



Human Identity: The Question Presented by Human-Animal Hybridization

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What makes each of us, as individuals, human to one another, or, more generally, what makes an individual creature human? We have not often had to ask the question because of the species line based on reproductive capacity and incapacity, although “degrees of humanness” were explored in the various eugenic programs of the last century. Now the biotechnological possibility of fusing human and other forms of life is presenting the question in a new and serious way. If the traditional biological means of defining species are no longer reliable, what other criteria might determine what is “human” and what is “nonhuman”? The issue is not just how to conceive of an individual hybrid presented to us, but how to act toward the creature, at the most basic level. Drawing on animal law and theory as well as the history of human eugenics in law and policy, Vining identifies criteria that may one day be used to gauge relative humanness, qualitative and quantitative. He observes that ultimately the difficulty of deciding or agreeing upon what identifies us as human will make even more problematic the current treatment of creatures deemed purely “animal.” In the end he suggests that what the human distinctively brings to the sentient world is general responsibility itself,

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and that wider contemplation of the real possibility of human-animal hybridization may lead to new ways of thinking about animals, in law and beyond.

Human Identity was presented recently as a talk to a longstanding interdisciplinary faculty seminar at the University of Michigan. It is presented largely in its original form here, with footnotes added.

I want to talk to you about something that intrigues me increasingly, and that has been developing rapidly as I have been trying to think about it. I teach and write on what one might call the law of human experimentation, which is really an encounter between the legal view of the human being, especially the human individual, and the view of the human being that animates experimental work in science. The widespread efforts today to combine the human and the animal in a single creature as an experiment, and for purposes of experimentation upon the creature, come understandably within that interest in human experimentation, and ultimately I think will become a subject of widespread interest in law. It is ultimately in law, and not anywhere else, that we meet to decide what we can do to each other or indeed to other creatures.

These new developments include the refinement of transplantation techniques that may allow combining fully developed parts of humans and animals, but most interesting are advances in genetic engineering, cloning techniques, and stem cell research generally that are making possible the mixing of human and animal cells and genetic material. Sometimes this latter is called the production of chimeras, or “chimerizing,” like the half-horse and half-man, the centaur, or the half-goat and half-man, the satyr. More often now it is referred to as hybridization, a term with quite positive connotations drawn from plant and animal breeding.

The desire, effort, and spending of money to combine human and animal are pushed partly by pure curiosity, or by competitiveness among people who find themselves equipped to do it. Partly it is transgressive, and some involved have said as much.¹ And partly it is driven by the hope of medicine that can reduce human suffering and vanquish human disease. It has come up of course against opposition to any human cloning and any experimentation on human creatures that cannot give consent, including the human in the womb. There are other grounds for opposing it too—among them, where cloning is involved, the difficulties in obtaining a supply of human eggs.

1. See, e.g., David P. Barash, *Humans Don't Stand Outside Nature*, SEATTLE POST-INTELLIGENCER, May 25, 2005, at B7; Barash, *Hurray for Monkey-Man!*, L. A. TIMES, June 17, 2006, at B11. (Barash, an evolutionary psychologist, is among those especially active in debates on the meaning of natural selection and the question of limits on scientific experimentation.)

Whatever the reason for it, the combining of the human and the animal in a single creature is with us. British authorities have been holding consultations on the introduction of a human nucleus into a rabbit or cow egg.² An ad hoc working group at Stanford University has approved a proposal to introduce human neural cells into a mouse embryo in an effort to produce a mouse—if you can still call it a mouse—with a brain composed of entirely “human” brain cells—if you can still call them “human.”³ Similar proposals are being considered elsewhere. The United States Patent Office recently ruled on and against a patent application for a creature with roughly equal portions of human and primate or other animal genetic material, though, notably, “animals” as such have been patentable in the United States ever since the Supreme Court ruled that an oil-eating bacterium was patentable.⁴

I also teach and write in animal law, an area of study and practice that now has its own state bar sections and law reviews, and as of recently its own endowment funds. Unlike the law of human experimentation, which essentially began with the Nuremberg Trials of doctors and scientists and the Nuremberg Code some sixty years ago, animal law is an “old” area going back to the early nineteenth century.⁵ It is pertinent also to human/animal hybrids.

