls in Human Therapeutic Cloning? An Historical Perspective*, 31 *J. MED. ETHICS* 733, 733 (2004).

115. See generally *id.* (explaining that while embryos can be obtained from unfertilized eggs, they will not grow into viable humans because the two necessary gene sets are missing).

116. Helga Kuhse & Peter Singer, *Individuals, Humans and Persons: The Issue of Moral Status*, in *DEFINING THE BEGINNING AND END OF LIFE*, *supra* note 100, at 294, 343; *Human Early Embryo Development*, SABIOSCIENCES, [http://www.sabiosciences.com/pathway.php?sn=Human\\_Early\\_Embryo\\_Development](http://www.sabiosciences.com/pathway.php?sn=Human_Early_Embryo_Development) (last visited Feb. 11, 2012).

117. Kuhse & Singer, *supra* note 116, at 342.



which is the outer membrane of the egg.<sup>118</sup> Each of these early cells is totipotent, which means that each has the potential to produce an entirely new organism.<sup>119</sup> Around day fourteen after fertilization, the primitive streak develops, resulting in a loss of totipotency.<sup>120</sup>

Prior to the primitive streak, identical twins can develop from a single zygote.<sup>121</sup> Of course, twins may also form when two eggs are fertilized and two zygotes produced.<sup>122</sup> In some instances, the zygotes combine, forming a chimera, and continue to develop as a single organism.<sup>123</sup> Under these circumstances, continuity as a distinct individual may be traced to some period after fertilization and prior to, or at, the primitive streak stage.

Since the zygote's development does not immediately differentiate the cells that form the embryo from those that form the placenta and other tissues, a zygote, in and of itself, is arguably too indeterminate to constitute a real and ongoing human individual. For these reasons, a number of bioethicists maintain that a human life cannot be said to exist prior to the primitive streak stage.<sup>124</sup>

A recent decision by the German Supreme Court highlights further practical concerns of defining human life prior to the primitive streak stage.<sup>125</sup> The German high court recently acquitted a doctor who performed pre-implantation genetic screening in his clinic.<sup>126</sup> Notably, the doctor reported himself to authorities in an effort to seek clarification of German law.<sup>127</sup>

118. *Id.*

119. *Id.* Totipotency also refers to the ability of a cell to differentiate into various cell types.

120. *Id.* at 324.

121. *See, e.g., id.* at 341.

122. *See, e.g., id.*

123. *Id.*

124. *See* Germain Grisez, *When Do People Begin?*, in *DEFINING THE BEGINNING AND END OF LIFE*, *supra* note 100, at 294, 303. Similarly, some Catholic priests have been troubled by the fact that twinning can occur after conception. SINGER, *supra* note 5, at 94. This position was set forth by Father Norman Ford, Master of Melbourne's Catholic Theological College. Father Ford concluded that, so long as twinning is a possibility, the cluster of cells does not constitute an individual organism. *Id.* His position has been neither accepted, nor condemned, by the Catholic Church. *Id.*

125. *Federal Supreme Court Allows Preimplantation Diagnosis*, BIOTECHNOLOGIE (July 14, 2010), <http://www.biotechnologie.de/BIO/Navigation/EN/root,did=113700.html>.

126. *Id.*

127. *Id.*

The German court limited use of the screening for detection of serious diseases, and specifically indicated that the method could not be utilized to select for eye color, hair color, or gender, noting that the law does not permit “designer babies.”<sup>128</sup>

Although *in utero* genetic screening and pre-implantation genetic diagnosis often require the removal of one or more totipotent cells, the court did not discuss whether the practice kills a potential human being or whether the removed cells equate to human life. These screening methods are commonly used in a number of nations for disease-based testing, including the United States, United Kingdom, and a majority of EU nations, while a number of other nations have no policy that directly prohibits use for non-disease selection factors.<sup>129</sup> Do such screening methods constitute legalized eugenics or intelligent use of reproductive technologies?

Some guidance may come from the Court of Justice of the European Union, which is considering the precise definition of the term “human embryo.”<sup>130</sup> Specifically, the court is set to determine “the earliest stage of the human body.”<sup>131</sup> In connection with the case, the court’s Advocate General (AG) issued a non-binding opinion in which it argued that the term human embryo “must be interpreted as matter which has the capacity to develop into a complete human being.”<sup>132</sup> According to the AG, this would include totipotent cells, blastocysts, “[u]nfertilised ova in to which a cell nucleus from a mature cell has been transplanted,” and “[u]nfertilised ova whose division has been stimulated by parthenogenesis insofar as totipotent cells would be obtained in that way.”<sup>133</sup>

In addition to fertilization and the primitive streak stage, viability is a stage of fetal development that is often cited as a defining line as to where human life begins.<sup>134</sup> As the U.S. Su-

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128. *Id.*

129. *Id.* (“[G]enetic testing of embryos in the womb is permitted for the detection of hereditary diseases such as Down’s syndrome or Huntington’s disease.”).

130. See Societa Italiana Brevetti, *Patenting Stem Cells in Europe: AG Opinion in Brustle v. Greenpeace*, 25 BNA WORLD INTELL. PROP. REP. 8 (2011).

