

Comments

Presumed Sapient: A Proposed Test for the Constitutional Personhood and Patentability of Human-Animal Chimeras and Hybrids

By ERIC ZYLSTRA*

Introduction

RECENTLY, IN *Association for Molecular Pathology v. USPTO*, a divided Federal Circuit panel split over whether isolated, naturally occurring genes were patentable even if their purified and commercially useful forms were not found in nature.¹ In attempting to limit the patentability of inventions derived from natural sources, the plaintiffs pitted the constitutional requirement for invention against the established scope of statutory subject matter for patents.² Although the categories of statutory subject matter for patents are interpreted broadly, they are

* J.D. Candidate 2013, University of San Francisco School of Law; Student Associate, Kilpatrick Townsend & Stockton LLP; Ph.D. 1998, University of California, Berkeley; S.B., S.B., 1992 Massachusetts Institute of Technology. The opinions and arguments presented here do not represent the official position of Kilpatrick Townsend & Stockton LLP. I thank Gary Loeb, Michael Dergosits, Annette Parent, Gordon Kwan, Scott Ito, Philip Tsai, Becca Casterline, and Janelle Smith for their helpful comments on previous drafts; and Todd Ostomel, Oleg Stolyar, and Mark Hopkins for useful questions forcing me to develop aspects of this proposed test. Naturally, any errors or defects remaining in this article are my fault, not theirs. Finally, and most importantly, I thank Samantha, Liam (William), Sebastian, and Miriya, for their support and patience as I wrote.

1. *Ass'n for Molecular Pathology v. USPTO*, 653 F.3d 1329, 1333, 1351 (Fed. Cir. 2011). By a two-to-one margin, the panel held that at least isolated segments of naturally occurring genes were patentable, but the two judges who concurred on this point advanced different rationales for their holding. *See id.* at 1333, 1351, 1361, 1366; Tony Dutra, *Patent Community Sees Post-Myriad Issues; Expects Either En Banc or High Court Review*, 82 PAT. TRADEMARK & COPYRIGHT J. (BNA) 452 (2011).

2. *See Ass'n for Molecular Pathology*, 653 F.3d at 1349. *See generally* Oskar Liivak, *The Forgotten Originality Requirement: A Constitutional Hurdle for Gene Patents*, 87 J. PAT. & TRADEMARK OFF. SOC'Y 261 (2005) (arguing that the Patent and Copyright Clause's mandate to

founded on—and bounded by—the Constitution’s Patent and Copyright Clause, which gives Congress legislative authority to protect the rights of “authors and inventors.”³ But the Patent and Copyright Clause’s positive grant of authority is not the only constitutional provision that limits the scope of patentability. This Comment explores how the Thirteenth Amendment’s prohibition of slavery and involuntary servitude constrains the patentability of genetically engineered organisms that combine human and animal genes, cells, or embryos.

What legal test should be applied for determining whether human-animal chimeras and hybrids are patentable?⁴ The question requires us to weigh an opportunity for advancing human knowledge and improving human health against a risk of creating a new, genetically based indentured servitude. Under the stated policy of the U.S. Patent and Trademark Office (“USPTO”), at least some human-animal chimeras are not patentable subject matter *per se*,⁵ but neither

protect the rights of inventors creates a constitutional originality requirement that bars patents on naturally occurring gene sequences).

3. U.S. CONST. art. I, § 8, cl. 8.

4. To be patentable, an invention must meet federal statutory criteria that include statutory subject matter, utility, novelty, nonobviousness, enablement, written description, and best mode. 35 U.S.C. §§ 101–103, 112 (2006). This Comment focuses on the criterion of statutory subject matter (§ 101) because I view it as the stronger of the two rationales that the USPTO has offered for its prohibition against patenting humans or excessively humanlike chimeras. *Animals—Patentability*, 1077 OFF. GAZ. PAT. & TRADEMARK OFFICE 24 (Apr. 7, 1987), available at <http://www.uspto.gov/web/patents/patog/week53/OG/TOCCN/item-115.htm> (setting forth the statutory subject matter rationale: “A claim directed to or including within its scope a human being will not be considered to be patentable subject matter under 35 U.S.C. § 101. The grant of a limited, but exclusive property right in a human being is prohibited by the Constitution.”).

In 2011, the Leahy-Smith America Invents Act (“AIA”) explicitly prohibited the grant of new patent claims “directed to or encompassing a human organism.” Pub. L. No. 112-29, § 33, 125 Stat. 288, 340 (2011) (barring patent claims to human organisms but applying the bar only to patents issued after the law’s enactment). The AIA apparently codified the previous USPTO policy, but by restricting the law’s scope to future patents, its enactors sidestepped the question of whether the USPTO’s rationales were legally correct. Since the AIA’s passage, the USPTO has instructed examiners to reject “claim[s] directed to or encompassing a human organism” under both the AIA and 35 U.S.C. § 101, stating that this provision of the AIA “does not change existing law or long-standing USPTO policy that a claim encompassing a human being is not patentable.” Memorandum from Robert W. Bahr, Senior Patent Counsel, Office of the Deputy Comm’r for Patent Examination Policy, to Patent Examining Corps (Sept. 20, 2011), available at http://www.uspto.gov/aia_implementation/human-organism-memo.pdf (instructing patent examiners how to apply the AIA prohibition). But the USPTO’s memorandum cited its 1987 policy statement without further explaining its legal basis under § 101. *Id.*

5. Press Release, USPTO, Media Advisory 98-6: Facts on Patenting Life Forms Having a Relationship to Humans (Apr. 1, 1998) [hereinafter USPTO Media Advisory 98-6], available at <http://www.uspto.gov/news/pr/1998/98-06.jsp>. The 1998 statement set forth the USPTO’s other rationale, moral utility: “It is the position of the PTO that inventions di-

the policy's rationale nor its limits have been described in detail.⁶ To describe and to justify such a policy of limited patentability, this Comment proposes a patentability standard for human-animal chimeras and hybrids, or fusions, based on an analysis of their legal personhood under the U.S. Constitution.⁷

Just as animal research has already advanced our knowledge of biology, research on genetically engineered human-animal fusions promises to advance our knowledge of human biology. Many of the arguments supporting animal experimentation also support experimentation with human-animal fusions especially because such creatures would likely have advantages over currently used animal research subjects.⁸ Using research subjects with selected and controllable human biological characteristics could allow scientists to isolate and to analyze the roles of distinctively human genes, organs, or biological subsystems. When it was necessary for understanding these human characteristics, researchers could attempt dangerous or invasive experiments not ethically permissible on humans.

The most enticing fruit of this knowledge would be more reliable and more efficient medical research.⁹ For example, using more humanlike research subjects should reduce the rate of false positives and negatives in drug development. The legal requirements to use

rected to human/non-human chimera could, under certain circumstances, not be patentable because, among other things, they would fail to meet the public policy and morality aspects of the utility requirement." *Id.* The utility requirement finds textual support in the Patent and Copyright Clause's mandate to encourage the "useful arts." U.S. CONST. art. I, § 8, cl. 8 (emphasis added); 35 U.S.C. § 101; *see also supra* note 4.

6. A search of "chimera" on the USPTO website provided no more detailed official statements. U.S. PAT. & TRADEMARK OFF., <http://www.uspto.gov> (search "Search our site" for "chimera") (last visited Mar. 4, 2012).

7. All the patentability criteria have been met for at least some patents claiming genetically engineered human-animal hybrids. *See, e.g.*, U.S. Patent No. 7,745,688 col. 209 ll. 35-42 (filed June 20, 2007). Therefore, a substantially humanlike chimera or hybrid could presumably also meet all the statutory requirements for patentability if its patentability were not barred by constitutional limits to § 101. *See, e.g.*, Ryan Haggglund, *Patentability of Human-Animal Chimeras*, 25 SANTA CLARA COMPUTER & HIGH TECH. L.J. 51, 97-102 (2009) (discussing the likely novelty and nonobviousness of some human-animal chimeras).

8. Although colorable arguments against animal experimentation exist, addressing them is outside this Comment's scope. Instead, this Comment assumes what I take to be the currently governing legal standard in human relations to animals. Some practices are prohibited as gratuitously cruel, such as dog-fighting or recreational torture of cats. But other practices that cause pain to animals, such as some forms of food production or scientific experimentation, are permitted or even required.

9. *See, e.g.*, Carrie F. Walter, Note, *Beyond the Harvard Mouse: Current Patent Practice and the Necessity of Clear Guidelines in Biotechnology Patent Law*, 73 IND. L.J. 1025, 1029-31 (1998) (discussing the possible medical advantages of transgenic animals with human genes).

animal models in early-phase drug research¹⁰ mean that some drugs that are effective only in the animal models could advance to later, more expensive phases of drug discovery before their rejection. Worse still, beneficial drugs can be wrongly eliminated from consideration because of idiosyncratic side effects specific to a nonhuman model. Animal models with a more human physiology should respond more similarly to humans and prevent many of these costly errors.

But this attractive prospect of scientific and medical advancement has an associated risk. Unless human-animal fusions were treated as animals, their advantages over consenting human subjects would be removed. As an engineered animal received more human cells or genes, however, it would acquire more humanlike characteristics. If a human-animal fusion became substantially equivalent to a human but was wrongly categorized as a nonperson, this would yield horrific results.¹¹ For example, animal research trials sometimes require animal sacrifice: the killing of animal subjects at the trial's end to evaluate

10. See *Investigational New Drug (IND) Application*, U.S. FOOD & DRUG ADMIN., <http://www.fda.gov/Drugs/DevelopmentApprovalProcess/HowDrugsareDevelopedandApproved/ApprovalApplications/InvestigationalNewDrugINDApplication/default.htm> (last visited Apr. 23, 2012) (describing the U.S. administrative requirements for marketing a new drug, which include animal testing).

11. This argument relies on the premises that nonconsensual medical experimentation on persons is a grave harm and that the law should prohibit this harm. But at least one commentator has proposed that in some borderline cases, the moral status of a human-animal chimera may be indeterminate. Robert Streiffer, *Chimeras, Moral Status, and Public Policy: Implications of the Abortion Debate for Public Policy on Human/Nonhuman Chimera Research*, 38 J.L. MED. & ETHICS 238, 242–44 (2010). In such cases, nonconsensual experimentation should be prohibited as overly risky. The possible harm—nonconsensual, possibly fatal medical experimentation on a humanlike creature—is great, which makes its effective weight greater (i.e., a greater expected mean value, or the harm weighed by the probability of its occurrence). And regardless of any skepticism about the validity of moral harm as a legal justification, the harm is not solely moral to the experimental subject, who may experience intense pain, disfigurement, or death. Many statutory and administrative restrictions or legal presumptions are imposed not because of definite, proven harms for each individual case, but because of the greater incidence of harm if the behavior were unregulated (e.g., required warnings for rare, but serious side effects of prescription drugs; the prohibition of drunk driving). If the status of a chimera were impossible to establish with certainty, a presumption against a possibly great harm is prudence, not timidity. See *id.* at 244 (asserting that “invasive, painful, and lethal experiments” are inappropriate for borderline cases); cf. Francis J. Beckwith, *When You Come to a Fork in the Road, Take It?: Abortion, Personhood, and the Jurisprudence of Neutrality*, 45 J. CHURCH & ST. 485, 493 (2003) (criticizing an argument for abortion rights when the status of the fetus is indefinite). Note that unlike the analogous argument against abortion rights, restrictions on medical experimentation do not limit any person's decision whether to reproduce, which weakens the argument against them. See Streiffer, *supra*, at 247.

their physical condition or to end suffering caused by the trial.¹² Although this may be permissible treatment for rats, a similar research protocol applied to near-humans would justly trouble many people, for the line between human researchers and their nonperson research subjects would increasingly become arbitrary.

How would the right to patent human-animal fusions matter in determining what kinds of human-animal experimentation were possible? In general, patents provide an incentive for applied scientific research in the patentable area.¹³ The right to exclude provided by patents¹⁴ can deter third-party free riders from using a patented technical innovation without direct benefit to the innovator.¹⁵ This is often a prerequisite for substantial corporate investment in a technology.¹⁶ Further, because patents require a written description showing others how to make and use the invention,¹⁷ the patents' publication would disseminate knowledge regarding how to make human-animal fusions, which would encourage and assist other such research.

But perhaps most importantly, a particular thing's patentability imputes at least two aspects of property to it. If a human-animal fusion were patented, the patent owner, or patentee, would have a right to prevent others from interacting with the patented creature in ways that would infringe the patent. Thus, the patent right to exclude also would be a right to prevent certain actions that the creature could otherwise perform. And this right to constrain actions could be freely alienated, or transferred, to another person through a sale of the patent. These qualities—the right to exclude and the right to alienate—are among those typically associated with a property owner's control

12. See INST. FOR LAB. ANIMAL RESEARCH, NAT'L ACADS., GUIDE FOR THE CARE AND USE OF LABORATORY ANIMALS 27–28, 123–24 (8th ed. 2011), available at http://www.nap.edu/openbook.php?record_id=12910 (providing guidelines for the euthanasia of animal subjects at protocol-specific endpoints or to relieve pain or distress).

13. F. SCOTT KIEFF ET AL., PRINCIPLES OF PATENT LAW 66–71 & n.157 (5th ed. 2011) (discussing the economic incentives that patents in theory provide). The Patent and Copyright Clause explicitly states that its purpose is “[t]o promote the Progress of Science and useful Arts.” U.S. CONST. art. I, § 8, cl. 8.

14. 35 U.S.C. § 154(a)(1) (2006); KIEFF ET AL., *supra* note 13, at 3–4 (discussing the right to exclude that a patent confers).

15. KIEFF ET AL., *supra* note 13, at 62–63 (discussing the inventor's paradox and the free-rider problem for inventions).

16. *Id.* at 68–70 (discussing the patent's economic incentive to commercialize an invention).

17. 35 U.S.C. § 112 (2006) (providing the statutory basis for the enablement requirement, which mandates that a patent discloses how to make and use its claimed inventions).

over property.¹⁸ Whether a creature is property under the control of others will affect the likelihood and extent of experimentation performed upon it: an owner need not ask property for its consent.

To avoid this harm, this Comment sets forth a proposed test for fusion organisms' patentability: the source-dependent presumption of humanity. For individual organisms that formerly were biologically human, the presumption would be nonrebuttable, and they would receive the same legal status as humans at the same developmental stage. Once recognized as a legal person, no organism would have its status as a person stripped away.¹⁹ For individual nonhuman organisms incorporating some human genetic material,²⁰ the presumption of humanity would be rebuttable. This would allow patenting and legal ownership of human-animal fusion organisms if their inventors

18. See ROGER A. CUNNINGHAM ET AL., *THE LAW OF PROPERTY* 1–6 (2d ed. 1993) (discussing the concept and elements of property); JESSE DUKEMINIER ET AL., *PROPERTY* 81 (6th ed. 2006) (listing property's "bundle" of rights as including rights to possess, to use, to exclude, and to transfer).

19. More precisely, no legal rights could be taken away except by processes that would also apply to unmodified human beings: the test is not intended to give fusion organisms more rights than standard humans. Thus, if a fusion-organism person were convicted of a crime, it could be imprisoned whenever an analogous human criminal could be. And when a fusion-organism person died, its legal personhood would be extinguished at death analogously to a human's, leaving only a few, residual rights, such as its decedent's rights under estate law.

20. Here, "human genetic material" indicates synthesized genes or artificial cells incorporating substantially the same genetic information as a human organism, as well as any cells, cell lines, or genes originally taken from a human organism. Either specific human genetic content or use of a human cell source would meet the threshold to trigger the test. This would prevent attempts to circumvent the standard through use of "copied" human biological materials duplicated by biotechnological techniques but substantially identical in function to the "original" materials. For example, a cloned cell created with an artificially produced copy of a parent human organism's genome would count as human genetic material.