In animal law we are constantly trying to interpret and develop the criteria used for drawing lines between those animals that ought to be protected in substantial ways and viewed as having their own interests, interests that are not merely proxies for human interests, and those animals that are minimally

2. BBC News, *Human-Animal Embryo Green Light*, Sept. 5, 2007, available at <http://news.bbc.co.uk/go/pr/fr/-/1/hi/health/6978384.stm> (discussing a decision by British regulators to allow creation of certain human-animal hybrids). See generally DEPARTMENT OF HEALTH (U.K.), HUMAN TISSUES AND EMBRYOS (DRAFT) BILL (May 2007) (proposed legislation covering the use of human tissues and embryos in the United Kingdom), available at http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsLegislation/DH_074718. See also Paul Elias, *Cloning Ideas Revisited*, ST. LOUIS POST-DISPATCH, Mar. 26, 2007, at A4 (comparing U.K. and U.S. policies regarding experimentation on human-animal hybrids).

3. Compare Henry T. Greely et al., *Thinking About the Human Neuron Mouse*, 7 AM. J. BIOETHICS 27 (2007) (reviewing how the Stanford working group arrived at its conclusion) with Françoise Bayles and Jason Scott Robert, *Part-Human Chimeras: Worrying the Facts, Probing the Ethics*, 7 AM. J. BIOETHICS 41 (2007) (critiquing the working group's conclusions and guidelines).

4. For the Court's decision, see *Diamond v. Chakrabarty*, 447 U.S. 303 (1980). See generally Thomas A. Magnani, *The Patentability of Human-Animal Chimeras*, 14 BERKELEY TECH. L. J. 443 (1999). For a discussion of the recent patent office decision, see Rick Weiss, *Rifkin Files Human-Chimp Chimera Patent*, WASH. POST, Apr. 2, 1998, at A12. See also Rick Weiss, *U.S. Denies Patent for a Too-Human Hybrid*, WASH. POST, Feb. 13, 2005, at A3. See also Aaron Zitner, *Patently Provoking a Debate*, L. A. TIMES, May 12, 2002, at A1.

5. See An Act to prevent the cruel, improper Treatment of Cattle (Martin's Act), 3 George IV ch. 71, 1822 (U.K.) (making it a crime to abuse certain domestic animals). See HILDA KEAN, ANIMAL RIGHTS: POLITICAL AND SOCIAL CHANGE IN BRITAIN SINCE 1800 33-34 (1998) (discussing the development and passage of Martin's Act). On the Nuremberg Trials and the Nuremberg Code, see THE NAZI DOCTORS AND THE NUREMBERG CODE: HUMAN RIGHTS IN HUMAN EXPERIMENTATION (G.J. Annas and M.A. Grodin eds., 1992).

protected, principally as cogs in the ecological machinery that ultimately supports human life. The line between the elephant or whale on one hand and the flea or fire ant on the other is not merely one of size. Chimpanzees admitted into a federal sanctuary under the Federal Chimpanzee Health Improvement, Maintenance and Protection Act of 2000 are a particularly clear example of animals with legally recognized individual interests. Once in sanctuary, “none of the chimpanzees may be subjected to euthanasia, except as in the best interests of the chimpanzee involved.”⁶

A common feature of these line-drawing criteria, that is seen from context to context, is (as might be expected) how close the animal is to the human—in gross terms, whether the animal is vertebrate rather than invertebrate, warm-blooded rather than cold-blooded, mammal rather than egg-laying. And, as one watches or participates in finer line drawing and then ranking of animals in a hierarchy of protection, with us at the top, one cannot escape a very definite sense that we are simultaneously telling ourselves what makes us human.