131. *Id.*

132. *Id.*

133. *Id.*

134. *Roe v. Wade*, 410 U.S. 113 (1973) (discussing the history preceding the abortion decision and how viability is often used to mark the beginning of life).

preme Court has argued, the government's interest in a new life becomes "compelling" at the stage of viability.<sup>135</sup> At the time of the *Roe v. Wade* decision, viability was determined to exist at approximately twenty-eight weeks.<sup>136</sup> However, advancements in medicine have pushed the stage of viability to an earlier point in gestation; Justice O'Connor acknowledged this fact a decade after *Roe*, when she noted that "[a]s medical science becomes better able to provide for the separate existence of the fetus, the point of viability is moved further back toward conception."<sup>137</sup>

Nevertheless, there is no consensus on the point of viability.<sup>138</sup> A number of factors, such as sex, birth weight, and maternal exposure to steroids, affect the point at which a particular fetus becomes viable.<sup>139</sup> In Japan, neonates born after twenty-two weeks (as determined by last menstrual period) are resuscitated,<sup>140</sup> while the Netherlands sets the mark at twenty-five weeks.<sup>141</sup> In the United States and United Kingdom, some neonates are resuscitated below twenty-three weeks.<sup>142</sup> At twenty-two weeks, the most reliable published data suggest a survival

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135. *Id.* at 114. Although the Supreme Court in *Roe v. Wade* claimed that it "need not resolve the difficult question of when life begins" and that it "is not in a position to speculate as to the answer[.]" it arguably did so by focusing on viability as the stage of fetal development where the state's interest becomes "compelling." *Id.* at 159.

136. *Id.* at 160.

137. *City of Akron v. Akron Ctr. for Reprod. Health Inc.*, 462 U.S. 416, 458 (1983) (O'Connor, J., dissenting). The point of viability can also be altered based on a woman's access to a modern medical center with facilities to care for a premature infant. SINGER, *supra* note 1, at 102.

138. Cohen & Sayeed, *supra* note 12, at 237.

139. Jon E. Tyson et al., *Intensive Care for Extreme Prematurity—Moving Beyond Gestational Age*, 358 N. ENG. J. MED. 1672, 1672 (2008).

140. Satoshi Kusuda et al., *Morbidity and Mortality of Infants with Very Low Birth Weight in Japan: Center Variation*, 118 PEDIATRICS e1130, e1134 (2006).

141. S. Verloove-Vanhorick, *Management of the Neonate at the Limits of Viability: The Dutch Perspective*, 113 BJOG SUPP. 3, 13–16 (2006) (noting that a gestational age of twenty-five weeks warrants intensive neonatal care).

142. Amer. Health Ass'n & Amer. Acad. of Pediatrics, *2005 American Heart Association (AHA) Guidelines for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (ECC) of Pediatric and Neonatal Patients: Neonatal Resuscitation Guidelines*, 117 PEDIATRICS e1029, e1035 (2006); N.S. Wood et al., *Neurologic and Developmental Disability after Extremely Preterm Birth*, 343 N. ENG. J. MED. 378, 379 (2000) (discussing resuscitation for infants with a gestational age of twenty to twenty-five weeks in the United Kingdom).

rate of 1% to 20%.<sup>143</sup> Are these fetuses truly viable, if 80% to 99% of them die? Furthermore, a majority of these infants who survive “sustain significant and permanent cognitive and physical disabilities.”<sup>144</sup>

For these reasons, one may argue that, although a viable fetus is theoretically able to survive outside the mother’s womb, until it actually does so, it is not functioning as an organism-as-a-whole. Prior to that point, it is reasonable to assert that the organism is properly deemed to be a fetus, embryo, blastocyst, etc., and thus may be properly identified as life or a developmental stage of human life. In this respect, there is a strong argument for identifying the beginning of human life with birth, where there is biological and physiological independence, and the life is functioning as an organism-as-a-whole independent of the mother’s body.

In other words, although a developing embryo or fetus has the potential to become a human, and this potential increases with each passing day, the actuality of being a distinct human does not occur until birth. This is when the fetus moves beyond the stage of being a potential human and actually becomes one. This perspective of human life is consonant with Jewish principles, which hold that full title to life arises only at birth.<sup>145</sup> Under Talmudic law, the fetus is considered to be part of the mother’s body until the birthing process begins; at which point, the fetus is considered a distinct life.<sup>146</sup>

This position is consistent with criminal law statutes throughout the United States, which define a person as one who is “born alive.”<sup>147</sup> While the “born alive” rule is the norm for state homicide statutes, “it has been effectively discarded through the adoption of special feticide statutes now in effect in

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143. Wood et al., *supra* note 142, at 379 tbl. 1.

144. Cohen & Sayeed, *supra* note 12, at 237.

145. See Aaron L. Mackler, *Jewish Perspectives on Abortion*, in DEFINING THE BEGINNING AND END OF LIFE, *supra* note 100, at 281, 284 (“No Jewish authority views the status of the fetus as fully equal to that of the mother, even at the end of gestation.”).

146. *Id.* As Regis notes, a “fetus ha[s] the *potential* of becoming an independent entity with the prospect of a full life in front of it . . . .” REGIS, *supra* note 5, at 163 (emphasis added).