A possible objection to a genetic standard is the complaint that reducing human personhood to a genetic description would provide inadequate protection for embryo experimental subjects or for near-humans with human qualities but a different genetic code. See, e.g., Nora O'Callaghan, *Human Origin and Human Rights in the Genome Age*, 3 *AVE MARIA L. REV.* 123, 124 (2005) (criticizing genetic reductionism as providing inadequate support for human rights). Under the standard for personhood proposed in Part IV, though a genetically engineered creature's gene sequence is not always determinative, it does influence the standard for identifying the creature's legal status.

But as a part of a test setting identifiable limits to patentability, a genetic description should provide some advantages. Given the associated fields of biological science necessary to make a human-animal fusion, any patent claiming such a creature will very likely describe it in biological or genetic terms. See, e.g., U.S. Patent No. 7,745,688 col. 209 ll. 35–42 (filed June 20, 2007) (describing a genetically engineered mouse that produces a human protein implicated in Alzheimer's disease). Thus, any proposed guidelines to patentability that were expressed in these terms would be more easily applied.

could show that their inventions were substantially dissimilar to human persons. For nonhuman organisms incorporating no human genetic material, but with humanlike characteristics, no presumption of humanity would apply. Their legal personhood would be assessed based on their capabilities.²¹

Part I of this Comment describes the types of human-animal fusions and summarizes the history of the USPTO's changing attitude toward patenting living things. Part II discusses the law interpreting the Thirteenth Amendment's prohibition of slavery and involuntary servitude, while Part III shows why this amendment would also prohibit patent rights in a legal person. Part IV sets forth a proposed standard for identifying when a human-animal fusion would qualify as a legal person. Part V discusses some possible difficulties with the test in practice and how these difficulties could be overcome.

I. Background: Human-Animal Fusions at the USPTO

To provide the starting point for its argument, this Comment will first define what it means by the terms human-animal chimeras, hybrids, and fusions. And to provide the historical context for its test, it will then trace the evolution of the USPTO's policy on patenting living things.

A. Defining Human-Animal Chimeras, Hybrids, and Fusions

Organisms that are combinations of different species are broadly classifiable as chimera or hybrids.²² A chimera is an organism that in-

21. Despite its title, this presumption of humanity need not always be restricted to humanity but should be extended to other species—or even artificially created subspecies—in which the individual members typically met the threshold tests for legal personhood as discussed in Part IV. The presumption's purpose is to provide greater protection to the biological group most likely to contain individuals with the relevant capacities characteristic of human legal persons. Currently, humans are the only group known to meet this standard. If another species or subspecies showed a high proportion of individuals meeting the test for personhood, however, that group should also qualify for the presumption. See, e.g., Michael D. Rivard, Comment, *Toward a General Theory of Constitutional Personhood: A Theory of Constitutional Personhood for Transgenic Humanoid Species*, 39 UCLA L. REV. 1425, 1496–97 (1992) (setting forth a scheme for classifying the default personhood of nonhuman species based on their members' average level of self-awareness).

22. See Neville Cobbe & Valerie Wilson, *Creation of Human-Animal Entities for Translational Stem Cell Research: Scientific Explanation of Issues That Are Often Confused*, in TRANSLATIONAL STEM CELL RESEARCH: ISSUES BEYOND THE DEBATE ON THE MORAL STATUS OF THE HUMAN EMBRYO 169, 170 (Kristina Hug & Göran Hermerén eds., 2011) (describing the broad classes of chimera and “subcellular mixtures”). Their more detailed taxonomy for interspecies organisms includes interspecies chimeras; transplant recipient chimeras; inter-

cludes somatic, or nonreproductive, cells from two or more different creatures.²³ Unlike a typical creature, which contains substantially the same genetic code in each of its cells,²⁴ a chimera has at least two genetically different, coexisting sets of cells, each with genes from only one progenitor creature.²⁵ A chimera would not breed true—produce offspring with the same phenotype, or expressed trait—because any particular reproductive cell would only contain genetic information from its individual progenitor.²⁶ One example of a chimera is the

species hybrids, which are produced by the fusion of gametes (i.e., a sperm and an egg); somatic cell hybrids, which are produced by the fusion of non-gamete cells; cybrids, which are produced by the transplantation of a cell's nucleus into another cell's cytoplasm; and transgenic animals, which incorporate a gene or genes from another species into their cells. See *id.* at 170–76.

23. *Id.* at 170 (defining the term “chimera”); see also Jason Scott Robert, *Regulating the Creation of Novel Beings*, HEALTH L. REV., Winter 2002, at 14, 14 (discussing proposed Canadian legal definitions of “chimera” and “hybrid” embryos). This distinction between somatic cells and gametes, or reproductive cells, distinguishes chimeras from hybrids produced by the fusion of gametes from different progenitor species.

24. A typical creature only has substantially the same genetic code in all its cells because of mutations in individual cells acquired as the creature ages or is exposed to mutagens. See *How Genes Cause Cancer*, STANFORD MED. CLINICAL CANCER CENTER, <http://cancer.stanford.edu/information/geneticsAndCancer/genesCause.html> (last visited Aug. 11, 2011) (describing how the gradual mutation of cells produces cancer). These effects can be clinically important in causing cancer but are different from the more controlled and more systemic variation of a chimera. See *id.*

25. This Comment primarily considers chimera incorporating genetic material from individuals of different species, as a human/human chimera would presumably have human capabilities. For example, a blood transfusion recipient would be a human/human chimera until the transfused, genetically different blood cells were replaced through normal physiological processes. Human/human chimera without noticeable abnormalities can occur naturally. Neng Yu et al., *Disputed Maternity Leading to Identification of Tetragametic Chimerism*, 346 NEW ENG. J. MED. 1545, 1545 (2002), available at <http://www.nejm.org/doi/pdf/10.1056/NEJMoa013452> (describing a naturally chimeric woman).

26. This raises one important difference between chimeras and hybrids: the genetic characteristics of their offspring. Because a chimera includes cells from different progenitors, the genetic identity of its offspring would depend on the individual cells incorporated into its reproductive system. See *id.* at 1550–51 (describing a human/human chimera with children derived from each progenitor's cells). For a hypothetical intraspecies example, a fertile male geep—or goat-sheep chimera—with testes derived from goat progenitor cells would produce full goat offspring with a female goat. See *It's a Geep*, TIME, Feb. 27, 1984, at 69 (referring to the goat-sheep chimera as a “geep”). In contrast, if a hybrid goat-sheep containing goat and sheep genes could interbreed with a goat, its offspring would be a new, more goatish hybrid—a goap.

This difference, however, would mean that two fertile human-animal chimeras might produce a genetically all-human child, which would make a chimera's offspring even more likely to create legal and ethical problems than a hybrid's. Perhaps for this reason, the National Academy of Sciences has cautioned against allowing human-animal chimeras to reproduce if the modifications could affect their reproduction. HUMAN EMBRYONIC STEM CELL RESEARCH ADVISORY COMM., NAT'L ACADS., FINAL REPORT OF THE NATIONAL ACADEMIES' HUMAN EMBRYONIC STEM CELL RESEARCH ADVISORY COMMITTEE AND 2010 AMENDMENTS

“geep,” a goat-sheep fusion that was created by combining early stage goat and sheep embryos.²⁷ When the combined embryo survived the process, it developed into an animal having both goat and sheep cells integrated into its body.²⁸

Thus, a human-animal chimera is an organism that incorporates both human and nonhuman cells. Xenotransplantation recipients, such as humans with replacement heart valves from pigs, are human-animal chimeras by this definition.²⁹ For more difficult cases, the human component of a human-animal chimera might be a human embryo or human embryonic cells taken soon after fertilization. The nonhuman chimera component might be an animal embryo, animal embryonic cells, or perhaps an artificial cell incorporating some non-human genes.³⁰ Such chimeras could be created for research or perhaps even for therapy if the animal cells could suppress the expression, or gene-directed manifestation, of a hereditary disease in a developing human embryo.

In contrast to a chimera, a hybrid is an organism that has substantially the same genetic code in all of its cells, but its genetic code includes genes from at least two species.³¹ One very old example is the

TO THE NATIONAL ACADEMIES' GUIDELINES FOR HUMAN EMBRYONIC STEM CELL RESEARCH app. C § 7.5 (2010), available at http://www.nap.edu/openbook.php?record_id=12923 [hereinafter NAT'L ACADS., FINAL REPORT].

27. Carole B. Fehilly et al., *Intraspecific Chimaerism Between Sheep and Goat*, 307 NATURE 634, 634 (1984); *It's a Geep*, *supra* note 26, at 71.

28. Fehilly, *supra* note 27, at 634. The combined embryo frequently did not survive. *See id.* at 636.

29. Cobbe & Wilson, *supra* note 22, at 177 (defining xenotransplants as “grafts of animal cells or tissue into postnatal humans”). By this definition, at least one human-animal chimera has served in the U.S. Senate: the late Senator Jesse Helms, whose replacement heart valve was from a pig. *See Jesse Helms Stable After Surgery*, CBSNEWS (Mar. 5, 2009), http://www.cbsnews.com/2100-250_162-507219.html (describing the late Sen. Helms' second heart valve xenotransplantation). Human xenotransplantation recipients are a useful test case for any proposed limit—or lack of limit—to the patentability of human-animal fusions. *But see* Lauren Cirlin, Comment, *Human or Animal: A Resolution to the Biotechnological Blurring of the Lines*, 32 SW. U. L. REV. 501, 508 (2003) (“[A] human cannot contain animal parts.”).

30. The first artificial cell has already been created. Daniel G. Gibson et al., *Creation of a Bacterial Cell Controlled by a Chemically Synthesized Genome*, 329 SCIENCE 52 (2010), available at <http://www.sciencemag.org/content/329/5987/52.full>; Ewen Callaway, *Immaculate Creation: Birth of the First Synthetic Cell*, NEW SCIENTIST (May 20, 2010), <http://www.newscientist.com/article/dn18942-immaculate-creation-birth-of-the-first-synthetic-cell.html>. A hybrid could also be created with a new gene designed and constructed *de novo* by humans.

31. *See* Cobbe & Wilson, *supra* note 22, at 170–72 (distinguishing between chimera and “subcellular mixtures” and describing various types of hybrids); *see also* Robert, *supra* note 23, at 14 (discussing proposed Canadian legal definition of “chimera” and “hybrid” embryos).

mule, a hybrid created by breeding a male donkey with a female horse.³² A more technologically demanding example of a hybrid is the Harvard oncomouse (or OncoMouse®), a mouse genetically engineered to incorporate an animal or human oncogene into its cells to provide an animal model for cancer research.³³ Unlike a chimera, a fertile hybrid could transfer some of its modified genes to its descendants through normal reproduction.³⁴ Although human-animal chimera and hybrids are biologically distinguishable, they raise similar legal problems. For brevity, this Comment will use the portmanteau term “human-animal fusion” or “fusion organism” to refer collectively to both human-animal chimeras and hybrids.

B. A (Very) Brief History of Patentable Life

As the biological sciences have advanced, the area of patentable subject matter has expanded to encompass living things.³⁵ During the nineteenth century, the USPTO viewed animals and plants as products of nature, and as such, unpatentable.³⁶ Even human-directed processes like plant breeding were not viewed as creating a patentable invention, perhaps because of difficulties in reliably duplicating a living invention or in fully describing its nature.³⁷ This policy, however,

32. Cobbe & Wilson, *supra* note 22, at 173. More exotic hybrids include the liger, which is produced by breeding a lion with a tigress. *Id.*

33. U.S. Patent No. 4,736,866 col. 2 ll. 15–21, col. 3 ll. 16–19 (filed June 22, 1984) (describing and claiming the Harvard oncomouse); *see also* Kevin E. Noonan, *Re-examination Ordered on “Expired” Harvard Oncomouse Patent*, PAT. DOCS (June 11, 2010, 6:49 AM), <http://www.patentdocs.org/2010/06/reexamination-ordered-on-expired-harvard-oncomouse-patent.html> (citing the three patents of the oncomouse patent family).

34. *See* Cobbe & Wilson, *supra* note 22, at 172. Often, hybrids produced by interspecies sexual reproduction are infertile because of genetic incompatibilities between the two parents. *See* Norman A. Johnson, *Hybrid Incompatibility and Speciation*, SCITABLE (2008), <http://www.nature.com/scitable/topicpage/hybrid-incompatibility-and-speciation-820>.

35. *See generally, e.g.*, Hagglund, *supra* note 7, at 58–74 (providing a detailed historical review of the patentability of living things); Thomas A. Magnani, *The Patentability of Human-Animal Chimeras*, 14 BERKELEY TECH. L.J. 443, 443–48 (1999) (discussing pre-1999 animal and chimera patents); Linda J. Demaine & Aaron Xavier Fellmeth, *Reinventing the Double Helix: A Novel and Nonobvious Reconceptualization of the Biotechnology Patent*, 55 STAN. L. REV. 303, 313–21 (2002) (discussing the history of biotechnology patents, including chimera patents); Brianna Dolmage, Note, *The Evolution of Patentable Subject Matter in the United States*, 27 WHITTIER L. REV. 1023 (2006) (discussing the expansion of patentable subject matter in response to technological advancement).

36. *See, e.g.*, *Diamond v. Chakrabarty*, 447 U.S. 303, 311 (1980) (discussing the USPTO’s pre-1930 reluctance to grant patents on plants).

37. *See id.* at 311–12.

was not uniformly applied: in 1873, Louis Pasteur received a U.S. patent on purified yeast.³⁸

After advances in genetics were more systemically applied to plant breeding, Congress created a new class of patents that explicitly provided patent protection for plant life. Under the 1930 Plant Patent Act, new breeds of plants were patentable if their phenotype, or displayed traits, could be preserved by asexual reproduction.³⁹ In 1970, the Plant Variety Protection Act created certificates providing patent-like protection to new varieties of sexually reproduced plants.⁴⁰

However, the general patentability of nonplant organisms remained uncertain. Despite Pasteur's patent on yeast, neither plant patent statute had specifically included microorganisms as patentable.⁴¹ Furthermore, a 1948 attempt to patent non-naturally occurring mixtures of soil-enriching bacteria was rejected for trying to claim the inherent properties of nature.⁴² If legislative action were necessary to

38. U.S. Patent No. 141,072, claim 2 (filed May 9, 1873) (claiming “[y]east, free from organic germs of disease, as an article of manufacture”); *Chakrabarty*, 447 U.S. at 314 & n.9 (citing Pasteur's patent for yeast as evidence that the USPTO had issued previous “patents on bacteria”). Here, *Chakrabarty's* use of terminology was mistaken—yeast are not bacteria—but the Pasteur patent still did provide a relevant precedent for the patentability of microorganisms. Telephone Interview with Annette S. Parent, Partner, Morgan, Lewis & Bockius LLP (March 12, 2011) (explaining *Chakrabarty's* error in equating yeast with bacteria); THE ENCYCLOPEDIA OF MOLECULAR BIOLOGY 343, 878 (John Kendrew et al. eds., 1994) (defining eukaryotes, which include all yeasts; and prokaryotes, which include all bacteria).