For example, a bond of mutual affection between parents and children, as a line-drawing criterion, can go rather far down the hierarchy, and can operate within the more general categories, as in the Marine Mammal Protection Act. The Act singles out for special protection marine creatures that are mammals and, among them, singles out nursing mothers and their young.⁷ It has been concluded, after litigation over it,⁸ that this special protection of mothers and young cannot be understood in resource conservation terms, environmental, ecological, but only as proceeding from concern, expressed through Congress, for the bond perceived between nursing mother and nursling, and, indeed, concern for the vulnerability of the individual nursling.⁹ These concerns are, in another context, what make “maternal deprivation experiments” on primates so widely viewed as particularly heinous.¹⁰

Across the board we look at our characteristics, those we value, and we ask whether those characteristics are shown by the creature in question. Lawyers have some latitude in doing this on behalf of the rest of us. The language in definitional sections of animal protection statutes is often deliberately vague. The

6. Chimpanzee Health Improvement, Maintenance, and Protection Act of 2000, 42 U.S.C. § 287a-3a(d)(2)(I) (2007).

7. See, e.g., Marine Mammal Protection Act of 1972 (as amended), 16 U.S.C. §§ 1361, 1371, 1372(b) (2007).

8. See *Animal Welfare Institute v. Kreps*, 561 F.2d 1002, 1011-12 (D.C. Cir. 1977) (finding in particular provisions of the Marine Mammal Protection Act that “Congress meant to refer to individual animals, not groups or populations . . . There is surely no ‘resource management’ explanation for [the provisions at issue]”).

9. *Id.*

10. See generally DEBORAH BLUM, *LOVE AT GOON PARK: HARRY HARLOW AND THE SCIENCE OF AFFECTION* (2002) (biography of Harlow who conducted maternal deprivation experiments on primates). See also Robert Sapolsky, *The Loveless Man*, 287(5) *SCI. AM.* 95 (Nov. 2002) (reviewing Blum).

California definition of “animal,” for instance, continues to be “every dumb creature,”¹¹ the Maine definition “every living, sentient creature not a human being.”¹² It is simply “the animals” that now have constitutional status in Germany,¹³ “sentient beings” that figure in the European Union Treaty of Amsterdam.¹⁴

But to ask the question regularly asked in contemporary animal law—what is it that makes an animal “like” us, who are “fully human”?—is not entirely benign. It opens us to the eugenic temptation, picking out this or that characteristic or endowment that we know in ourselves, or can recognize, valuing it above other characteristics or endowments, and letting it determine our treatment of another being in the most basic of ways. “Eugenics,” going beyond ordinary selection in breeding, favors with life and active protection those with characteristics thought desirable, and eliminates now and for the future, or leaves without protection, those with characteristics we in our time and condition do not value. Human eugenics is human experimentation on a grand scale, and great names were associated with it here in the 20s and 30s. Oliver Wendell Holmes put succinctly the perceptions it involved in holding for the constitutionality of forcible eugenic sterilization of human beings in 1926, which then continued into the 1970s: “It is better for all the world,” Holmes ended, “if instead of waiting to execute *degenerate offspring* for crime, or to *let them starve* for their imbecility, society can prevent those who are *manifestly unfit* from continuing *their kind*.”¹⁵

The eugenic instinct on the human side went rather underground during and after the Second World War, but it is again with us today, inevitably I think, as private decisions are made, and public decisions are made about the limits of private decision—making, to “select in” or “select out” in human reproduction. “Selecting in” is the choice to implant a particular embryo after pre-implantation diagnosis in *in vitro* fertilization. “Selecting out” is the choice to terminate after testing an embryo already in development. The classification of a characteristic as a “disease,” or as a “defect” in humanness, such as deafness or dwarfism, is a prelude to the molding of the definition of what it is to be fully human that is implicit in eugenic decisions. Eugenics today has its very serious defenders. Peter

11. CAL. PENAL CODE, § 599b (2008).

12. ME. REV. STAT. ANN. tit. 7 § 3907 (2007). *See generally* S. WAISMAN ET AL., ANIMAL LAW: CASES AND MATERIALS 3-37 (3d ed., 2006).