147. FOLEY, *supra* note 1, at 13–26. The “born alive rule” does not recognize a “fetus as a distinct person under homicide law until the fetus [survives] the birthing process” and is biologically independent from the mother. *Id.* at 14.

most states.”<sup>148</sup> Nevertheless, a larger question remains—namely, can the existence of the entity, inside or outside a woman’s body, “be so significant that it marks the beginning of a new human life?”<sup>149</sup> For example, continuity may also be traced to a point during gestation where the human that is born may be classified as an individual entity—something that arguably occurs at the primitive streak stage—despite the fact that there is a biological and physiological dependence on the mother until birth.

Quickening has also been proposed as a defining moment for personhood.<sup>150</sup> The theory traces its roots to Thomas Aquinas, a Christian philosopher sometimes described as a “liberal” Catholic.<sup>151</sup> Aquinas argued that a fetus was unformed until quickening, which is the time when a pregnant woman first feels the fetus moving inside of her.<sup>152</sup> He believed that this occurred forty days after conception for males, and eighty days for females.<sup>153</sup> For Aquinas, to have an abortion before quickening was birth control, not homicide.<sup>154</sup> Quickening was also the point of gestation, under English common law, when abortion was a crime.<sup>155</sup>

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148. *Id.* at 29.

149. SINGER, *supra* note 1, at 101.

150. *Id.* at 87 (noting that during the middle ages Christian philosophers believed the soul to enter the fetus at quickening).

151. *Id.*

152. *Id.*

153. *Id.*

154. *Id.* It was not until the nineteenth century that the Roman Catholic Church began to widely adopt the view that abortion, from the time of conception, is a form of homicide. *Id.*

155. *Id.* at 88. Singer provides an informative historical overview of abortion rights:

Under English law, once a baby moved and, arguably, showed itself to be alive, abortion became illegal. *Id.* This changed in the nineteenth century when legislation in England and the United States made abortion a crime at any point after conception. *Id.* Physicians in the United States supported this move because they knew the irrelevance of the quickening stage in terms of fetus development. *Id.* This change in legislation was supported by the American Medical Association (AMA), which commenced a crusade against abortion. *Id.* During the AMA’s national convention in 1859, “delegates voted unanimously to protest the ‘unwarrantable destruction of human life’” and thereafter began to lobby state legislatures for stricter laws against abortion. *Id.* at 89. There was little opposition to the AMA’s position, and their efforts were successful. *Id.*

Laws prohibiting abortions at any stage were present in every state by the turn of the twentieth century. *Id.* Although the laws did not eliminate abortions, “[b]y 1950 American public opinion considered abortion ‘socially odious,’”

Arriving at a determination of the point at which human life begins does not answer the question of what rights ought to attach to human life and its developmental stages. For example, classifying birth as the commencement of human life does not imply that a zygote, embryo, or fetus should have rights subservient to the mother or another human being. Such rights could be linked to the relevant developmental category of life, regardless of whether the rights are categorized as human rights.

#### B. CESSATION OF THE ORGANISM-AS-A-WHOLE

The continuing existence of a person depends on the continued functioning of the organism-as-a-whole.<sup>156</sup> Though many

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and few called for re-legalization. *Id.* As Singer notes: "The changes in attitude to early abortions that occurred in the nineteenth century reflected a change in beliefs about when the life of the developing human being began, rather than about the fundamental view that, once alive, the innocent human being must not be killed." *Id.* at 89–90. In the 1960s, the drug thalidomide helped change the societal and legal view of abortion. *Id.* at 90. In many European countries, women were prescribed thalidomide as a sedative during pregnancy. *Id.* Children began to be born with strange abnormalities, such as flaps of skin for arms. *Id.* Once the link between the drug and the abnormalities was made, women who were pregnant and had taken thalidomide sought abortions. *Id.* at 90–91. The push to legalize abortions was strengthened by a Belgian woman's trial and acquittal after killing her infant, which was born with serious birth defects linked to the drug. *Id.* at 91. Meanwhile, in the United States, a woman named Sherri Finkbane, fearing that her unborn child would have a severe defect after using thalidomide during her pregnancy, unsuccessfully sought to have an abortion in Arizona, California, and New Jersey. *Id.* Finkbane was finally able to obtain an abortion in Sweden, which revealed the fetus to be deformed. *Id.* At the time, this event shed a new light on abortion, which began to be seen as not merely a choice between life and not life, but rather a matter of degree—"what kind of life under what kind of conditions." *Id.*

In addition to the thalidomide catastrophe, statistics on the number of women who died or were injured during illegal abortions galvanized public sympathy for the re-legalization of abortion. *Id.* "In 1967[,] the British parliament passed a law allowing abortion . . . performed by a medical practitioner to prevent 'risk of injury to the physical or mental health of the woman or of any of her existing children of the family greater than if the pregnancy were terminated'" or "if there was a substantial risk that the [unborn] child would be seriously handicapped" (this clause being influenced by the thalidomine tragedy). *Id.* at 91–92. By the time *Roe v. Wade* was decided in the United States, eighteen states had laws allowing abortions in a variety of circumstances, usually related to the woman's health, a high risk of abnormality, or if the pregnancy was the result of rape or incest. *Id.* at 92.