39. Plant Patent Act, ch. 312, 46 Stat. 376 (1930) (codified as amended at 35 U.S.C. § 161 (2006)) (providing the statutory basis for plant patents); *J. E. M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc.*, 534 U.S. 124, 132–44 (2001) (discussing the history of plant patents and plant variety protection certificates); Demaine & Fellmeth, *supra* note 35, at 313–14 (same). Methods of plant asexual reproduction, such as propagating plants from cuttings or spores, produce new plants that are genetically identical to their single parent, while plant sexual reproduction produces new plants with genes from two parents. *See, e.g., J. E. M. Ag Supply, Inc.*, 534 U.S. at 132 (discussing plant asexual reproduction); THE ENCYCLOPEDIA OF MOLECULAR BIOLOGY, *supra* note 38, at 69–70 (defining asexual reproduction); *Asexual Reproduction*, DICTIONARY.COM, <http://dictionary.reference.com/browse/asexual+reproduction> (last visited Apr. 8, 2012).

40. Plant Variety Protection Act § 42, 7 U.S.C. § 2402(a) (2006) (providing the statutory basis for plant variety protection certificates); *J. E. M. Ag Supply, Inc.*, 534 U.S. at 138; Demaine & Fellmeth, *supra* note 35, at 313.

41. *See* Demaine & Fellmeth, *supra* note 35, at 313–16.

42. *Funk Bros. Seed Co. v. Kalo Inoculent Co.*, 333 U.S. 127, 130–32 (1948) (holding that the mixture of bacteria was new but not an invention). Rather than broadly rejecting the patentability of bacteria, however, the *Funk* majority stressed the bacteria's natural origin and the mixture's reliance on the bacteria's inherent properties for its advantages. *See id.* at 130–32.

extend patentability to plants, then perhaps legislative action would be necessary to extend patentability to other living organisms.⁴³

All this changed in 1980 with *Diamond v. Chakrabarty*.⁴⁴ In *Chakrabarty*, the plaintiff researcher attempted to secure a patent on a genetically engineered oil-eating microorganism.⁴⁵ The USPTO rejected the application,⁴⁶ but in a five-to-four decision, the Supreme Court held that microorganisms were patentable.⁴⁷ Under the governing statute for patentable subject matter, genetically engineered life was interpreted to fall into the statutory categories of “manufacture or composition of matter.”⁴⁸ In dicta, the Court suggested that the categories of statutory subject matter include “anything under the sun that is made by man.”⁴⁹

Although *Chakrabarty*'s patent claimed a genetically engineered bacterium, the decision provided no doctrinal basis for distinguishing multicellular life.⁵⁰ The USPTO did not attempt to construct one. The 1987 Board of Patent Appeals and Interferences decision *Ex parte Allen* rejected claims to genetically engineered oysters but did not reject them as improper subject matter.⁵¹ By implication, this decision recognized the patentability of multicellular animals. The USPTO soon expressly stated its interpretation that all “nonnaturally occurring non-human multicellular living organisms, including animals” were statutory subject matter for patents.⁵²

43. See *J. E. M. Ag Supply, Inc.*, 534 U.S. at 134–35 (asserting that Congress had thought this in 1930 but was proven wrong with time); 1 DONALD S. CHISUM, CHISUM ON PATENTS § 1.02[7][d][iii] (2011) (discussing *J. E. M. Ag Supply, Inc.*, 534 U.S. 124).

44. *Diamond v. Chakrabarty*, 447 U.S. 303 (1980).

45. *Id.* at 305–06.

46. *Id.* at 306.

47. See *id.* at 318.

48. *Id.* at 307, 309.

49. *Id.* at 309 (quoting S. REP. NO. 82-1979, at 5 (1952), reprinted in 1952 U.S.C.A.N. 2394, 2399) (internal quotation marks omitted).

50. See generally Q. Todd Dickenson, *Patentable Subject Matter: The Debate Reignites—Or Did It Ever Really Go Away?*, LANDSLIDE, Nov.–Dec. 2008, at 30, 32–33 (providing a more detailed account of the post-*Chakrabarty* USPTO statements regarding the patentability of animals and humans). But see *Comm'r of Patents v. President & Fellows of Harvard Coll.*, 2002 SCC 76, [2002] 4 S.C.R. 45, 146–50 (Can.) (distinguishing between patentable “lower life forms” and unpatentable “higher life forms,” such as the Harvard oncomouse).

51. *Ex parte Allen*, No. 86-1790, 2 U.S.P.Q.2d (BNA) 1425, 1427–28 (B.P.A.I. Apr. 3, 1987) (holding that the claimed oysters were statutory subject matter but unpatentable for obviousness under 35 U.S.C. § 103); Dickenson, *supra* note 50, at 33. The Federal Circuit affirmed the Board's obviousness rejection in an unpublished opinion. *In re Allen*, 846 F.2d 77 (Fed. Cir. 1988) (unpublished table decision); see *Animal Legal Def. Fund v. Quigg*, 932 F.2d 920, 923 (Fed. Cir. 1991) (citing the Federal Circuit's decision).

52. *Animals—Patentability*, *supra* note 4.

This policy statement provoked a legal challenge, but the USPTO's interpretation was upheld in *Animal Legal Defense Fund v. Quigg*.⁵³ In *Quigg*, opponents of animal patentability asserted that the statement was outside of the agency's statutory authority.⁵⁴ However, the Federal Circuit held that the statement was only an interpretation of existing law, not substantive law making,⁵⁵ and that the policy's challengers lacked standing.⁵⁶ The Court declined to consider the propriety of the USPTO's exclusion of humans from patentability.⁵⁷

By both administrative and judicial authority, all bioengineered animals were now statutory subject matter. All animals, that is, besides humans. Under the USPTO's policy, patent claims explicitly or implicitly including human beings in their scope would be rejected as unpatentable under the Constitution.⁵⁸ Although the constitutional basis for the prohibition was not explicitly stated, several commentators have inferred that the USPTO relies upon the Thirteenth Amendment.⁵⁹

Despite this express policy against human patents, at least one patent on mammalian cloning has been issued with broad claims that do not exclude humans from their scope,⁶⁰ although the assignee stated that it would not use the methods to clone humans.⁶¹ As the patent did not expressly claim humans, its issuance may merely represent an oversight during examination. However, it may indicate that the USPTO's unexpressed constitutional rationale distinguished

53. *Animal Legal Def. Fund*, 932 F.2d at 922.

54. *Id.* at 923–24.

55. *Id.* at 927–28.

56. *Id.* at 931.

57. *Id.* at 928 n.9.

58. *Animals—Patentability*, *supra* note 4.

59. See, e.g., Magnani, *supra* note 35, at 448 & n.45 (“The Commissioner did not specify the precise language in the Constitution that prohibits patenting human beings, but it has been assumed that he was referring to the Thirteenth Amendment’s ban on human slavery.” (citing Elizabeth Joy Hecht, Note, *Beyond Animal Legal Defense Fund v. Quigg: The Controversy over Transgenic Animal Patents Continues*, 41 AM. U. L. REV. 1023, 1023 n.1 (1992))); Dashka Slater, *huMouse*[™], LEGAL AFF., Nov.–Dec. 2002, at 20, 25 (“The basis for this directive, [Quigg] said, was the Constitution—presumably the Thirteenth Amendment ban on human slavery, which precludes treating human beings as property. Allowing someone to patent a person, the argument goes, is the same as allowing someone to own one.”); Hagglund, *supra* note 7, at 66 & n.96 (citing Magnani, *supra* note 35, at 448 and Hecht, *supra*, at 1024).

60. See U.S. Patent No. 6,211,429 col. 21 ll. 21–30 (filed June 18, 1998); Slater, *supra* note 59, at 26 (discussing the '429 patent, which is assigned to the University of Missouri).

61. Slater, *supra* note 59, at 26 (“A university spokesman later told *The Wall Street Journal* that the institution opposed human cloning and would use its patent to prevent anyone else from cloning humans.”).

composition claims on humans, which are unpatentable, from method claims on the artificial generation or bioengineering of humans, which may have been considered patentable.⁶²

The USPTO's attitude toward patenting human-animal fusions has been more permissive, for it has allowed patents on some fusion organisms containing human genes. The Patent Office directly addressed the patentability of human-animal fusions in its response to the Rifkin-Newman chimera application.⁶³ In 1997, Jeremy Rifkin, an anti-biotechnology activist, and Stuart Newman, a biologist, applied for a broad patent covering human-animal chimeras.⁶⁴ They hoped to force the USPTO either to declare human-animal chimeras unpatentable or to grant them a patent allowing them to block further chimera research.⁶⁵ The Patent Office's Commissioner publically stated that

62. This Comment focuses on composition claims rather than method claims, as I see no reasonable basis for a method being a legal person. However, allowing method patents on humans creates the risk of the same unconstitutional uses as composition patents.

Consider a claim to a method of breathing for a novel, nonobvious human-animal chimera, comprising the step of the chimera's breathing. Breathing is an activity that is well-known in the prior art, which makes it unpatentable under 35 U.S.C. § 102 (2006) (the novelty requirement). But even a single novel, nonobvious element, such as the chimera, renders an otherwise anticipated or obvious claim patentable. *See* U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE §§ 2131, 2141 (8th ed. Rev. 8, July 2010) [hereinafter MPEP], available at <http://www.uspto.gov/web/offices/pac/mpep/index.htm> (instructing examiners that for a claim to be anticipated, the prior art must teach all claim elements, and that for a claim to be obvious, the invention as a whole must be obvious to one of skill in the relevant art). Here, the applicant could argue that the novel, nonobvious element—the chimera—would make the method patentable. If such a claim were granted, its scope would be almost as broad as the analogous composition patent, for every chimera would need to use the method all the time to stay alive.

To avoid this problem, a method claim's patentability should not rest entirely on a novel, nonobvious organism if that organism were unpatentable on constitutional grounds. Instead, the claim should require different, constitutionally permissible claim elements that supported its patentability.

The AIA prohibits the grant of any new "claim directed to or encompassing a human organism," which seemingly would bar method patents claiming humans. Pub. L. No. 112-29, § 33, 125 Stat. 288, 340 (2011) (applying the bar only to patents issued after the law's enactment). But because this law is directed to human organisms, not legal persons, it may not block patents claiming only human-animal fusion organisms.

63. *See* Slater, *supra* note 59, at 22, 26–28 (providing a more detailed account of the Rifkin-Newman application prerejection); Seán M. Coughlin, *The Newman Application and the USPTO's Unnecessary Response: Patentability of Humans and Human Embryos*, 5 CHI-KENT J. INTELL. PROP. 90, 90–91 (2006) (criticizing the USPTO's handling of the Newman application).

64. Slater, *supra* note 59, at 22; Stuart A. Newman, *My Attempt to Patent a Human-Animal Chimera*, L'OBSERVATOIRE DE LA GÉNÉTIQUE (Apr.–May 2006), http://www.omics-ethics.org/observatoire/zoom/zoom_06/z_no27_06/za_no27_06_01.html (providing Dr. Newman's rationale for filing the application).

65. Slater, *supra* note 59, at 22.

the claimed chimeras were unpatentable under the seldom-used morality clause of the utility requirement.⁶⁶ Ultimately, however, the patent application's examiner rejected it on multiple grounds, including lack of novelty and lack of written description as well as nonstatutory subject matter.⁶⁷

Despite the rejection of the Rifkin-Newman application, U.S. patents on other fusion organisms with more limited human elements have been issued. For example, the USPTO's first animal patent was for a mouse incorporating a human or animal oncogene.⁶⁸ This hybrid mouse is perhaps an easy case: it incorporates only a small amount of human genetic material, and its human oncogene is associated with cancer production rather than more humanlike qualities like cognition or appearance.⁶⁹ The patents' issuance indicates that the USPTO has implicitly adopted a more permissive policy for human-animal fusion patents than for human patents, but the limits of this policy are as yet undefined.

As was true after *Ex parte Allen*, the uncertainty represents an opportunity for the USPTO to present the reasoning behind its policies. Among other things, this paper proposes that by using its administrative authority to interpret the law,⁷⁰ the USPTO can better explain the Thirteenth Amendment support for its restriction on human patentability and provide more guidance to those researchers seeking patents on human-animal fusions.

66. USPTO Media Advisory 98-6, *supra* note 5. The USPTO's moral utility rationale is controversial. *See, e.g.*, Cynthia M. Ho, *Splicing Morality and Patent Law: Issues Arising from Mixing Mice and Men*, 2 WASH. U. J.L. & POL'Y 247, 282-83 (2000) (cautioning against the Office's use of moral utility as a patentability criterion). *But see* Margo A. Bagley, *Patent First, Ask Questions Later: Morality and Biotechnology in Patent Law*, 45 WM. & MARY L. REV. 469, 474 (2003) (arguing that a "patent first, ask questions later" approach to morally controversial inventions is a bad policy).

67. U.S. Patent Application No. 08/993,564, Final Rejection from Deborah Crouch, Primary Examiner, Aug. 2, 2004; *see* Hagglund, *supra* note 7, at 68-69 (discussing the USPTO's Final Rejection).

68. U.S. Patent No. 4,736,866 (filed June 22, 1984) (describing and claiming the Harvard oncomouse).

69. *See id.* at col. 2 ll. 15-20, col. 8 ll. 48-49.

70. *See, e.g.*, *Animal Legal Def. Fund v. Quigg*, 932 F.2d 920, 927-28 (Fed. Cir. 1991) (discussing the USPTO's authority to issue substantive and interpretive rules and holding that the USPTO's statement regarding the patentability of multicellular organisms was merely interpretive).

II. The Thirteenth Amendment Prohibits Patents on Human Persons⁷¹

Currently, at least one statutory provision prevents the USPTO from granting patents on humans. Under the Weldon Amendment, the USPTO cannot use government funds to grant “patents on claims directed to or encompassing a human organism.”⁷² The initial one-year restriction was passed in 2004, but it has been intermittently renewed.⁷³ Besides the Weldon Amendment, the 2011 Leahy-Smith America Invents Act (“AIA”) prohibits the issuance of any future patents “directed to or encompassing a human organism.”⁷⁴ This law created a more permanent, statutory barrier to both composition and method claims on humans.

But these statutory barriers to human patentability are based on Congress’ enumerated powers to control spending and to administer the patent system.⁷⁵ The Thirteenth Amendment presents an inde-

71. Esther Slater McDonald, Note, *Patenting Human Life and the Rebirth of the Thirteenth Amendment*, 78 NOTRE DAME L. REV. 1359, 1381–85 (2003) (arguing that patent rights over humans would be equivalent to slavery). *But see, e.g.*, Paul Lesko & Kevin Buckley, *Attack of the Clones . . . and the Issues of Clones*, 3 COLUM. SCI. & TECH. L. REV. 3, at 35 (2002), <http://www.stlr.org/html/volume3/lesko.pdf> (suggesting that because patents only confer a right to exclude, a patent on human clones would not violate the Thirteenth Amendment); Dan L. Burk, *Patenting Transgenic Human Embryos: A Nonuse Cost Perspective*, 30 HOUS. L. REV. 1597, 1647–49 (1993) (arguing that because patents only confer a right to exclude, a patent on humans would not violate the Thirteenth Amendment); Kevin D. DeBré, Note, *Patents on People and the U.S. Constitution: Creating Slaves or Enslaving Science*, 16 HASTINGS CONST. L.Q. 221, 231–32 (1989) (arguing that the Thirteenth Amendment allows patents on human genotypes). Interestingly, although DeBré argues that human genotypes are patentable, he asserts that the manufacture of human-animal hybrids would be an unconstitutional subordination. *Id.* at 233–34.