13. Grundgesetz für die Bundesrepublik Deutschland [GG] [Basic Law], Article 20a (*quoted in* AXEL TSCHENTSCHER, THE BASIC LAW (GRUNDGESETZ) 27 (Würzburg: Jurisprudencia, 2002)). *See generally* BTDrucks 14/8360 (providing an explanatory statement of Article 20a). *See also* Kate M. Nattress, “. . . Und Die Tiere”: Constitutional Protection for Germany’s Animals, 10 ANIMAL L. 283 (2004).

14. Treaty of Amsterdam, Protocol on Protection and Welfare of Animals, Oct. 2, 1997 (establishing the European Community’s legislative, regulatory, and interpretive guide “to ensure improved protection and respect for the welfare of animals as sentient beings”).

15. *Buck v. Bell*, 274 U.S. 200, 207 (1927) (emphasis added).

Singer at Princeton argues for infanticide of hemophiliacs.¹⁶ James D. Watson, co-discoverer of DNA, looks to “genetic analysis to help work out the biochemical pathways underlying memory and clear thinking . . . [O]nly by reducing the differences in human beings will we ever have a society in which we can effectively view all individuals as truly equal.”¹⁷

In the absence of eugenic thought a very great range is included in the human. Annie Dillard describes the “bird-headed dwarf” in *For the Time Being*,¹⁸ “[S]eventy-five years old, no taller than a yardstick. And friendly and pleasant, but easily distracted [T]hey all can—and do—receive love and give love.” But as the ranking and especially action on the ranking of characteristics proceeds, the basic respect for all beings that are human in all their surprising variety, what we call “human equality” in law, begins to become the “true equality” to which James D. Watson points, achieved “by reducing the differences in human beings.”¹⁹ A being without the favored characteristics begins to slip outside and down from the circle of “human beings,” and be thought of as not “fully human.”

That Charles Darwin himself thought and spoke in these terms is not often noted, much less emphasized. It is an embarrassment to read his words out loud, and I set them out here to indicate how easy it is for the admirable and admired, or any of us, to respond to the eugenic temptation. The subtitle of *The Origin of Species* was *The Preservation of Favoured Races in the Struggle for Life*, and in *The Descent of Man* he looked forward:

At some future period, not very distant as measured by centuries, the civilized races of man will almost certainly exterminate, and replace, the savage races throughout the world. At the same time the anthropomorphous apes . . . will no doubt be exterminated. The break between man and his nearest allies will then be wider, for it will intervene between man in a more civilized state, as we may hope, even than the Caucasian, and some ape as low as a baboon, instead of as now between the negro or Australian and the gorilla.²⁰

To speak of other beings as more human or less human, on some suggestion of a quantified scale, or divided between the fully human and the less than fully human, has clinging to it some of the horror of twentieth-century human experimentation, exploitation, and genocide. Describing beings as less

16. PETER SINGER, PRACTICAL ETHICS 185-91 (21st prtg. 2006).

17. ROBERT POLLACK, THE MISSING MOMENT 121-22 (1999) (quoting James D. Watson).

18. ANNIE DILLARD, FOR THE TIME BEING 5-6 (1999).

19. See POLLACK, *supra* note 17, at 121-22.

20. CHARLES DARWIN, THE DESCENT OF MAN (Penguin Books 2004) (1879) (quoted in MARILYNNE ROBINSON, THE DEATH OF ADAM: ESSAYS ON MODERN THOUGHT 34-35 (2005)). See also CHARLES DARWIN, THE ORIGIN OF SPECIES: A FACSIMILE OF THE FIRST EDITION (Harvard University Press 2001) (reproducing the title and subtitle of the 1859 first edition: ON THE ORIGIN OF SPECIES BY MEANS OF NATURAL SELECTION, OR THE PRESERVATION OF FAVOURED RACES IN THE STRUGGLE FOR LIFE).

human or less than fully human accompanied, possibly in some necessary way, the capacity to do what was done to them in Europe, in Africa, in Asia. And in the United States: I think we all, not just law students or historians, ought to be required to reread periodically the *Dred Scott* decision to keep us realistic about ourselves.²¹ The idea of a being as somehow *less* than human speaks directly to the way we treat and have treated animals, our doing to them what we say we would not do to a fellow human being, in the infliction of pain, suffering, death, even clear torture. But the phrase “less than fully human” also speaks to treatment of those who would otherwise be considered simply fellow “human beings”: historically, and even today, lines based on age or gender as well as race or ethnicity have been drawn between the fully human and the not fully human.