156. See Lynne Rudder Baker, *When Does a Person Begin?*, in DEFINING

consider the brain to be the most critical system, the body is highly dependent on multiple systems.<sup>157</sup> “The heart pumps blood . . . , the lungs provide intake of oxygen and output of carbon dioxide . . . , the intestines provide nutrition and hydration . . . , and the liver and kidneys detoxify ingested material and excrete . . . waste[.]”<sup>158</sup> Although the loss of one vital function may inevitably bring about death, it does not by itself constitute death, though interruption of any vital system for a period of time can result in the destruction of the organism-as-a-whole.<sup>159</sup>

Historically, death has been defined as irreversible loss of circulation, respiration, or brain function.<sup>160</sup> The creation of the ventilator drastically changed the notion of the meaning of death.<sup>161</sup> For those patients who needed only temporary support, this was a breakthrough technology.<sup>162</sup> For others, who were in irreversible comas or irreversibly unconscious states, the ventilator served to prolong “life” indefinitely.<sup>163</sup> Not only did this provide grief to the families of the patients, hospital administrators feared a scenario where wards would be full of patients in such states.<sup>164</sup>

As Peter Singer explains, the proliferation of organ trans-

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THE BEGINNING AND END OF LIFE, *supra* note 100, at 384, 397. As Singer notes, “if human life is of equal worth, whether it has the capacity for consciousness or not, why focus on the death of the brain, rather than on the death of the body as a whole?” SINGER, *supra* note 1, at 191.

157. Bernat, *supra* note 105, at 422.

158. *Id.*

159. *Id.*; Michael B. Green & Daniel Wikler, *Brain Death and Personal Identity*, in *DEFINING THE BEGINNING AND END OF LIFE*, *supra* note 100, at 507, 510. Vital signs can temporarily disappear, only to be restored later. REGIS, *supra* note, at 160. For example, there have been false declarations of death and premature burials. *Id.*

160. FOLEY, *supra* note 1, at 86–87.

161. The ventilator was developed by a Danish doctor during a worldwide polio epidemic in the 1950s. SINGER, *supra* note 1, at 22. Children who had contracted polio were dying because they were unable to breathe. *Id.* at 22–23. The doctor created a means of using air bags to pump oxygen into the lungs of the children. *Id.* at 23. This practice was able to prolong life, until one stopped pumping. *Id.* For a period of time, nurses and medical students pumped bags into the lungs of patients, which was successful in saving the lives of some patients. *Id.* Thereafter, a mechanical pump was attached to the air bag. *Id.*

162. *Id.*

163. *Id.*

164. *See id.* It is clear that use of technologies to support the body’s vital functions may prolong life, but the removal of, or refusal to use, such support is best defined as acknowledgement of the natural functioning of the organism-as-a-whole, rather than the hastening of death.

plantation as a means of saving patients, and generating income, served as the catalyst for a new definition of human death.<sup>165</sup> Soon after the first successful heart transplant, a procedure that was performed in South Africa, Harvard University established the Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death,<sup>166</sup> which later came to be known as the Harvard Brain Death Committee.<sup>167</sup> The committee's first report indicated that the current definition of death created a "controversy" about obtaining organs for transplantation.<sup>168</sup> The authors argued that death "is an arbitrary decision" and that their proposal—which defined death as an irreversible coma—had "life-saving potential."<sup>169</sup> In defining irreversible coma, however, the committee provided conflicting definitions including "permanent loss of intellect," "irreversible coma as a result of permanent brain damage," and "comatose individuals who have no discernible central nervous activity."<sup>170</sup>

Although brain death is generally seen as providing a more reliable criteria for death than cardiopulmonary criteria, there is significant disagreement as to what qualifies as a diagnosis of brain death.<sup>171</sup> Many patients diagnosed as brain dead have

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165. *Id.*

166. The committee included ten physicians, a lawyer, a historian, and a theologian. *Id.* at 24.

167. Prior to Dr. Barnard's successful heart transplant, Henry Beecher, who was chairman of a Harvard University committee that oversaw ethical issues arising from experiments on human subjects, wrote a letter to Robert Ebert, Dean of the Harvard Medical School, wherein he wrote that "Dr. Murray and I . . . think that the time has come for a further consideration of the definition of death. Every major hospital has patients stacked up waiting for suitable donors." *Id.* Notably, Ebert did not set up the ad hoc committee until after the successful heart transplant. *Id.*

168. *Id.* at 25. The first draft of the report was even more straightforward, and Dean Ebert suggested that the committee reword its report, which it did. *Id.* at 25–26.

169. *Id.* at 26.

170. *Id.* at 26–27. A report published in *Neurosurgery* in 1986 challenged some of the assumptions underlying the brain death definition. At the time, Japan did not recognize brain death as death of a human. Japanese scientists found that in patients whose brain had "died" lacked an antidiuretic hormone. After using an intravenous drip of the hormone to brain dead patients, the doctors found that patients lived, on average, an additional 23 days after death. *Id.* at 54.