72. Emir Aly Crowne-Mohammed, *Can You Patent That? A Review of Subject Matter Eligibility in Canada and the United States*, 23 TEMP. INT’L & COMP. L.J. 269, 305 (2009) (quoting Consolidated Appropriations Act, Pub. L. No. 108-199, § 634, 118 Stat. 3, 101 (2004)). Crowne-Mohammed also argues that patents on human clones should be prohibited as violations of the Thirteenth Amendment’s prohibition of involuntary servitude, but provides no detailed justification. *Id.*

73. Hagglund, *supra* note 7, at 70–74 (discussing the Weldon Amendment in detail). Note, however, that the USPTO’s rejection of the Rifkin-Newman chimera application did quote the Weldon Amendment’s prohibition, even if this was not used as an explicit basis for the rejection. *See* U.S. Patent Application No. 08/993,564, Final Rejection from Deborah Crouch, Primary Examiner, Aug. 2, 2004, at 22.

74. Pub. L. No. 112-29, § 33, 125 Stat. 288, 340 (2011) (barring patent claims “directed to or encompassing a human organism,” but applying this bar only to patents issued after the law’s enactment). This provision took effect on September 16, 2011. U.S. PATENT & TRADEMARK OFFICE, AMERICA INVENTS ACT: EFFECTIVE DATES 2 (2011), *available at* http://www.uspto.gov/aia_implementation/aia-effective-dates.pdf.

75. *See* U.S. CONST. art. I, § 8, cl. 1 (the Taxing and Spending Clause); U.S. CONST. art. I, § 8, cl. 8 (the Patent and Copyright Clause).

pendent and more durable constitutional bar to patents on legal persons, one that is based on their fundamental rights.⁷⁶

A. The Thirteenth Amendment Forbids Private, Legally Enforced Coercion of Labor⁷⁷

Passed by the Radical Republicans at the end of the Civil War, the Thirteenth Amendment was intended to end the chattel slavery of

76. The theme of this argument was foreshadowed in a dissent for *Moore v. Regents of the University of California*, a California case dealing with the nonconsensual, commercial use of a patient's cells:

[O]ur society acknowledges a profound ethical imperative to respect the human body as the physical and temporal expression of the unique human persona. One manifestation of that respect . . . is our prohibition against indirect abuse of the body by its economic exploitation for the sole benefit of another person. The most abhorrent form of such exploitation, of course, was the institution of slavery. Lesser forms, such as indentured servitude or even debtor's prison, have also disappeared. Yet their specter haunts the laboratories and boardrooms of today's biotechnological research-industrial complex.

Moore v. Regents of the Univ. of Cal., 793 P.2d 479, 515 (Cal. 1990) (Mosk, J., dissenting) (advocating that persons should have property rights in their "own bodies and its products," such as the derived cell line claimed by the plaintiff and defendants).

The Thirteenth Amendment is likely not the only constitutional provision preventing the patenting of legal persons. Under governing Fourteenth Amendment precedent, human persons have a fundamental right to avoid state denial of their ability to procreate. *Skinner v. Oklahoma ex rel. Williamson*, 316 U.S. 535, 541 (1942). This suggests that the Fifth Amendment's Due Process Clause should also bar patenting of some fusion organisms and embryos. In reproduction, the parent's genetic material is transmitted to a new organism. If a patent claimed an organism or embryo bearing the same genetic material, the patentee's right to exclude could either bar a person from bearing children or subject it to damages if it did. Such a ruling would be consistent with precedent only if fusion organisms were not constitutional persons. See DeBré, *supra* note 71, at 238–39 (after presenting a similar analysis for human genotype patents, concluding "[t]o the extent they infringed the procreation and privacy rights of anyone entitled to constitutional protections, current patent laws would be unconstitutional."). DeBré asserted that a statutory exemption for human parents could prevent this issue from ever arising. *Id.* at 239; see Burk, *supra* note 71, at 1649–50 (arguing against reproductive rights as a bar to patentability of transgenic humans and asserting that even if the patent right conflicted with reproductive autonomy, the right would not destroy the entire patent grant); Hagglund, *supra* note 7, at 89–90 (arguing that even if a patentee's control of reproduction was foreclosed, it would not destroy the entire scope of the patent right).

77. The Thirteenth Amendment has been urged as a way to create constitutional rights against a surprising variety of social ills, such as racially motivated crimes and even human cloning. See, e.g., Robert J. Kaczorowski, *Epilogue: The Enduring Legacy of the Thirteenth Amendment*, in *THE PROMISES OF LIBERTY: THE HISTORY AND CONTINUING RELEVANCE OF THE THIRTEENTH AMENDMENT* 300, 302–03 (Alexander Tsesis ed., 2010) [hereinafter *THE PROMISES OF LIBERTY*]; Sean Charles Vinck, Note, *Does the Thirteenth Amendment Provide a Jurisdictional Basis for a Federal Ban on Cloning?*, 30 J. LEGIS. 183, 183 (2003). Perhaps because of concern about a principled limit to the amendment's reach, courts have generally not adopted these broader readings. But a broadened Thirteenth

black Americans.⁷⁸ Its text expressly prohibits slavery and nonpenal involuntary servitude: “Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.”⁷⁹ The amendment provides Congress with broad power to enforce this prohibition “by appropriate legislation.”⁸⁰

The “involuntary servitude” prohibition was intended to prevent the ex-Confederate States from establishing de facto slavery through legal schemes for controlling former slaves’ labor.⁸¹ It prohibits the types of control historically exercised by masters over their slaves’ labor as opposed to their hired servants. But by the Thirteenth Amendment’s express use of “person” without qualification, its protection applies to all persons, not only to historically enslaved groups.⁸² Because the amendment’s wording was not limited to former slaves or racial minorities, it has provided a basis for laws against other nongovernmental schemes of involuntary servitude, such as peonage⁸³ and human trafficking.⁸⁴ The Supreme Court has upheld this all-person reading in its rulings upholding the constitutionality of the Anti-Peonage Law.⁸⁵

Amendment should provide at least the same level of protection as the narrower interpretations relied upon in this Comment.

78. Records of congressional debates over the Thirteenth Amendment’s ratification suggest that both its proponents and opponents alike believed that its ratification would not only eliminate slavery, but also guarantee at least some rights to ex-slaves. See ALEXANDER TSEIS, *THE THIRTEENTH AMENDMENT AND AMERICAN FREEDOM: A LEGAL HISTORY* 37–48 (2004).

79. U.S. CONST. amend. XIII, § 1.

80. *Id.* § 2. Because regulating the patent system is already among Congress’ enumerated powers, here the Thirteenth Amendment would limit the operation of the Patent and Copyright Clause rather than provide an independent power of congressional action. See U.S. CONST. art. I, § 8, cl. 8.

81. See, e.g., *Bailey v. Alabama*, 219 U.S. 219, 241 (1911). Despite the Thirteenth Amendment, the ex-Confederate States quickly passed the Black Codes, which severely restricted the freedom of former slaves. William M. Wiecek, *Emancipation and Civic Status: The American Experience, 1865–1915*, in *THE PROMISES OF LIBERTY*, *supra* note 77, at 78, 84–86 (discussing the Black Codes). In response, Congress enacted other statutory and constitutional measures protecting the rights of ex-slaves, including the Civil Rights Act of 1866 and the Fourteenth Amendment. *Id.* at 86–88.

82. See, e.g., *Bailey*, 219 U.S. at 240–41 (“While the immediate concern was with African slavery, the [Thirteenth] Amendment was not limited to that. It was a charter of universal civil freedom for all persons, of whatever race, color or estate, under the flag.”).

83. TSEIS, *supra* note 78, at 154–57.

84. *Id.* at 157–58 (discussing the Victims of Trafficking and Violence Protection Act of 2000, Pub. L. No. 106-386, 114 Stat. 1464, a law that targeted human trafficking).

85. *Id.* at 156–57.

More recently, a definition of “involuntary servitude” has been explicitly set forth in the 1988 Supreme Court decision *United States v. Kozminski*.⁸⁶ In *Kozminski*, the defendant coerced two “mentally retarded” men to work on his farm.⁸⁷ Because of a dispute between lower courts about the type of coercion required to place persons in involuntary servitude, the Supreme Court considered what sort of coercion could justify criminal prosecution under a law forbidding involuntary servitude.⁸⁸ The Court held that because the wording of the Thirteenth Amendment explicitly excluded punishment for crimes from its ban, “the term ‘involuntary servitude’ necessarily means a condition of servitude in which the victim is forced to work for the defendant by . . . the use or threat of coercion through law or the legal process.”⁸⁹ Therefore, purely legal coercion can be sufficient to produce involuntary servitude under the statute.

Soon after the Thirteenth Amendment’s adoption, the Supreme Court also interpreted the Amendment’s scope to include a prohibition of the “badges and incidents of slavery,” which include the loss of civil rights that was associated with chattel slavery.⁹⁰ In the *Civil Rights Cases*, the plaintiffs sued under a federal law prohibiting racial discrimination in certain businesses serving the public, such as inns, theaters, and railroads.⁹¹ The law was held to be an unconstitutional restraint on private action.⁹² In its decision, however, the Court described many legal features of slavery that were forbidden by the Thirteenth Amendment:

Compulsory service of the slave for the benefit of the master, restraint of his movements except by the master’s will, disability to hold property, to make contracts, to have a standing in court, to be a witness against a white person, and such like burdens and incapacities were the inseparable incidents of the institution. . . . [Former slaves now have] those fundamental rights which are the essence of civil freedom, namely, the same right to make and enforce contracts, to sue, be parties, give evidence, and to inherit,

86. *United States v. Kozminski*, 487 U.S. 931, 952 (1988).

87. *See id.* at 934–35.

88. *Id.* at 937–39.

89. *Id.* at 952.

90. *The Civil Rights Cases*, 109 U.S. 3, 20 (1883).

91. *Id.* at 4–5.

92. *Id.* at 24–26. Because both the Thirteenth Amendment’s proponents and adversaries understood its scope as including other civil rights, this decision has been criticized as a rejection of the Thirteenth Amendment’s original intent. *See, e.g.*, TSESIS, *supra* note 78, at 72–74.

purchase, lease, sell and convey property, as is enjoyed by white citizens.⁹³

Therefore, the Court's first list of "badges and incidents" included labor services compelled without a bargained exchange, control of travel, and the inability to make contracts.

The scope of the *Civil Rights Cases*' badges and incidents of slavery was narrowly construed in the now-overturned case *Hodges v. United States*.⁹⁴ In *Hodges*, the defendants appealed their conviction for intimidating black workers to break their work contracts.⁹⁵ The Court held that it had no jurisdiction over the case⁹⁶ because the Thirteenth Amendment applied only to slavery and involuntary servitude, which the Court defined as "a condition of enforced compulsory service of one to another."⁹⁷ Extending the amendment's prohibition to slavery's "badges and incidents" would allegedly be inconsistent with the amendment's facial meaning, later statutory precedent, and the citizenship of ex-slaves.⁹⁸ This narrowing of the badges and incidents of slavery seemingly restricted the Thirteenth Amendment's scope to government action that coerces a person to provide labor for another person.

The broader, currently controlling reading of the badges and incidents of slavery was set forth in the 1968 case *Jones v. Alfred H. Mayer Co.*⁹⁹ In *Jones*, an interracial married couple sued for the right to buy a house whose owners refused to sell solely because the husband was black.¹⁰⁰ In upholding the 1866 Civil Rights Act's prohibition of private housing discrimination, the Court affirmed the law's justification under the Thirteenth Amendment, stating that Congress had both the power to define what a "badge" was and to pass any law necessary

93. *The Civil Rights Cases*, 109 U.S. at 22.

94. *Hodges v. United States*, 203 U.S. 1 (1906), *overruled by* *Jones v. Alfred H. Mayer Co.*, 392 U.S. 409 (1968). Although this decision's narrow interpretation of the Thirteenth Amendment is no longer binding law, it shows that patents on human persons would violate even a narrower interpretation than the currently prevailing one.

95. *Id.* at 2–4.

96. *Id.* at 20.

97. *Id.* at 16.

98. *See id.* at 16–20.

99. *Jones*, 392 U.S. 409. *See generally* Jennifer Mason McAward, *The Scope of Congress' Thirteenth Amendment Enforcement Power After City of Boerne v. Flores*, 88 WASH. U. L. REV. 77, 134–35 (2010) (describing the "broad approach" of *Jones*).

100. *Jones*, 392 U.S. at 412; McAward, *supra* note 99, at 94.

to eliminate it.¹⁰¹ In the cases following *Jones*, the courts have consistently upheld legislation based on the Thirteenth Amendment.¹⁰²

The recent Fourteenth Amendment decision *City of Boerne v. Flores*, which limited Congress' power to expand state civil rights by federal enforcement legislation,¹⁰³ suggests that the modern Court might not reaffirm the full scope of *Jones*.¹⁰⁴ But a patent on a human person would violate the Thirteenth Amendment even under the narrower holdings of the *Civil Rights Cases* or *Hodges*.

B. Patents on Humans Would Allow Private Coercion of Their Labor and Activities

Even if narrowly construed, the Thirteenth Amendment forbids systems of involuntary, government-enforced private control over another person's labor.¹⁰⁵ To understand why this would prohibit patents on humans, however, we must review some general properties of patents.

A patent confers a right to exclude others from practicing the invention described by the patent's claims.¹⁰⁶ Typically, this right lasts from the patent's issuance to twenty years from the patent application's filing.¹⁰⁷ Without a license from the patent owner, or patentee, use of or inducement to use the invention is an infringement of the

101. *Jones*, 392 U.S. at 439–40; McAward, *supra* note 99, at 95.

102. See McAward, *supra* note 99, at 97 & n.109 (asserting and supporting the claim: “Since *Jones*, federal courts have upheld at least seven statutes challenged on Thirteenth Amendment grounds and struck down none.”).

103. *City of Boerne v. Flores*, 521 U.S. 507, 519–20 (1997) (holding that Congress can use its Fourteenth Amendment power only to enforce rights, not to expand them).

104. See McAward, *supra* note 99, at 77. Because its holding applies to the Fourteenth Amendment, *City of Boerne* does not overtly contradict *Jones*, but *City of Boerne* limits Congress' ability to expand a constitutional right's scope by “enforcing” it broadly, while *Jones* gives Congress broad power both to define and to enforce Thirteenth Amendment rights. See *id.* at 79–82.

105. See *Hodges v. United States*, 203 U.S. 1, 16 (1906) (defining slavery and involuntary servitude), *overruled by Jones*, 392 U.S. 409; *Bailey v. Alabama*, 219 U.S. 219, 241 (1911) (“The plain intention [of the Thirteenth Amendment] was to abolish slavery of whatever name and form and all its badges and incidents; to render impossible any state of bondage; to make labor free, by prohibiting that control by which the personal service of one man is disposed of or coerced for another's benefit[,] which is the essence of involuntary servitude.”).

106. 35 U.S.C. § 154(a)(1) (2006). A patent provides no positive right to practice a patented invention. See *id.* Thus, a patentable improvement to another inventor's patented invention could incorporate the patented invention as a claim element.

107. *Id.* § 154(a)(2).

patent.¹⁰⁸ If infringement can be established, the legal standard for infringement damages requires at least a reasonable royalty, but the court will often also issue an injunction prohibiting the infringing activities.¹⁰⁹

Under current United States law, a patent requires a written description of the claimed invention.¹¹⁰ This written description marks the outer bounds of the invention, providing notice to others of what was invented,¹¹¹ while the patent claims define the boundaries of the patentee's property right.¹¹² Just as in patents claiming genetically engineered animals, the written description and claims of a human-animal fusion patent would be expressed in qualitative terms describing an organism (e.g., "a goat-sheep chimera"), though it likely would also define at least one novel biological feature in more detail. For example, a patent that claims "a mouse carrying the human oncogene X" would likely include a complete genetic description of the oncogene X.