171. Similar to the remarkable experience of Dr. Selzer, see *supra* note 10, is that of Mr. Cybulski:



the ability to breathe spontaneously and maintain a variety of reflexes in the esophagus and other areas.<sup>172</sup> In fact, it is generally accepted that the organism-as-a-whole can die though the entire body is not yet dead.<sup>173</sup> This idea is essential to the notion and ability to transplant live organs from dead patients—it is an explicit recognition that something in a patient remains alive despite the “death” of the patient. “Most startling is the way in which such bodies commonly react to incision during organ harvesting. The heartbeat quickens and the blood pressure rises rapidly. The reactions are often so extreme . . . that some hospitals” utilize general anesthesia during organ harvesting.<sup>174</sup>

Some argue that these bodily reactions do not demonstrate that a person is alive.<sup>175</sup> Others acknowledge that sections of the brain can remain active, but claim that these pockets of activity have no meaningful significance because “the brain-as-a-whole no longer exists as a functioning organ.”<sup>176</sup> Doctors in

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[D]octors in an Ottawa hospital had declared 79-year-old Mr. Cybulski to be brain dead, ten weeks after an emergency operation on his heart. The patient was about to be taken off life support and receive the last rites from a priest when, in response to his two-year-old grandson yelling at him from the door of his room, Mr. Cybulski, it was reported, sat up and stretched out his arms to the child. The patient was described as not only alive but exceedingly well one month after this incident. Apparently the doctors involved cannot account for this case; they confirm that the patient’s brain scans showed “almost” no activity, and their assumption was that he had suffered irreparable brain damage.

Lock, *supra* note 10, at 576.

172. There are documented reports of brain dead patients being kept alive for over three months. REGIS, *supra* note, at 164. In some instances, brain dead pregnant women have been kept alive for months in order to successfully deliver a baby. *Id.* Meanwhile, the patient lies in a hospital bed and, just like a “live” patient, produces urine, is capable of bowel elimination, and is surrounded by the entire range of instrumentality that would accompany a patient in an intensive care unit. *Id.*

173. C. Pallis, *Return to Elsinore*, 16 J. MED. ETHICS 10, 11 (1990).

174. FOLEY, *supra* note 1, at 104–05 (indicating that the use of fentanyl and Regitine aims to reduce potential pain and anxiety of the donor, and that the drugs may also hasten death); David A. Jones, *An Unfounded Diagnosis: Revisiting the Medical and Metaphysical Justifications of “Brain Death,”* in *DEFINING THE BEGINNING AND END OF LIFE*, *supra* note 100, at 446, 450. The wound bleeds just as if the patient were under another type of operation. Furthermore, during organ harvesting, the donor maintains a heartbeat, metabolic function, a breathing rate, a pulse, blood pressure, and temperature within the normal limits. REGIS, *supra* note, at 164.

175. Jones, *supra* note 174, at 450.

176. *Id.* at 450–51.

some countries are legally permitted to pronounce a patient as brain dead without observing the electrical activity of the brain, while others may rely on vague cognitive diagnoses for brain death.<sup>177</sup>

For instance, for one to be diagnosed as being in a persistent or permanent vegetative state, there must be some irreversible loss of consciousness or other cognitive functions. Since a determination that this loss is irreversible is not absolute, but rather based on probabilities, there is intense debate regarding who qualifies for such classifications, and disagreement as to whether the specified cognitive functioning is lost temporarily or irreversibly.<sup>178</sup> One recent study found that patients who were diagnosed as being in an irreversible “vegetative” state showed signs of full consciousness when tested with an electroencephalogram (EEG).<sup>179</sup> These findings underscore the fact that ambiguous demarcations are problematic when one is faced with a clinical decision in an individual case.<sup>180</sup>

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177. *Id.* at 449.

178. Lizza, *supra* note 100, at 15 n.2; Multi-Society Task Force on PVS, *Medical aspects of the persistent vegetative state: Parts 1 and 2*, 330 N. ENG. J. MED. 1499, 1501–1502 (1994). For example, in 2003, Terry Wallis regained consciousness spontaneously after nineteen years in an unconscious state. REGIS, *supra* note, at 161. A subsequent brain scan found that his brain has apparently grown a mass of new axons and nerve fibers. *Id.* In 2006, a British woman who was in an unconscious state was found to have brain responses only to certain words. *Id.* The widely-publicized cases of Karen Ann Quinlan, Nancy Cruzan, and Terri Shiavo all involved individuals who did not suffer whole brain death. FOLEY, *supra* note 1, at 118.

179. Damian Cruse et al., *Bedside Detection of Awareness in the Vegetative State: A Cohort Study*, 378 LANCET 2088, 2091 (2011).

180. *See, e.g.*, Green & Wikler, *supra* note 159, at 523. The tragic case of Rudy and Samuel Linares provides an apt example. In August of 1988, Mr. Linares ran furiously into a Chicago firehouse begging for medical assistance for his 6-month old son, Samuel, who had swallowed a balloon. Samuel’s eyes had dimmed and he became limp—by the time he arrived at the hospital, he had severe brain damage and had fallen into an irreversible coma. Although the physicians all agreed that the child could not recover from the coma, they kept him on life support for months. Given legal ambiguities as to when life support could be terminated, and who could make this determination, the hospital refused to remove the equipment. The Linares’s pleaded with the hospital; they were emotionally and economically unable to handle the prolonged death of their child. Finally, in April 1989, after nine months of “living” with an irreversible coma, Mr. Linares entered the hospital with a gun and removed the life support from his child. He then took his child into his arms and rocked him for thirty minutes as his child peacefully died in his arms. Once Samuel has passed away, Mr. Linares gave the police his gun and handed himself over. He was charged with first degree murder and brought before a

Since “nearly all brain inputs and outputs pass through the brain stem, and because the brain stem is the center for breathing, blood pressure control, and wakefulness,” some argue that the permanent cessation of its functioning equates to death.<sup>181</sup> However, the reliability of techniques that measure brain stem activity has been called into question.<sup>182</sup> Moreover, this definition fails to account for individuals with locked-in syndrome. Locked-in syndrome is “a state of preserved conscious awareness, but with paralysis so profound that evidence of the preserved awareness may be difficult to ascertain.”<sup>183</sup> For patients with locked-in syndrome, although the brain stem and other portions cease to function, portions of the brain responsible for cognition and consciousness remain intact.<sup>184</sup> This condition recently received considerable public attention due, in large part, to the experience of Jean-Dominique Bauby, the former editor-in-chief of *Elle* magazine, who suffered a massive stroke and lapsed into a coma.<sup>185</sup> Twenty days later, he awoke from his coma, but suffered from locked-in syndrome.<sup>186</sup> He retained the ability to blink one eye and, through use of the eye and an assistant, wrote a memoir of his experience titled *The Diving Bell and the Butterfly*, which later became an internationally-acclaimed film.<sup>187</sup>

In addition to humans with locked-in syndrome, thousands of anencephalic infants are born each year.<sup>188</sup> Anencephaly is a severe and uniformly fatal abnormality resulting in the congenital absence of a skull, scalp and forebrain.<sup>189</sup> At the time of

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grand jury. Dirk Johnson, *Questions of Law Live On After Father Helps Son Die*, N.Y. TIMES, May 7, 1989, at 26; see also SINGER, *supra* note 1, at 3. The grand jury refused to indict him, and the prosecutors subsequently dropped the case. During the pendency of the case, the prosecutor highlighted the “real gap’ that has developed between advances in medical science and the law governing medical responsibility.” Robert Davis, *Partee Says He Must Prosecute Father In Death of Comatose Son*, CHI. TRIB., May 14, 1989, at 2.

181. Bernat, *supra* note 105, at 424.

182. *Id.* at 425.

183. *Id.* at 424.

184. John P. Lizza, *On the Definition of Death*, in *DEFINING THE BEGINNING AND END OF LIFE*, *supra* note 100, at 533, 533–534.

185. PETER JOHN MCCULLAGH, *CONSCIOUS IN A VEGETATIVE STATE?: A CRITIQUE OF THE PVS CONCEPT* 183 (1st ed. 2004).

186. *Id.*

187. *Id.*

188. *Facts about Anencephaly*, CDC, <http://www.cdc.gov/ncbddd/birthdefects/Anencephaly.html> (last visited Feb. 9, 2012).

189. *Id.*

birth, there is no functional cortex but only a hemorrhagic mass of neurons and glia.<sup>190</sup> Although half of these infants are still-born and, of the other half, about ninety percent die within the first week, survival beyond a few weeks has been reported in a few instances.<sup>191</sup> A comprehensive definition of life and death must account for these states of existence.

Given the difficulty of doing so, some scholars have argued that “the true standard of death” is “the irreversible cessation of *all* brain functions.”<sup>192</sup> This definition, however, has not been widely adopted.<sup>193</sup> Furthermore, medical journals document over 150 cases of individuals who were declared “whole brain dead” who remained “alive” for weeks, months, and, in one instance, over fifteen years.<sup>194</sup> These patients “continued numerous bodily functions that are often associated with living organisms, including the metabolism of nutrition and excretion of waste, regulation of temperature, maintaining electrolyte balance, functioning immune response, continued growth, and the production of sperm and eggs.”<sup>195</sup>

More troubling is the process of decision-making; a majority of the top neurology departments in the United States do not require that a neurologist must make a determination of brain

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190. See Jean-Michael Guerit, *The Concept of Brain Death*, in BRAIN DEATH AND DISORDERS OF CONSCIOUSNESS 15, 19–20 (C. Machado and D. A. Shewmon, eds., 2004); S. Shinnar & J. Arras, *Ethical issues in the use of anencephalic infants as organ donors*, 7 NEUROLOGIC CLINICS 730, 730 (1989). In some anencephalic infants, the top of the skull may be missing above the eyebrows, and in its place may be a layer of skin. SINGER, *supra* note 1, at 38. In other cases the skull may be malformed or filled with fluid. *Id.* Other infants suffer catastrophic brain damage shortly after birth, such that they can never regain consciousness. *Id.* at 39. However, both types of infants may be kept alive for months or years. *Id.* Both may have a functioning brain stem, and thus the infant “may move their limbs, cough, sneeze, cry, and even appear to smile . . .” *Id.* at 39–40. Can we think of these infants as born dead?

191. Lizza, *supra* note 100, at 16 n.3. Peter Singer presents a challenging perspective: The heart of an anencephalic infant is a heart of a member of the species *Homo sapiens*, but the heart will not beat faster when the infant’s mother walks into the room because the infant cannot feel emotions of love or concern for anyone. The heart of a chimpanzee is not a heart of a member of the species *Homo sapiens*, but it is capable of relating to others, showing love and concern. In a sense, the heart of the chimpanzee is more human than the infant’s. SINGER, *supra* note 1, at 205.