A patent on a person's body or in vivo genetic composition¹¹³ would allow the patentee to prohibit the body's use by any unlicensed person.¹¹⁴ Because the patent right to exclude "use" of an invention

108. *Id.* § 271(a)–(b). Other activities, such as making or selling the invention, will also infringe the patent. *Id.*

109. *See id.* §§ 283–284 (providing the standards for injunctive relief and damages); eBay Inc. v. MercExchange, L.L.C., 547 U.S. 388, 391–94 (2006) (discussing the standard for injunctive relief).

110. 35 U.S.C. § 112.

111. *Id.*; *see also* Ariad Pharm. v. Eli Lilly & Co., 598 F.3d 1336 (Fed. Cir. 2010) (affirming the requirement for written description); Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555 (Fed. Cir. 1991) (setting forth the requirement for written description).

112. *See* 35 U.S.C. § 112; KIEFF ET AL., *supra* note 13, at 866 (discussing how the claims define the right to exclude).

113. If a genetically engineered, patentable cell or gene did not occur in nature, its composition of matter could be claimed even in vivo. *See supra* Part II.B; *Diamond v. Chakrabarty*, 447 U.S. 303, 313 (1980) ("Congress thus recognized that the relevant distinction was not between living and inanimate things, but between products of nature, whether living or not, and human-made inventions."). If such a patented composition were incorporated into a person's body, the patentee could likely use the patent right to coerce the person's actions much as a patent to the person's body as a whole. *But see* DeBré, *supra* note 71, at 231–32 (arguing that the Thirteenth Amendment allows patents on human genotypes).

114. *See* 35 U.S.C. § 154(a)(1); Andrew W. Torrance, *Physiological Steps Doctrine*, 23 BERKELEY TECH. L.J. 1471, 1500–01, 1503, 1505 n.213 (2008) (arguing that case law regarding in vivo metabolism of drugs indicates an implicit prohibition on patenting "products of human physiological processes" and mentioning the Thirteenth Amendment as a possible justification). *But see* DeBré, *supra* note 71, at 231–32 (arguing that the recipient of a patented genotype would have an implied license once the genotype was "sold"). Perhaps such an implied license would protect purchaser/recipients of patented organs, but how

includes its employment for commerce or other economic activity,¹¹⁵ this right would effectively provide the patentee with exclusive control over the patented person's labor.¹¹⁶ Any unlicensed employer would commit patent infringement because the work performed for them by the patented person would involve the use of a patented composition: the person's body. This would allow the patentee to define the conditions of the patented person's employment. To avoid patent infringement and the accompanying legal penalties, the patented person could work only for a licensed employer under whatever terms that the patentee would set.

Even more problematic, the patented person would need a license to take any action without incurring liability. Exercising a patent's exclusionary right does not require positive ownership over a particular physical embodiment of the invention, or patents would be unenforceable.¹¹⁷ A patent would not grant positive title to a patented person's body as such. Instead, a patent on a person's body would subject that person to the patentee's right to prohibit the patented invention's unlicensed use, even by a person who would otherwise have positive ownership or control of the patented property. But persons use their bodies—which are either themselves or at least a legally significant part of themselves—whenever they act.¹¹⁸ Even purely mental deliberation involves some detectable physiological activity

would it apply to genetically engineered humans produced without a sale to the recipients or with a sale under an expressly limited license?

115. See 35 U.S.C. § 154(a)(1). Were it otherwise, a patent would provide very weak protection for commercialization of inventions.

116. See McDonald, *supra* note 71, at 1385 (equating the patentee's right to exclude others from selling a patented invention as preventing patented persons from exercising their right to make employment contracts). Although McDonald correctly identifies the unconstitutionality of allowing a patentee to overrule a patented person's liberty of contract, she also asserts that a patent would confer a positive right to contract out a patented person's labor. *Id.* But a patent provides no positive right to use: it only provides the right to exclude. See 35 U.S.C. § 154(a)(1).

117. Positive ownership of property typically provides a right to exclude. See, e.g., CUNNINGHAM ET AL., *supra* note 18, at 1–6 (discussing the concept and elements of property); DUKEMINIER ET AL., *supra* note 18, at 90–91 (discussing the right to exclude and its limitations). If a patentee could only enforce patent rights on physical embodiments that the patentee owned, the patent right to exclude would largely be redundant.

118. The philosophical debate of whether a person's nature is characterized by something other than a body is outside the scope of this Comment. All that is necessary to this argument is that a particular physical body's externally uncoerced movements and activities express the acts of a particular legal person.

within a person's brain (e.g., a use of the brain). Thus, if a person's body is patented, the person necessarily uses the patented material.¹¹⁹

Although it might seem that most activities of a patented person would not economically harm the patentee, this would not apply to any productive labor. A patented person's labor would produce economic value accruing to the employer and the patented person rather than the patentee. In any case, infringement of the patentee's right to exclude provides a sufficient justification for damages and often an injunction as well.¹²⁰ Were it otherwise, the patent right would be empty. This right would give the patentee a legal veto over the patented human's actions: the patentee could deter undesired actions by the threat of infringement damages or injunctive prohibitions.

This degree of control over another person's actions would violate the Thirteenth Amendment. The patented persons would have no option to avoid using their bodies, so they would have no power to avoid the patentee's right to exclude. They would have to take a license for the patent's term or be liable for infringement.¹²¹ Under current law, the patentee has wide discretion to set the terms of a patent license, including a requirement to use the patented materials—the person's body—only in transactions with a particular company or companies.¹²² A license could even be limited to a particular

119. This argument primarily applies to composition of matter or manufacture claims directed to a human person, but may be inapplicable to method claims unless they are so broad that they would apply to all or most of the patented person's actions. *See supra* note 62.

120. *eBay Inc., v. MercExchange, L.L.C.*, 547 U.S. 388, 391–92 (2006) (holding that the traditional four-factor test for injunctions applies to patent cases). *eBay* sets forth the currently governing standard, which usually (but not always) allows for an injunction against the infringer. *See, e.g., id.* at 394–95 (Roberts, C.J., joined by Scalia & Ginsburg, JJ., concurring). Even if the four-factor test weighed against injunction, however, this would not prevent a patentee from seeking a reasonable royalty for use of the patented body. *See* 35 U.S.C. § 284 (“[Damages can be] in no event less than a reasonable royalty . . .”).

121. The limited term of the patent grant and the length of time for human maturation suggest that many patented humans would be minors, who might not have the ability to consent to a licensing agreement. Even so, minors have no statutory immunity from infringement liability. *See* 35 U.S.C. § 271(a) (defining direct infringement). If the patented person's age were to provide some protection, infringement liability still would affect any nonpatentee adult guardian or third party interacting with the patented minor.

122. A possible alternative strategy for dealing with this problem would be to require issuance of a mandatory license to the patented person. *Cf. DeBré, supra* note 71, at 231–32 (arguing that the recipient of a patented genotype would have an implied license). Perhaps this could be effective in circumventing the overt Thirteenth Amendment problem, but it would require a test to know when this mandatory license would be necessary. Transfer of the patent's exclusionary right from the patentee to the patented persons might also represent a regulatory taking unless the patentee received some compensation for the loss of value.

field of use, such as a particular industry or even a specific job. Although these licensing terms would be broadly limited by contract, labor, and employment laws, the core principle of the license would still be disposition of the patented person's labor or activities without the need for consent at any stage. Such control over a person's labor and other actions would be a form of coercion enforced by the threat of civil damages or injunction, which would satisfy the definition of involuntary servitude used in *Kozminski*. Therefore, because allowing patents on human persons would yield a result forbidden by the Thirteenth Amendment, human persons must be unpatentable under the Constitution.¹²³

Some commentators argue that because a patent provides neither title to a patented creature nor any positive right to use patented subject matter, it cannot infringe the Thirteenth Amendment.¹²⁴ Supposedly, because the patent only conveys a negative right to exclude persons from using the patented subject matter, it prevents indirect control based on infringement liability "because the subject matter of a patent cannot infringe its own patent."¹²⁵ But this assumption of noninfringement is unjustified. Neither statute nor case law explicitly

123. Certain commentators have argued that human embryos or fetuses are or should be patentable. See, e.g., Jonathan Grossman, Comment, *Human Embryos, Patents, and the Thirteenth Amendment*, 55 U. KAN. L. REV. 731, 733 (2007) (arguing that the Thirteenth Amendment does not apply to human embryos). But see McDonald, *supra* note 71, at 1362 (arguing that given the circumstances of its passage, the Thirteenth Amendment prohibits all ownership of humans, including human embryos). The AIA's prohibition of new claims "directed to or encompassing a human organism" bars any future patents on human embryos and fetuses. Pub. L. No. 112-29, § 33, 125 Stat. 288, 340 (2011) (applying this prohibition only to patents issued after the law's enactment).

The legal status of part-human embryos and fetuses, however, is still unresolved. Under current abortion-rights precedents, embryos are only "life or potential life," not constitutional persons. E.g., *Planned Parenthood of Se. Pa. v. Casey*, 505 U.S. 833, 852, 870 (1992) (describing the developing infant as "life or potential life"). Debating the correctness of this holding is outside this Comment's scope. However, the positive governmental interests supporting patent protection for embryonic research in chimera and hybrids—promoting scientific research and possibly advancing human health—are different from (and weaker than) the government interest in preventing state interference with a fundamental right, which the *Casey* Court stated was the basis for the abortion-rights holdings (along with *stare decisis*). *Id.* at 851–53. This difference could allow courts to distinguish embryo patenting from the abortion-rights decisions.

124. E.g., Hagglund, *supra* note 7, at 86–89.

125. See Grossman, *supra* note 123, at 765 (asserting that a patented human embryo would "need no shielding from actions of infringement because the subject matter of a patent cannot infringe its own patent."); Bagley, *supra* note 66, at 502 (asserting that the patent's exclusionary right would not allow patentees to coerce actions); see also Lesko & Buckley, *supra* note 71, at 35 (claiming that because patents only confer a right to exclude, they are not equivalent to human ownership or slavery).

provides the subject of a patent with immunity from infringement. Historically, patented inventions have not been natural or corporate persons, and as nonpersons, they could not be sued for infringement.¹²⁶ Without an explicit basis for immunity, however, the patented human person would be subject to the same legal obligations as other legal persons, including liability for infringement. Unless patented humans were ruled nonpersons—a legal status that would open the door to abuses even worse than involuntary servitude—they would lack the immunity from suit that an integrated circuit or a genetically engineered carrot enjoys.

A second argument put forth in favor of human patentability is that although coercive uses of human patents would be unconstitutional, this limitation would not bar the patent itself, but only bar the patent's misuse.¹²⁷ Such a position is mistaken because it wrongly focuses on an owner's misuse of a property right rather than the nature of the right itself. Because the Thirteenth Amendment is an "absolute bar" against involuntary servitude, the opportunity to use a patent's property right in a person to create involuntary servitude through legal coercion is a signal of the property right's facial conflict with the Thirteenth Amendment.¹²⁸ Even the kindest and most humane masters lost their ability to have slaves and bondservants because of the Thirteenth Amendment. Suppose that a lax or absentee master allowed his indentured servants the full range of freedoms allowed to free laborers, but still retained his legal title to their labor. Regardless of the servants' de facto freedom, the Thirteenth Amendment would still prohibit the indentured servitude itself because their freedom would only be at the landowner's sufferance.¹²⁹

126. See 35 U.S.C. § 271 (2006) (stating "whoever" violates the patent's exclusionary right is an infringer). Among other reasons, if nonpersons could be sued for infringement, it would create absurd results regarding the separate liability of machines or tools that were used in practicing a patented process. Would my computer need to pay a separate royalty if I used it to infringe a software patent?

127. See Hagglund, *supra* note 7, at 89–90 (analogously arguing that the Fourteenth Amendment's substantive due process rights to privacy and reproductive autonomy would not prevent the patentability of human-animal chimeras).

128. See McDonald, *supra* note 71, at 1383–84 (making a similar argument with the premise that the Thirteenth Amendment bans all chattelism or any property right in a human).

129. *Id.* at 1384 (discussing an analogous hypothetical involving slaves).

C. Are Human-Animal Fusions Persons Under the Thirteenth Amendment?

Even if we accept persons to be per se unpatentable, this proposition will only affect the patentability of human-animal fusions if they also are persons under the Thirteenth Amendment. But are these creatures persons? The Constitution does not explicitly define the criteria for legal personhood in its articles or amendments. A consideration of the Thirteenth Amendment's original meaning, however, provides some guidance in answering this question.

Given the level of biotechnology in the 1860s, the Amendment was not, of course, deliberately designed to grant legal personhood to human-animal fusions. Instead, the Amendment was designed to end slavery and its related abuses.¹³⁰ For many of their congressional proponents, the broader purpose of the Thirteenth, Fourteenth, and Fifteenth Amendments was also to elevate a subordinated racial group with limited constitutional rights to de jure political equality with the dominant race.¹³¹ Both the Amendment's proponents and its opponents expressed this understanding of the Thirteenth Amendment's meaning in the debates surrounding its ratification.¹³² Indeed, in the *Civil Rights Cases*, the Supreme Court described the Thirteenth Amendment as "establishing and decreeing universal civil and political freedom throughout the United States."¹³³

In the decades since its adoption, the Thirteenth Amendment has been consistently applied to other racial groups, even those that had no history of slavery and who were otherwise discriminated against in the late-nineteenth century, such as Chinese immigrants.¹³⁴

130. See generally TESIS, *supra* note 78, at 37–48 (examining the congressional debates on the Thirteenth Amendment's meaning and purpose).

131. See *id.* at 40; Wiecek, *supra* note 81, at 86–88 (discussing the intended legal effect of the Amendments to protect the civil rights of ex-slaves). Insofar as the Thirteenth Amendment's original public meaning was to grant equal legal rights to "inferior" races—that is, the more that its original public meaning was influenced by racist or racialist rankings of human subgroups—the better the argument that the provisions' original public meaning should extend personhood to "inferior" part-humans with lower capacity than an average human.

132. See TESIS, *supra* note 78, at 37–48.

133. The Civil Rights Cases, 109 U.S. 3, 20 (1883).

134. William J. Carter, Jr., *Race, Rights, and the Thirteenth Amendment: Defining the Badges and Incidents of Slavery*, 40 U.C. DAVIS L. REV. 1311, 1356 n.160, 1357–61 (2007) (describing prior applications of the Thirteenth Amendment to protect other racial groups). *But see id.* at 1356 n.160 (discussing limits to application of the Thirteenth Amendment to curtail private racial discrimination: "Overly creative interpretations of the Amendment that pay little attention to its actual history and context can result in cases and scholarship diminishing the Amendment rather than strengthening it.").

Even in *Hodges*, the Court's analysis stated that the Thirteenth Amendment's applicability did not depend on a person's race:

It reaches every race and every individual, and if in any respect it commits one race to the Nation it commits every race and every individual thereof. Slavery or involuntary servitude of the Chinese, of the Italian, of the Anglo-Saxon are as much within its compass as slavery or involuntary servitude of the African.¹³⁵

This understanding strongly implies that the Thirteenth Amendment was and still should be broadly applicable to other groups distinguished by their national origin, ancestry, or physiological features.

Although the Thirteenth Amendment's original meaning applies broadly to humans of different races, this is not sufficient to determine the issue regarding human-animal fusions. A race is not a species. Insofar as a human race is a true biological category at all,¹³⁶ it is closest to a subspecies with an indistinct boundary. The Thirteenth Amendment's "universal liberty" was applied to enslaved humans, not to horses in their stables or chickens in their coop, suggesting that the Amendment's original meaning distinguished between human persons, who were freed, and animal nonpersons, which remained the

135. *Hodges v. United States*, 203 U.S. 1, 17 (1906), *overruled by* *Jones v. Alfred H. Mayer Co.*, 392 U.S. 409 (1968).

136. In general, subspecies have biological features that more sharply distinguish their members as different from other creatures of the species, while the biological features of human "races" are more like a continuum lacking clear lines of demarcation. *See, e.g.*, PETER H. RAVEN & GEORGE B. JOHNSON, *BIOLOGY* 406–07, 420–21 (1986) (defining subspecies, but cautioning that human "races" are hard to characterize by particular combinations of racial traits). Because of this fact, and likely because of the many abuses associated with racial classifications, the American Anthropological Association has stated that for humans, the category "race" is an "arbitrary and subjective" classification scheme. *American Anthropological Association Statement on "Race,"* AM. ANTHROPOLOGICAL ASS'N (May 17, 1998), <http://www.aaanet.org/stmts/racepp.htm>. Given that racial groups are in some cases correlated with observable physiological traits, such as different incidences of particular hereditary diseases (e.g., sickle-cell anemia), this view may go too far in denying any biological basis to the category. *Learning About Sickle Cell Disease*, NAT'L HUMAN GENOME RES. INST., <http://www.genome.gov/10001219> (last updated Oct. 25, 2011) (sickle cell anemia is most prevalent among African Americans with one in twelve being carriers of the sickle cell trait).

But more importantly, for identifying the Amendments' original public meaning, what their enactors believed about race is more important than whether those beliefs were scientifically correct. At the time of the Thirteenth Amendment's enactment in 1865, conceptions of black slaves as biologically different in kind from—and inferior to—their white masters were common. *See, e.g.*, *American Anthropological Association Statement on "Race," supra*. This historical context of racial prejudice is deplorable on many grounds, but it strengthens the argument that the Thirteenth Amendment's original public meaning mandates the extension of personhood to genetically different, "inferior" species that have the properties characteristic of legal persons.

property of their masters.¹³⁷ Thus, although the Thirteenth Amendment's text and history suggest that it should apply to any person in servitude, its applicability to particular cases turns on the criteria for personhood implicit in American law.

III. The Properties of a Constitutional Person Can Be Inferred from Existing Law

Merely recognizing that criteria for personhood are implied in the law does not automatically reveal their fundamental nature or even guarantee that consistent, universally applicable legal criteria exist. However, it does suggest a procedure for identifying whatever standards that should apply. Proposed criteria for personhood can be compared with existing law to test if the proposed standard would yield results matching the current, implied standard. If the proposed criteria's results were to differ from the law significantly in some respect, it would be a signal to reject the criteria as a bad fit. Alternatively, if the new results were to seem more reasonable than existing law, it would be a motive to change the law to institute the new criteria.

A. Is Self-Awareness Necessary and Sufficient for Legal Personhood?

At least one commentator, Michael Rivard, has proposed a single criterion as "necessary and sufficient" for constitutional personhood: self-awareness.¹³⁸ Self-awareness is often defined as self-consciousness, the knowledge of oneself as an object as well as a subject.¹³⁹ This common definition, however, is a weak self-awareness, not the stronger version that Rivard advocates. Following Daniel Dennett and Harry Frankfurt, Rivard defines strong self-awareness more narrowly as possessing "second-order volition," or the quality of desiring to have dif-

137. See *Tilikum ex rel. People for the Ethical Treatment of Animals, Inc. v. Sea World Parks & Entm't, Inc.*, No. 11cv2476 JM(WMC), 2012 WL 399214, at **3–5 (S.D. Cal. Feb. 8, 2012) (discussing textual indications why the Thirteenth Amendment's prohibition does not apply to animals). The *Tilikum* court takes a strong stand against granting animals rights under the Thirteenth Amendment, but does not consider the possibility of novel part-human creatures. See *id.*

138. Rivard, *supra* note 21, at 1488.

139. See, e.g., *Self-Conscious*, DICTIONARY.COM, <http://dictionary.reference.com/browse/self-consciousness> (last visited Apr. 8, 2012) (defining the relevant sense of "self-conscious" as "conscious of oneself or one's own being").

ferent “preferences and purposes.”¹⁴⁰ Rivard argues that this strong self-awareness will allow a creature to understand, and presumably to desire, the constitutional interests of liberty and autonomy.¹⁴¹ If some members of a species display this quality, then all the species’ members should be granted constitutional personhood.¹⁴²

Weak self-awareness has some plausibility as a criterion for legal personhood, as self-consciousness seems a necessary precondition for perceiving ourselves as beings with legal rights and duties. Strong self-awareness has the added benefit of providing an explicit basis for a person’s understanding of some legal interests, as well as being a quality so far only identified in humans.¹⁴³ But an application of these definitions to existing law shows that neither weak nor strong self-awareness is a sufficient criterion for defining legal personhood as currently embodied in the law.

The first, weaker definition of self-awareness—self-consciousness, or the knowledge of oneself as an entity—is overbroad to serve as the definition for legal personhood. It would grant personhood to any self-conscious creature, but the law currently does not. For example, chimpanzees seem to be self-aware under this weaker definition. When a chimpanzee that has been familiarized with a mirror is marked on its face, it will use the mirror to examine the mark.¹⁴⁴ Chimpanzees unfamiliar with a mirror, however, do not check their reflections, nor do other monkeys even if they have been familiarized with a mirror. This self-recognition indicates a chimpanzee’s identification of its reflection with its body or “self.” Elephants and dolphins also seem to have this capacity for mirror self-recognition.¹⁴⁵ But these

140. Rivard, *supra* note 21, at 1486. Rivard contrasts this with “first-order volition,” which is the quality of desiring an object or experience. *See id.* (noting Dennett and Frankfurt’s definition of first- and second-order volition as discussed in DANIEL C. DENNETT, *Conditions of Personhood*, in *Brainstorms: Philosophical Essays on Mind and Psychology* 267, 283–85 (MIT Press 1981) (1978) and Harry G. Frankfurt, *Freedom of the Will and the Concept of a Person*, in *WHAT IS A PERSON?* 127, 128–29 (Michael F. Goodman ed., 1988)). Those without second-order volition include children, the mentally impaired, and nonhuman animals. *Id.* (quoting Frankfurt’s characterization of these groups as “wantons”).

141. *Id.* at 1487. A lawyer’s proposal that the conscious understanding of legal interests is the essential capacity for legal personhood perhaps invites skepticism, but its strength is in linking personhood with the appreciation of legal rights and duties necessary to respect the interests of other persons.

142. *See id.* at 1488.

143. *Id.* at 1486.

144. MARCO IACOBONI, *MIRRORING PEOPLE: THE NEW SCIENCE OF HOW WE CONNECT WITH OTHERS* 136–38 (2008) (describing the mirror experiments set forth in Gordon G. Gallup, Jr., *Chimpanzees: Self-Recognition*, 167 *SCIENCE* 86 (1970)).

145. *Id.* at 139–40.

animals are not considered legal persons.¹⁴⁶ Therefore, weak self-awareness cannot be a sufficient criterion for legal personhood, though it may be some evidence supporting a creature's legal personhood.

Though mere self-consciousness is too broad, the more narrow definition of strong self-awareness—second-order volition—also has some difficulties as a criterion. First, the apparent simplicity of the criterion fails in actual cases because its identification depends on a creature's capacity—and willingness—for communication. Humans can often communicate their second-order volitions through language. Without a common language, the second-order desire for a different nature would be hard to detect unambiguously. Even if second-order volition prompted a creature's actions, the intent to produce a change in one's being though the actions would be hard to distinguish from the intent to perform the actions themselves.

For example, consider two runners who follow the same training regimen. The first runner simply enjoys running (a first-order volition), while the second enjoys running, but is also trying to build endurance for another activity (a second-order volition). Both runners would exhibit similar behavior: they would both run and seem to enjoy running. An observer would have trouble distinguishing the two runners' motives by their actions alone, as their shared first-order volition would provide a sufficient rationale for their behavior. To identify the runner with second-order volition, it would be easiest—and perhaps even necessary—to ask the runners about their motives.

But if a fusion organism could communicate fluently enough to express second-order volition, it would be more capable than young children and some mentally disabled adults, all of whom are legal persons. Without some demonstration that the capacity to possess volition necessarily produces the capacity to express the volition in language, a test for strong self-awareness would in practice test both communication and self-awareness. If a creature were less sophisticated at communication than cognition, how could a reasonable observer reliably apply the test?

Second, even if strong self-awareness could be tested without relying on language, the criterion would still be overnarrow. Many legal

146. See, e.g., *Tilikum ex rel. People for the Ethical Treatment of Animals, Inc. v. Sea World Parks & Entm't, Inc.*, No. 11cv2476 JM(WMC), 2012 WL 399214, at *5 (S.D. Cal. Feb. 8, 2012) (holding that the Thirteenth Amendment only applies to humans, not orcas); *Cetacean Cmty. v. Bush*, 386 F.3d 1169, 1171 (9th Cir. 2004) (denying standing for cetaceans to sue).

persons do not seem self-aware in this sense at all. For example, under governing precedent a human is legally recognized as a person at birth,¹⁴⁷ which seems to precede self-awareness of either sort. And even in cases of dementia or severe brain damage with no hope of recovery, a human person may not be actively euthanized by a legal guardian, while a nonperson, such as a dog, can be killed by its owner.¹⁴⁸ Instead, only the withholding of lifesaving medical treatment is legally permissible, and it generally requires evidence of the patient's wish to decline treatment, even if the patient were no longer capable of expressing it.¹⁴⁹

Rivard attempts to fix this apparent problem with the criterion by extending constructive personhood to infants and children because of their social value to strongly self-aware persons, a value that he describes as "social cohesion within a species."¹⁵⁰ However, this implies that the personhood of children and other creatures without strong self-awareness is contingent on others' interest or a societal interest rather than any intrinsic quality. In a society that did not value them, completely unwanted children or mentally impaired adults presumably should not be legal persons, as they would lack any interested party or group to provide them with social value. In such a society, the painless killing of unwanted children or the mentally impaired should logically be permissible, as no genuinely self-aware person would be

147. See *Roe v. Wade*, 410 U.S. 113, 158–62 (1973) (excluding the unborn from constitutional personhood, but not newborn infants: "[T]he word 'person,' as used in the Fourteenth Amendment, does not include the unborn."). However, the law does recognize certain rights even before birth. For example, many states have historically allowed a property right to vest before birth, though the right would not be perfected until live birth. *Id.* at 162 (referring to inheritance rights of the unborn); John P. Wilson, *Fetal Experimentation: Legal Implications of an Ethical Conundrum*, 53 DENV. L.J. 581, 596 & nn.66, 69 (1976). In many states, attacks on pregnant women causing late-term miscarriage can be prosecuted as homicide. See *id.* at 597–98. See generally Wilson, *supra* (discussing the legal status of the fetus *in utero*); Gregory J. Roden, *Unborn Children as Constitutional Persons*, 25 ISSUES L. & MED. 185 (2010) (discussing legal precedents for prebirth personhood in an attack on *Roe v. Wade*).

148. See, e.g., *Washington v. Glucksberg*, 521 U.S. 702, 728 (1997) (rejecting arguments for a fundamental right to physician-assisted suicide). The legal personhood of the demented and dying further suggests that legal personhood is durable. For example, an elderly man with advanced Alzheimer's disease loses the ability to act purposefully, to speak, and eventually to move his body in voluntary action. This mental degeneration slowly strips away the qualities that we normally associate with a person. Despite this loss, his legal personhood will endure until death. He may be declared incompetent, but he is never declared an object. This suggests that it should be impossible to "unperson" a living creature who is legally recognized as a person.

149. See *Cruzan v. Dir., Mo. Dep't of Health*, 497 U.S. 261 (1990).

150. Rivard, *supra* note 21, at 1489.

directly harmed. Ignoring for a moment the moral problems with such a result, it flatly contradicts governing law.¹⁵¹

Further, Rivard restricts this social cohesion on a genetic basis by species, which he otherwise rejects as an arbitrary way to limit personhood.¹⁵² Experience suggests that some animals are held in high regard by strongly self-aware persons, such as the beloved pet of an animal-loving, childless person. Because many pets, like most non-self-aware children, are very important to strongly self-aware persons, by similar logic these pets—or at least the favored elite animals held in particular regard—should be imputed with constructive personhood because of their value to the self-aware. To do otherwise would be inconsistent. But if pets could be imputed with personhood, why shouldn't their killing be considered homicide?

These two results—permissible child-killing and pets with legal personhood—seem not to reflect the concept of personhood implicit in prevailing law. Thus, self-awareness in either a weak or strong form is not the right criterion.

Indeed, the temptation to establish a single mental quality as determinative of personhood may well produce an oversimplified scheme for categorizing mental activity, especially if the quality must be easily testable. Because mental activity involves a large number of diverse capacities, animals resist being easily ranked on a single ladder of being from the most advanced creature—conveniently humans, the adopters of the scale—to the lowest bacterium. Rather than a single quality, it may be better to weigh a number of capabilities to judge whether a human-animal fusion should be categorized as a legal person.¹⁵³

151. See, e.g., *Cruzan*, 497 U.S. at 278 (confirming a competent person's right to refuse medical treatment); *Glucksberg*, 521 U.S. at 731–35 (describing the State interest in preventing assisted suicide to protect “vulnerable persons,” such as disabled infants and the elderly, from involuntary euthanasia).

152. See Rivard, *supra* note 21, at 1489–90 (discussing the rationale for not requiring strong self-awareness from each individual, such as a baby, before granting them legal personhood); *id.* at 1466–70 (criticizing the limitation of personhood to genetically *homo sapiens* organisms as akin to racism). Rivard's apparent purpose—to protect infants from exploitation—is laudable, but his theory as described does not seem to support it.

153. See Cobbe & Wilson, *supra* note 22, at 182 (ascribing human uniqueness to “a suite of different characteristics” rather than a single factor).

B. Comparing Humans with Chimpanzees Suggests Criteria for Legal Personhood

From the time of the Thirteenth Amendment's adoption until today, animals such as chimpanzees and dolphins have been legal nonpersons.¹⁵⁴ Their status has not changed despite increasing scientific evidence about their many humanlike capacities.¹⁵⁵ Because they are highly intelligent nonpersons, these species of animals provide clues to the law's implicit requirements for legal personhood.

Chimpanzees seem to have many characteristics that people associate with humans. They can use simple tools to accomplish their goals and they may prepare them in advance of their need.¹⁵⁶ Unlike less intelligent monkeys, they can recognize their reflections in a mirror, suggesting that they have some capacity for self-consciousness.¹⁵⁷ They may be taught some sign language, though the extent of their capability for understanding the meaning of language has been questioned.¹⁵⁸ But they are still legally nonpersons. Therefore, having some capacity for tool use, self-consciousness, and language is not per se qualification for legal personhood, though these capacities may be evidence supporting personhood in an implicit threshold or totality of the circumstances test.

Chimpanzees do seem to lack sophisticated human capacities, such as the connection of actions with their moral significance. For example, chimpanzees do not seem to have any understanding of themselves or their troopmates as moral agents.¹⁵⁹ Aberrant chimpan-

154. See *Tilikum ex rel. People for the Ethical Treatment of Animals, Inc. v. Sea World Parks & Entm't, Inc.*, No. 11cv2476 JM(WMC), 2012 WL 399214, at **3-5 (S.D. Cal. Feb. 8, 2012) (discussing textual indications why the Thirteenth Amendment's prohibition does not apply to animals).

155. See *infra* notes 156-58.

156. MARY MIDGLEY, *BEAST AND MAN: THE ROOTS OF HUMAN NATURE* 226-27 (Routledge rev. ed. 1995) (1979) (discussing chimpanzee tool use as described in JANE GOODALL, *IN THE SHADOW OF MAN* app. C (rev. ed. 1988)).