192. BERNAT, CULVER & GERT, *supra* note 107, at 8 (emphasis added).

193. See *id.*

194. See FOLEY, *supra* note 1, at 125.

195. See *id.*

death, and the majority of states do not require a second opinion.<sup>196</sup> Nevertheless, the medical community generally agrees that ongoing biological activity in various cells or tissues is not sufficient to mark the presence of a living organism.<sup>197</sup> For example, in some patients with total brain failure, the body still “fight[s] infection, heal[s] wounds, and maintain[s] temperature.”<sup>198</sup> Whereas parts of the organism remain alive, the organism-as-a-whole arguably does not.

In the United States, the Uniform Definition of Death Act, which has been substantially adopted in all fifty states, defines death as *either* an “irreversible cessation of all functions of the entire brain, including the brain stem” *or* an “irreversible cessation of circulatory and respiratory functions.”<sup>199</sup> Although a determination of either permits organ harvesting, there is no consensus on how much time must elapse prior to a determination of death. The University of Pittsburgh maintains a two-minute protocol before declaring cardiopulmonary death, while the Denver Children’s Hospital requires a wait of seventy-five seconds before organ harvesting from children can take place.<sup>200</sup> Australian regulations require a wait of at least two minutes, but no more than five, while Canada recommends that physicians wait at least five minutes.<sup>201</sup> In the European Union, a ten-minute wait is required prior to organ harvesting.<sup>202</sup> Despite these protocols, resuscitation of cardiopulmonary function is possible for ten to fifteen minutes following the cessation of cardiac output.<sup>203</sup> However, there is no regulation or institutional policy that mandates a fifteen-minute wait prior to organ harvesting.<sup>204</sup>

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196. *See id.* at 129. Examples of improper determinations of brain death have been made, though they rarely receive much attention in the popular press. *Id.* at 127–129.

197. Those who support the whole brain death criteria note that the focus must be on brain function, not brain activity. *Id.* at 120.

198. The President’s Council of Bioethics, *Selections from Controversies in the Determination of Death: A White Paper*, in *DEFINING THE BEGINNING AND END OF LIFE*, *supra* note 100, at 551, 559.

199. FOLEY, *supra* note 1, at 120.

200. *Id.* at 90.

201. *Id.*

202. *Id.*

203. *Id.*

204. *Id.* at 91. One patient’s experience, from June 2008, is particularly notable:

A forty-five-year-old man had a heart attack and was rushed to the nearby hospital, where resuscitation efforts took place for ninety

Marking the point of death becomes particularly relevant when one seeks to determine the point at which organ harvesting can begin. Although societies have established various laws and practices surrounding dying and death, the event of death is a biological phenomenon that can be studied and described.<sup>205</sup> Accurately defining the moment of death is not only significant for the individual and the people close to the dying person, it has important implications for issues such as organ harvesting, when providers can stop treatment, and when payers can stop paying for treatment.

#### IV. CONCLUSION

While biomedical innovations have significantly enhanced the human condition, they have also challenged conventional notions of how we define human life.<sup>206</sup> It may be the case that

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minutes. He was declared dead using cardiopulmonary criteria, and preparations were begun for organ retrieval. He "came alive" in the operating room, and after a significant time in intensive care, fully recovered.

*Id.* at 94 (citing John Lichfield, *Dead Patient Comes Around as Organs are About to be Removed*, INDEPENDENT (London), June 12, 2008, at 30; *Dead Man Waking Shocks Doctors*, TORONTO SUN, June 11, 2008, at 34).

205. See Bernat, *supra* note 105, at 414.

206. Peter Singer perceptively summarized the issues more than a decade ago:

Like cosmology before Copernicus, the traditional doctrine of the sanctity of human life is today in deep trouble. Its defenders have responded, naturally enough, by trying to patch up the holes that keep appearing in it. They have redefined death so that they can remove beating hearts from warm, breathing bodies, and give them to others with better prospects, while telling themselves that they are only taking organs from a corpse. They have drawn a distinction between 'ordinary' and 'extraordinary' means of treatment, which allows them to persuade themselves that their decision to withdraw a respirator from a person in an irreversible coma has nothing to do with the patient's poor quality of life. They give terminally ill patients huge doses of morphine that they know will shorten their lives, but say that this is not euthanasia, because their declared intention is to relieve pain. They select severely disabled infants for 'non-treatment' and make sure they die, without thinking of themselves as killing them. By denying that an individual human being comes into existence before birth, the more flexible adherents of the sanctity of life doctrine are able to put the life, health, and well-being of a woman ahead of that of a fetus. Finally, by putting a taboo on comparisons between intellectually disabled human beings and nonhuman animals, they have preserved the species boundary as the boundary of the sanctity of life ethic, despite overwhelming evidence that the differences between us and other species are differences of degree rather than of kind.

humans are the only organism that can contemplate their own existence. Indeed, some have argued that the human capacity for self-definition may be viewed as one of the crowning achievements of our species.<sup>207</sup>

This faculty, however, comes with a price. The ability to determine who we include as part of us has an important moral dimension, and we must be mindful not to engage in ontological gerrymandering.<sup>208</sup> As history reveals, the capability has been frequently utilized as a tool to suppress the rights of minorities and indigenous peoples.<sup>209</sup> Although such historical malfeasance has often been discussed, the social, cultural, and historical depth of defining personhood has been insufficiently explored. In order to intelligently frame public policy in light of technological advancements,<sup>210</sup> legislators must closely exam-

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The patching could go on, but it is hard to see a long and beneficial future for an ethic as paradoxical, incoherent and dependent on pretence as our conventional ethic of life and death has become. New medical techniques, decisions in landmark legal cases and shifts of public opinion are constantly threatening to bring the whole edifice crashing down.