157. IACOBONI, *supra* note 144, at 136-38 (describing the mirror experiments set forth in Gordon G. Gallup, Jr., *Chimpanzees: Self-Recognition*, 167 *SCIENCE* 86 (1970)).

158. See, e.g., DOUGLAS KEITH CANDLAND, *FERAL CHILDREN AND CLEVER ANIMALS: REFLECTIONS ON HUMAN NATURE* 318-19 (1993) (describing human-ape communication researcher Hebert Terrace's concerns that chimpanzees' signing did not truly signify language use and citing HERBERT S. TERRACE, *NIM* 221 (1979)).

159. MARY MIDGLEY, *CAN'T WE MAKE MORAL JUDGEMENTS?* 159-60 (1993) (discussing the significance of chimpanzee nonjudgmentalism as observed by Jane Goodall); see JANE GOODALL, *THE CHIMPANZEES OF GOMBE: PATTERNS OF BEHAVIOR* 351-52 (1986) (describing a successful cannibalistic attack, followed by the mother's apparent reconciliation with her attacker less than two hours later). In Goodall's more detailed description of one attack, the attacked chimpanzee's older child did attempt to help her mother. *Id.*

zees have observed to kill and eat the young of other chimpanzees in the same troop, and although the mothers attempted to stop the attacks, the rest of the troop ignored the episode.¹⁶⁰ The cannibalistic chimpanzee was not afterwards treated differently by the others.¹⁶¹ Such apathy seems very difficult to imagine in humans observing the murder and cannibalism of a neighbor's children. Even if they could not intervene, they would make judgments about the cannibal's actions, and those judgments would almost certainly influence their treatment of the cannibal. Among humans, an observer's chimpanzee-like apathy would likely provoke condemnation in its own right.

Despite its value, the moral sense should not be established as the single, defining characteristic of legal persons any more than self-awareness should be. Such a quality could be hard to identify in another species unless the creature could describe its mental states to humans, which would already demonstrate a degree of introspection and abstract language use never before encountered in nonhuman animals. Even so, if demonstrated, it would provide very good evidence of personhood. The ability to understand a moral or legal prohibition, like other high-level analytic or expressive mental capabilities, is often demonstrated by humans and rarely (if ever) observed in other species. Similar qualities requiring mental sophistication, such as high artistic ability or mathematical reasoning, should also be interpreted as strong evidence of personhood.

The lower status of chimpanzees as compared to severely mentally impaired humans also suggests that the law's criteria for legal personhood include a presumption in favor of humans over other species. Although this presumption could be viewed as an unreasonable bias, it can be justified by the same implicit reasoning underlying the general rejection of solipsism. People can plausibly infer from their subjective experience of their own moral agency, self-awareness, and personhood that other creatures like them also have these capacities and are persons. This additional subjective evidence in favor of personhood supports a presumption favoring humans. For human-animal fusions, this also suggests that human-derived organisms should have a lower burden in proving that they are persons.

160. MIDGLEY, *supra* note 159, at 159.

161. *Id.*

IV. The Proposed Test: The Source-Dependent Presumption of Humanity

Using highly intelligent animal nonpersons as a threshold allows the framework of a test for legal personhood to be assembled. Like several of its antecedents,¹⁶² this test incorporates presumptions to assign the burden of proof for legal personhood. To patent a human-animal fusion, the patentee would need to overcome a presumption that the fusion organism is a legal person. The burden of overcoming this presumption would vary depending on the amount and type of the genetic materials incorporated into the fusion organism.

The test's specific details may not all emerge inevitably from the underlying constitutional materials, but it is an attempt to interpret them fairly to extract their implicit propositions and to construe their application to the new case of human-animal fusion organisms. The test's goals are to create a broad framework applicable to any kind of fusion organism, making the legal determination of personhood consistent for all cases, and to tie the personhood analysis to benchmarks set by animal nonpersons, making the test's determination as objective and fact-based as possible.

Under the test, a particular fusion organism would first be classified into one of three groups: (1) organisms previously identifiable as humans; (2) organisms not recognized as humans, but incorporating human cells or genetic material; and (3) organisms neither recognized as humans nor incorporating human cells or genetic material. Each group would be subject to a different presumption controlling the burden of proof for the determination of patentability and personhood. This tripartite division would provide the greatest protection to those organisms most likely to be legal persons and thus most likely to suffer injustice if denied personhood.

162. See Rachel E. Fishman, Comment, *Patenting Human Beings: Do Sub-Human Creatures Deserve Constitutional Protection?*, 15 AM. J.L. & MED. 461, 480–81 (1989) (proposing a definition of human being for incorporation into an amended Patent Act); Rivard, *supra* note 21, at 1487–88 (setting forth a chimera patentability test based on a narrowly defined form of self-consciousness); Hagglund, *supra* note 7, at 79–80 (setting forth a chimera patentability test based on the balancing of mental capacity and physical similarity to humans); D. Scott Bennett, Comment, *Chimera and the Continuum of Humanity: Erasing the Line of Constitutional Personhood*, 55 EMORY L.J. 347, 379–86 (2006) (setting forth an alternative test also using a presumption framework); Mark Jagels, Comment, *Dr. Moreau Has Left the Island: Dealing with Human-Animal Patents in the 21st Century*, 23 T. JEFFERSON L. REV. 115, 142–43 (2000) (proposing a rebuttable presumption against patenting genes associated with “intellect, behavior, or emotion”); F. Patrick Hubbard, “Do Androids Dream?": *Personhood and Intelligent Artifacts*, 83 TEMP. L. REV. 405, 419–28 (2011) (setting forth a capacity-based test for the personhood of artificial intelligences).

A. The First Group: Organisms Previously Identifiable as Human Organisms

For the first group—any individual organisms formerly identifiable as a human organism—the presumption of humanity would be nonrebuttable. Because under governing precedent, all living, born humans are recognized as persons under the Constitution,¹⁶³ no fusion organisms that were previously recognized as human persons would have their rights stripped away. This presumption would provide the rationale for preserving the constitutional rights of human xenotransplantation recipients, including their Thirteenth Amendment right not to be patented. For example, if a scientist patented a genetically engineered animal organ useful for xenotransplantation, patients receiving the organ could not be patented as a whole organism comprising the organ.

But the nonrebuttable presumption of humanity would not automatically grant legal personhood to formerly human organisms at all stages of development. Instead, the presumption would guarantee that any organism that was once genetically human would have the same rights that a human would at the same stage of development. Under governing precedent, early-stage human embryos are not recognized as legal persons, but infant humans' legal personhood is recognized by the time of their live birth.¹⁶⁴ Although fusion embryos that were once human organisms would receive no additional rights than their genetically human counterparts,¹⁶⁵ upon birth—or the equivalent state of independent viability—they would be recognized as legal persons just as human infants are.

This presumption would provide consistency with the status of personhood granted to other human organisms. Infants are recognized as legal persons without a test of their capacities, even if they are both mentally and physically impaired. A fusion organism that was previously a genetically human organism would be closely analogous to a child with birth defects attributable to human-caused environmental stresses. The difference would be that the fusion organism's "birth defects"—its animal component—would be produced inten-

163. See *Roe v. Wade*, 410 U.S. 113, 158–62 (1973) (recognizing newborn infants as legal persons).

164. See *id.* (excluding the unborn from constitutional personhood, but not newborn infants).

165. Cf. Streiffer, *supra* note 11, at 243–44 (suggesting that guidelines for chimeric human-animal embryo research should be no less restrictive than for research on comparable animals, but no more restrictive than for research on unmodified human embryos).

tionally, not accidentally. This intentional damage to the organism would provide even stronger reason to protect its rights, even if they did not vest until birth.

If a fusion organism were radically modified, its original status under the law might be unclear. For example, if a human brain were transplanted into an artificial body composed of animal-derived organs, it could be viewed either as previously a legal person, if the brain were considered as the primary source for the organism, or previously a nonperson, if the body were considered as the primary source. Because the brain is the physical locus of mental activity,¹⁶⁶ the identification of whether such a composite organism was previously a legal person should depend on the original source of the brain. Therefore, if a human head and brain could be grafted onto a pig's body,¹⁶⁷ the newly piggish "humanimal"¹⁶⁸ would still be recognized as an unpatentable human person.

B. The Second Group: Organisms Not Previously Recognized as Human, But Possessing Human Genes

For the second group—individual organisms that are not recognized as humans or persons under the law, but contain some human genes or cells—the presumption of humanity would be rebuttable, with the burden of proof placed on the prospective patentees. This would allow patenting of fusion organisms if their prospective owners could rebut the test's presumption. Rebuttal would require passing a two-prong test: (1) the mental capacity prong, a showing of sufficiently low potential mental capacity so that the creature, when fully developed, would not have mental facilities substantially superior to the most intelligent or humanlike animals; and (2) the physical dissimilarity prong,¹⁶⁹ a showing that the creature, when fully developed, would lack substantial similarity to human appearance. The second prong of the test would apply mostly to protect humans, who might be exploited or otherwise harmed under the guise of fictitious fusion organisms.

166. See, e.g., STEPHEN WALKER, ANIMAL THOUGHT 106 (1983) (discussing the relation between brain states and subjective awareness).

167. Such a direct graft likely would be impossible, but a piece-wise replacement of over half of a human body by animal-derived or prosthetic replacements might not be.

168. Cf. CFM5632, *Manimal (Ep 1)*, YOUTUBE (Feb. 29, 2012), <http://www.youtube.com/watch?v=RS8CKij8YeU> (coining a similar term to describe the series' shape-shifting protagonist).

169. Hagglund, *supra* note 7, at 79–80 (setting forth a rationale for a physical similarity prong to a standard for humanity).

Although each prong would require the evaluation of multiple factors, this two-prong test would not balance each prong against the other for the overall determination of personhood.¹⁷⁰ Instead, its prongs would be considered separately, with the separate prongs' thresholds set to exclude all those species generally agreed not to be legal persons under existing law. To avoid corruption of the test, the test for personhood would lack a utility exception or factor.¹⁷¹ The determination of whether an organism should qualify as a legal person would be made without considering the advantages if the organism were not.

The threshold level for the mental capacity prong is difficult to identify, but to minimize the chance of a false negative, the threshold would be a highly intelligent animal that is currently accepted to be a legal nonperson—the chimpanzee.¹⁷² An alternative animal for the mental threshold test, and perhaps a better alternative for fusion organisms without hands, would be the dolphin.¹⁷³ Given the number of different characteristics associated with humanity—self-consciousness, intentionality, moral agency, and the awareness of other creatures' agency, among others¹⁷⁴—evaluation of an organism's mental capacity would be based on the totality of circumstances. Would a reasonable person, looking at the totality of circumstances, judge the creature to be more humanlike than a chimpanzee or dolphin?

The reasonable person for the mental activity prong should be a qualified expert in animal behavior. A reasonable, but unqualified

170. In contrast, Hagglund's standard uses a "sliding scale" approach that balances a chimera's physical and mental similarity to humans. *Id.*

171. *But see, e.g.,* Jagels, *supra* note 162, at 142–43 (proposing a rebuttable presumption against patenting genes associated with "intellect, behavior[,] or emotion," but allowing rebuttal by a showing of "societal benefits"). Jagels makes his proposal regarding genes, so it is not precisely analogous. However, regardless of the merits of his scheme for genes, it should not be applied to creatures that may be persons with their own interests. The refusal of constitutional rights to creatures when it would be useful for them to be nonpersons has unhappy historical parallels with nineteenth-century slavery.

172. *See* Stephen R. Munzer, *Human-Nonhuman Chimeras in Embryonic Stem Cell Research*, 21 HARV. J.L. & TECH. 123, 133–34 (2007) (defining "enhanced chimeras" as having cognitive capacities equivalent to a chimpanzee and "dramatically enhanced chimeras" as having capacities equivalent to a human). Munzer develops a set of moral principles for the creation and treatment of human-animal chimeras. *Id.* at 136–39. The presumption test proposed in this Comment could be viewed as assigning the legal burden of persuasion for adjudicating which category that a particular fusion organism occupies.

173. *See, e.g.,* DONALD R. GRIFFIN, *ANIMAL MINDS* 211–17 (1992) (presenting evidence of dolphins' advanced mental capabilities).

174. Interestingly, chimpanzees and some other primates may already possess many of these capabilities, though not at average human levels. *See generally* JIM GRIGSBY & DAVID STEVENS, *NEURODYNAMICS OF PERSONALITY* 203 (2000).

layperson is more likely to project humanlike characteristics onto animal behavior, even unwarrantedly, and thus reach an incorrect conclusion about the creature's mind.¹⁷⁵ This standard would be analogous to the "person having ordinary skill in the art" standard used for determining nonobviousness in patent law.¹⁷⁶ In contrast, the reasonable person for the second, physical similarity prong should be an ordinary citizen without special expertise, as the relevant quality—appearance—should be gauged on how ordinary citizens would perceive the fusion if they encountered it. If an ordinary citizen would confuse the fusion organism with a human, making it hard to assess whether a particular creature were a legal person, then it would create too much confusion and opportunity for abuse even if a qualified expert could still distinguish the fusion organism from a human. For example, the sale of humanlike chimera could become a cover for open human trafficking.

This proposed test for estimating higher mental capacity carries with it the flaw inherent to a totality of circumstances test: possible inconsistency and unpredictability as different judges apply their own individual standards to the test's framework. Like the "reasonable person" standard for tort liability, however, it is the best option available for this particular problem. Given the widely disparate definitions of human nature and purposes held by different subgroups within our society, establishing a broadly accepted definition of distinctively human characteristics applicable to all cases seems impossible.¹⁷⁷ But abandoning any attempt to distinguish humanlike from nonhumanlike fusion organisms would allow troubling practices, such as the enforced servitude of near-human fusion organisms. Even otherwise antagonistic subgroups are all highly likely to reject such practices as wrong. Without a reasonable and socially accepted definition for what constitutes the essence of humanity, the occasional inconsistency produced by a totality of the circumstances test is preferable to the risk of consistent, severe injustice produced by restricting personhood only to unmodified, genetically "pure" human persons.

175. See, e.g., KONRAD LORENZ, KING SOLOMON'S RING: NEW LIGHT ON ANIMAL WAYS 77–79 (Marjorie Kerr Wilson trans., Routledge Classics 2002) (1952) (discussing how naïve observers have mistakenly believed animals to be thinking, counting, or talking when they were instead reacting to subtle, involuntary cues from their owners).

176. MPEP, *supra* note 62, § 2141 (instructing examiners how to determine if a patent claim is obvious under 35 U.S.C. § 103).

177. For example, a Roman Catholic and an atheist would weigh the capacity for forming religious beliefs differently in assessing a fusion organism's higher mental capacity.

C. The Third Group: Organisms Not Previously Recognized as Humans and Without Human Genes

For the third group—individual organisms not previously recognized as humans or persons under the law and not possessing some human genetic material or gene sequences—no presumption of unpatentability would be applied. However, the organism would be classified as a legal person, and therefore unpatentable, if the trier of fact could positively establish either (1) sufficiently high potential mental capacity, which would give the organism near-humanlike capabilities; or (2) physical similarity to humans, which would cause other humans to interact with the fusion as if it were human.

These two prongs would be applied using the same standards as the presumption of humanity discussed above, albeit for establishing similarity rather than dissimilarity. The mental capacity prong would require a showing that the creature, when fully developed, would have mental facilities that were substantially greater than an unmodified chimpanzee or dolphin. The physical similarity prong would require a showing that the creature, when fully developed, would have a substantial similarity to human appearance.

This standard for the third group could be met by a preponderance of the evidence, but it could also be applied as a presumption of patentability under § 101, which would make any challenge to patentability more difficult. Given that a hypothetical fusion-organism lab animal would likely not be as capable of presenting its case as those attempting to establish its patentability, a preponderance of the evidence standard would likely be better than a presumption of patentability.

D. Test Cases

Applying these criteria to some test cases allows a judgment of how well the test would work. First, adult human xenotransplantation recipients who received a pig organ or tissue would be unpatentable legal persons under the test. They would have previously have been recognized as humans and legal persons, making them part of the first group with its nonrebuttable presumption of humanity.

A human-chimpanzee chimera that was created by adding chimpanzee stem cells to a human embryo would also be unpatentable. As a formerly human organism, the chimera would fall into the first group with its nonrebuttable presumption of humanity. During the embryo stage, it would only have the same rights as an analogous

human embryo. But if implanted in a surrogate mother and carried to term, the chimera would receive the same rights as an analogous human infant: legal personhood and its accompanying civil rights, including unpatentability under the Thirteenth Amendment.

A chimeric rat with a brain incorporating human nerve cells would likely still be patentable. Because it would be a nonhuman organism that contained some human cells, it would fall into the second group, so its inventors would need to rebut a presumption of its humanity to patent it. However, rebutting the presumption would likely not be difficult. If the size and organizational scheme of its brain were still rodentlike, a reasonable scientist would expect its mental capabilities to be low, which would meet the first, mental capacity prong of the test.¹⁷⁸ Its different brain cells would not make the rat's appearance humanlike, which would meet the second, physical dissimilarity prong of the test.

A human-chimpanzee chimera with a human-derived heart, liver, and intestines would also likely be patentable. Like the chimeric rat, the chimpanzee's human components would create a presumption of its humanity and unpatentability, but the presumption would likely be rebutted. A reasonable scientist would not expect the creature's human organs to affect the mental functions that distinguish humans from chimpanzees, which would meet the mental capacity prong of the test. The human internal organs would also not make the chimpanzee appear more humanlike, which would meet the physical dissimilarity prong.

However, a chimeric chimpanzee with all human brain cells or a hybrid chimpanzee with human genes related to cognition would likely not be patentable under this standard. The human nerve cells or genes would create a rebuttable presumption of unpatentability, and it would be difficult to overcome. Because the brain's structure and composition is related to mental activity, a reasonable scientist might predict that such a creature would be more mentally humanlike than its unmodified chimpanzee peers. If so, the presumption against its patentability would stand. If only part of a chimpanzee's brain were replaced by human nerve cells, the result of the test would likely be fact-specific. It might depend whether the human cells were incorporated into part of the brain associated with cognition, such as the cerebrum, rather than part of the brain associated with the autonomous

178. But perhaps this underrates the effects that human cells would produce, for the National Academy of Sciences has urged caution in creating chimeras with human nerve cells. See NAT'L ACADS., FINAL REPORT, *supra* note 26, at app. C §§ 6.4, 6.6, 7.3, 7.4, 9.0.

nervous system, such as the brain stem.¹⁷⁹ It might also turn on whether the human cells assembled into more humanlike structural elements.

A human-dog hybrid with human movie-star appearance and dog-like mental facilities would also not be patentable. If the engineered part of its genetic code were copied from the human genome, it would have a presumption of unpatentability that would be difficult to overcome. Though expert testimony would show that it were still only as intelligent as a dog, which would meet the mental capacity prong, it would be substantially similar to humans in appearance and would thus fail the second prong of the test. Even if the hybrid's genes were constructed *de novo* without copying human gene sequences, making it fall into the third group, its great similarity to the human form would establish its unpatentability under the test. If it were declared a nonperson, the opportunities for abuse and exploitation (both of it and of humans) would be too great.

A dolphin bioengineered with artificial, nonhuman genes for enhanced cognition from a nonhuman mammal might be patentable depending on the level of mental enhancement produced. The modified dolphin would fall into the third group, organisms neither previously recognized as human persons nor possessing human genetic material. The dolphin would not be physically similar to humans, meeting the second prong of the test for patentability. But it might fail the first prong depending on how much the genes enhanced its intelligence. In such a case, the trier of facts would have to assess expert testimony as to whether the fusion organism was substantially enhanced over unmodified dolphins, which would depend entirely on the effects of the added genes.

In summary, this Comment sets forth a proposed test for patentability designed to avoid this possible harm: the source-dependent presumption of humanity. For any organism that was previously a fully human organism, the presumption would be nonrebuttable. No one who would otherwise be granted the legal rights of a person could have them stripped away. For a genetically modified organism not previously human, but imbued with some human genetic material, the presumption of humanity would be rebuttable. This would allow the organism's patenting if the organism's inventors could show that their inventions were substantially dissimilar to human persons both men-

179. See generally WALKER, *supra* note 166, at 174–93 (discussing the organization of the brain in vertebrates and how certain areas correlate with different brain functions).

tally and physically. For genetically modified organisms neither previously recognized as persons nor including human-derived materials, no presumption would apply, but their personhood and unpatentability could be established by a showing of physical or mental similarity to humans.

V. Possible Complications with the Test and Some Proposed Resolutions

Every legal test, if implemented, must be applied to the messy particularity of actual disputes. And, here, trouble may arise. In practice, this proposed test would have some possible complications, but they can be resolved.

A. A First Complication: Biological Unpredictability

The first complication is our limited ability to predict how a fusion organism's cells and genes would interact to produce some physiological qualities, such as greater self-awareness or a humanlike appearance. As scientific knowledge about fusion organisms and gene function increases, predicting a fusion organism's properties will likely be less of an educated guess. Now, however, it would take much better knowledge than we currently have to provide anything more than a best guess. For the proposed totality of the circumstances test to provide a meaningful restraint, the creators of a fusion organism should be able to predict its capabilities. If this were impossible, it would be necessary to make the fusion organism to determine its patentability. Because the resulting uncertainty would make it harder to predict the return from such projects, it would discourage private innovation.

One possible solution to this problem is to use a reasonability standard to identify whether a reasonable molecular biologist or geneticist would predict that the organism would have a particular property. During prosecution of a patent application claiming a fusion organism, the patent examiner would reject a claim based on its *prima facie* likelihood of encompassing particular claim embodiments that would fail the presumption of humanity test, and the applicant would have the opportunity to rebut the examiner's arguments. This is analogous with how a U.S. patent examiner would apply prior art to determine if the reasonable person of skill in the art would find patent claims to be nonobvious,¹⁸⁰ so examiners would have some experi-

180. MPEP, *supra* note 62, § 2141.

ence with a similar test. But the reasonability standard would be more difficult to apply. It would require the reasonable molecular biologist's prediction of characteristics that the reasonable expert in animal behavior would identify under the totality of circumstances. This prediction of two hypothetical persons' opinions seems challenging for an examiner or jury to evaluate fairly and predictably.

A better alternative would be to make the assessment based on the patent applicant's good-faith analysis of whatever evidence that there was at the time of the patent's examination. This would fall within the current duty of disclosure, which requires applicants and their agents to provide the USPTO with any known information that would be material to the determination of their claims' patentability.¹⁸¹ A good-faith analysis would likely prevent patents on creatures most likely to be legal persons, given that the scientists conducting the experiments would likely know what qualities that they intended to produce and would have a duty of disclosure to provide relevant evidence to the USPTO. This might seem to provide less protection to the hypothetical fusion organism, as it could encourage scientists to avoid learning things that might lead to an inconvenient good-faith belief. But despite this possible pitfall, it would likely be a better, more practically applicable alternative.

Under either standard, if new evidence was produced tending to show more humanlike properties, the patent would preferably be challengeable through some form of administrative procedure, such as a modified form of reexamination based on published evidence of the fusion organism's capabilities.¹⁸² This mechanism would allow correction of any mistakes in the initial determination, which would help to prevent injustice. Given the uncertainties involved in appraisals of an animal's mental capabilities, this would also allow for modification of an organism's status as more information about its capabilities became available.

181. See MPEP, *supra* note 62, § 2001 (stating applicants' duty of disclosure to the USPTO under 37 C.F.R. § 1.56 (2011)).

182. For such a reexamination-based procedure to be effective, it would have to allow submission of art published after the filing date of the patent. This would likely require a statutory change. See 35 U.S.C. § 302 (2006) (providing a statutory basis for reexamination based on "prior art"); MPEP, *supra* note 62, § 2003.01 (discussing *ex parte* reexamination based on prior art); cf. Thomas Schneck, *Patenting Human Life, a Multidimensional Problem*, 32 LINCOLN L. REV. 1, 24–25 (2004) (proposing a "Rule of Doubt" allowing postissuance challenge of human cloning patents not "clearly violative" of the Patent Office's guidelines).

B. A Second Complication: Measuring Mental Capabilities

A second complication would be evaluating the mentality of fusion organisms, especially nonhumanlike organisms. For example, the mental capacities of a whale or octopus with human brain cells or spliced human brain-related genes would be hard to determine. Its different sensory capabilities and temperament would make it harder for a human to understand the fusion organism's perception of the world around it. Even if genetic manipulations made these nonhumans the mental equals of humans, their very different nature might make them express their intelligence in a very different way.¹⁸³ For example, attempts to communicate with other creatures might not interest a naturally solitary or asocial creature even if genetic engineering gave it greater linguistic capabilities.

But as with the first complication, as scientific knowledge about gene function increases, predicting a fusion organism's properties will likely become less of an educated guess. Further, as a creature became the target of genetic engineering, understanding its perceptual capabilities and behavior would likely become a higher priority, especially if such an understanding it were necessary to overcome a presumption of unpatentability. The resulting scientific work would help in assessing the creature's mental capacity. And because of their greater dissimilarity to humans, more unusual creatures like octopuses may also be less useful for medical experimentation. Thus, these harder instances of the problem would be less common in the test's actual application.

Although the difficulty of assessing a fusion organism's mental abilities would have to be considered in the totality of the circumstances test for mental capacity, this problem should not destroy the test's applicability or usefulness.

183. Given the different habitat and habits of such creatures, they are more likely to have different perceptual abilities and ways of responding to their environment than humans. These differences could make it harder to apply human tests for mental capabilities. See Munzer, *supra* note 172, at 131 n.34 (citing LESLEY J. ROGERS, MINDS OF THEIR OWN: THINKING AND AWARENESS IN ANIMALS 56–57 (1997)) (noting that a test measuring animal IQ may be impossible because animal species vary so much in their senses and in their manner of processing information). See generally Todd M. Preuss, *What Is It Like to Be a Human?*, in THE COGNITIVE NEUROSCIENCES III, at 5 (Michael S. Gazzaniga ed., 3d ed. 2004) (comparing distinctive features of human cognitive specialization with other animals).

C. A Third Complication: Standing to Challenge the Determination of Personhood

Both complications of the test discussed above would require interested parties to challenge the patents to assure that any later evidence about a creature's mental capabilities is released. Given the history of chimera patents, any patent specifically directed to human-animal fusions will likely be challenged by animal-rights groups or anti-biotechnology activists, especially if it seemingly exceeded USPTO guidelines. Without banning fusion organism experiments or making the entire subject matter area unpatentable, one possible way to encourage the release of information would be allowing third parties standing to challenge the patent based on later evidence of the patented creature's personhood. Although a California court has rejected an animal-rights group's attempt to gain standing on behalf of killer whales, a similar approach for an entirely novel creature might be viewed more favorably.¹⁸⁴

Another way that might result in fewer lawsuits would be to establish an alternative procedure for challenging these patents after issuance, whether by an administrative process like patent reexamination or a more quasi-judicial process. A general postgrant opposition procedure was included in the America Invents Act, though it was restricted to references submitted very soon after issuance.¹⁸⁵ This proposed procedure would probably not allow enough time for evidence about the organisms' characteristics to emerge. But if the time line were to be extended, the criteria for a challenge under such a method should be restricted to avoid a "heckler's veto"¹⁸⁶ for all patents involving chimeras and hybrids.

184. *Tilikum ex rel. People for the Ethical Treatment of Animals, Inc. v. Sea World Parks & Entm't, Inc.*, No. 11cv2476 JM(WMC), 2012 WL 399214, at *5 (S.D. Cal. Feb. 8, 2012) (rejecting a suit filed in behalf of killer whales); *see also* *Cetacean Cmty. v. Bush*, 386 F.3d 1169, 1171 (9th Cir. 2004) (denying standing for cetaceans to sue).

185. Pub. L. No. 112-29, § 33, 125 Stat. 288, 340 (2011) (amending 35 U.S.C. to include §§ 321–329, which set forth the new mechanism for postgrant review available up to nine months after a patent's issuance or reissue).

186. A heckler's veto is an objector's ability to prevent speech by the threat of a violent response. *See* Ruth McGaffey, *The Heckler's Veto: A Reexamination*, 40 MARQ. L. REV. 39, 39–41 (1973) (discussing the problem of the heckler's veto). Here, the veto would be repeated challenges to a disliked patent right.

D. A Final Complication: The USPTO's Authority to Set Limits to Patentability

A common objection to the USPTO's delineating a boundary of patentable subject matter is that only Congress, and not the USPTO, has the authority to draw such a line.¹⁸⁷ In practice, however, the USPTO has more interpretive discretion than such an objection allows. Given any particular application that is controversial, the agency must make a *prima facie* determination whether the particular case meets the statutory and constitutional standards for patentability. In the absence of judicial precedent that authoritatively interprets the appropriate statutory and constitutional provisions, the agency's officers must use their judgment to predict what the authoritative interpretation will be. They cannot avoid making a judgment: establishing a policy permitting the controversial application is in effect judging that the courts will agree that it is patentable. As *Chakrabarty* and the America Invents Act show, establishing a patentability policy using the agency's best understanding of the law will encourage judicial or legislative clarification of the law. If the agency's policy were to prove irrelevant, no one would care enough to contest it. But if the policy were to impact a growing field of lucrative scientific research, it would likely provoke a challenge that would result in a better definition of the law.

Conclusion

This Comment has proposed that the Thirteenth Amendment presents an absolute bar to any human ownership of humans, even through patent rights. This bar can best be applied to human-animal fusion organisms through a source-dependent presumption test for determining their legal personhood. Although the Constitution has

187. See, e.g., DeBré, *supra* note 71, 250–52 (arguing that the USPTO has no authority or competence to reject a patent for unconstitutionality); see also Rivard, *supra* note 21, at 1443 & n.72 (arguing that without congressional delegation the USPTO “clearly lacks authority” to distinguish humans from nonhumans, and Supreme Court precedent gives an administrative agency only narrow authority to interpret the law implicating a fundamental right like freedom from slavery). Rivard also argues that courts could also invoke the rarely used nondelegation doctrine to prevent the USPTO from interpreting the Thirteenth Amendment. *Id.* at 1443 n.74.

The AIA's explicit prohibition of patenting humans, however, should provide the USPTO with authority to interpret whether inventions fall within the scope of the statutory provision just as it did for multicellular organisms. See Pub. L. No. 112-29, § 33, 125 Stat. 288, 340 (2011) (stating the statutory prohibition); *Animal Legal Def. Fund v. Quigg*, 932 F.2d 920, 927–28 (Fed. Cir. 1991) (discussing the USPTO's authority to issue substantive and interpretive rules). And here the USPTO would act to protect the possible exercise of a fundamental right rather than to curtail it.

no explicit definition for legal persons, the criteria for the test can be inferred from the specific rules of currently governing law and from empirical investigation of animal cognition. By explicitly implementing such a test, the USPTO could both provide guidance for investigators seeking patent rights and provoke whatever further judicial and legislative refinement of the test that is necessary.