SINGER, *supra* note 1, at 188–89.

207. Taçon, *supra* note 35, at 66. Others posit that one of the few remaining features that is uniquely human is “the fact that we humans continue to be enthralled with our own intelligence . . . .” Trenton W. Holliday, *Comment on Henshilwood and Marean: The Origin of Modern Human Behavior*, 44 CURRENT ANTHROPOLOGY 639, 640 (2003); *see also* Savulescu, *supra* note 7, at 216 (“As human beings, we believe that being human has special significance . . .”).

208. *See* Green & Wikler, *supra* note 159, at 515 (discussing the difficulty of determining death and how that determination alters the behavior of others).

209. Lizza, *supra* note 100, at 12.

210. In addition to directly addressing the extent to which medical technologies may be utilized by individuals, defining who is encompassed by the term human impacts regulatory requirements of businesses. Each federal agency arrives at a value of human life and uses this value to determine a wide range of regulations that include restrictions on air pollution, the extent of warning labels on cigarettes, and stronger roofs on cars. *See* Binyamin Appelbaum, *A Life's Value, It May Depend on Agency*, N.Y. TIMES, Feb. 16, 2011, at A3. Federal guidelines permit a valuation between \$1 million and \$10 million per human life, though the Office of Management and Budget has indicated that figures under \$5 million “would be difficult to justify . . . .” *Id.* at A3. Under the Obama administration, agencies set values significantly higher than those under the Bush administration. *Id.* at A1. For example, the EPA now values human life at \$9.1 million, up from \$6.8 million during the Bush administration. *Id.* Similarly, the FDA values life at \$7.9 million, up from \$5 million in 2008. *Id.* Since these determinations are ultimately made by political appointees, the amounts invariably reflect the political agenda of the presiding administration. *Id.*

ine the question of how we define human life by methodically evaluating proposed definitions in light of verifiable scientific data.

The wisdom gained from the work of anthropologists, geneticists, embryologists, and medical researchers provides an important starting point for an interdisciplinary discussion of issues such as human origins, human nature, and human uniqueness. Though policy-makers must balance competing interests that are seemingly irreconcilable, this does not imply that we are incapable of making progress towards consensus. Progress requires critical reflection of personal beliefs coupled with a thorough understanding of the relevant disciplines, each placed in historical context. Whereas some scholars argue that we can handle relevant moral issues without settling the question of personhood, I think that today's moral issues can be more appropriately addressed if we first have undertaken a comprehensive exploration of what it means to be human.<sup>211</sup>

While this Article has undoubtedly raised more questions than it has answered, my goal has been to challenge the framework of how legal definitions of human are analyzed. To this end, the findings discussed herein highlight the value and limitations of various disciplines. A review of the anthropological record reveals clues as to the origins and characteristics of *Homo sapiens*, though the record does not provide us with a definitive statement as to who qualifies as human. Genetics guides our awareness of the evolution of mankind and the differences between species, yet fails to delineate the significance of genetic variation and demarcate precisely where one species ends and another begins. Medicine provides us with a window into fetal development and end of life issues, but fails to identify the normative status of where each life begins and ends. While current scientific knowledge may not provide us with an unambiguous legal definition of human life, critically analyzing objective characteristics facilitates an informed dialogue.<sup>212</sup>

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211. As Darwin observes:

It has often and confidently been asserted, that man's origin can never be known; but ignorance more frequently begets confidence than does knowledge; it is those who know little, and not those who know much, who so positively assert that this or that problem will never be solved by science.

CHARLES DARWIN, *THE DESCENT OF MAN, AND SELECTION IN RELATION TO SEX* 2 (2d ed. 1882).

212. In the end, arriving at a legal definition of human may not be the best



And thus we find ourselves in the unique position of not only determining the genesis of our own species, but also the parameters of inclusion into our select club. In order to facilitate a nuanced analysis of defining when human life begins, we must be mindful to separate the question of personhood from the moral and legal obligations owed to each individual. Elucidating a clear vision of what it means to be human permits resolution of important legal, ethical and regulatory issues, and helps guide one's vision of life and well-being.

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way to regulate the use of biomedical advancements. As Arthur Caplan argues, “[w]hat we must do is take each proposed enhancement technology under consideration and decide whether what it can do is worth whatever price it might exact.” Arthur L. Caplan, *Good, Better, or Best?*, in *HUMAN ENHANCEMENT*, *supra* note, at 199, 208; see Nick Bostrom & Julian Savulescu, *Introduction*, in *HUMAN ENHANCEMENT*, *supra* note, at 19 (“Whether we should employ a particular enhancement depends on the reasons for and against that particular enhancement.”); see also Clive Gamble, *Comment on Henshilwood and Marean: The Origin of Modern Human Behavior*, 44 *CURRENT ANTHROPOLOGY* 638, 639 (2003) (noting that, in the field of archaeology, “grand narratives are currently on hold, universal statements should be treated with caution, and local rather than global is currently king”).