And of course from the beginning Darwin or anyone following Darwin’s thought on “selecting out,” or to use Darwin’s word, “extermination,” has actively to decide which individual beings are of a higher sort and which of a lower, and by what criteria, since many beings above the human/animal line are mixtures of the categories we use to describe each other. We have a great deal of modern experience in trying to decide into which of our various human sorts and kinds an individual can be fitted or claim to be fitted.

This is where human-animal hybrids become increasingly intriguing to me. You move from the sorting and ranking and treatment of kinds of animals, and sometimes individual animals, that we do in animal law according to their closeness to the human or their “possession” of currently valued characteristics of human beings. You move from that directly over, without a bump or a jump, to the eugenic in the treatment of human beings, according to their possession of characteristics similarly picked out. This slides quickly into thinking in terms of different degrees of being human. And then you move to the hybrid that asks us, as it were, whether it is human or animal and to what “degree” it is one or the other. It must ask and we must answer, because action turns on it. Perhaps we can turn the non-benign around, at least a bit, and look at the question in the positive rather than in the negative: When does a hybrid – or as the hybrid might say, “When do I” – become human enough to escape or modify treatment as an animal?

Moreover, going about answering that question, being really forced to answer it, starts teasing out what we actually believe makes us “human,” or, the same thing for purposes of action, what makes us especially valuable. To the extent we eventually find ourselves really unable to answer the question, or to agree among ourselves on some answer, I think there will be pressure to move away from the basic human/animal dichotomy, and to begin thinking and talking in other, more evocative terms, such as whether another being is an individual in the sense that we can see ourselves as individuals. Hierarchy might

21. *Dred Scott v. Sandford*, 60 U.S. 383, 407, 411 (1856) (addressing the pre-Civil War federal constitutional status of free descendants of slaves).

be tilted even if it is never reversed – perhaps it would not be such a bad thing to be more like elephants and dolphins. Speaking in different terms might even lead us to value other beings not only for their exhibiting what we know and value, but for their difference, their strangeness, their opening to us, as human individuals around us do also, new perceptions and new realities.

Let me briefly run through the ways we use or try to use to differentiate and decide whether or not to exclude from a circle of concern, or, more positively, whether to reach out beyond it and embrace. One is simply “looks”: the forms of ear, eye, nose, body, the criteria used in ordinary contemporary sorting that is not so genetic as Nazi racism was. To the extent looks make more possible a relationship between another creature and a full-fledged – no, full-maned – human being, through the expressiveness of eyes or face, looks may have some relevance, and looks can go some distance. Something human or somewhat human might well look at us through camera eyes constructed just like ours but slightly improved, the superior camera eyes of an octopus, which is a mollusk. But the challenge of hybridization, crossing species lines, makes looking to “looks” difficult: the thought, the concern, is that something human might appear in a form quite nonhuman. Unrecognized, it might not be treated “appropriately” or “ethically,” to use the euphemistic words used in current discussion. As more than a footnote, it might suffer for just being in that form. Attention to the potential suffering of the number of “malformed” that would likely result before a successful human clone was born has been an important block to entering into human reproductive cloning at all.²²

A second way is quantitative, the proportions of a mix. Obviously the mixing of concern to us is not molecular mixing as such. Eating an animal is being very intimate with it, taking its materiality into the most delicate reaches of our own materiality. But though this would not be true of the Eucharist, today eating is not thought to be combining life with life; nor combining kind or

22. See NATIONAL BIOETHICS ADVISORY COMMISSION (the “Shapiro Commission”), CLONING HUMAN BEINGS: REPORT AND RECOMMENDATIONS III, 65-66, 108 (1997) (“The Commission concludes that at this time it is morally unacceptable for anyone in the public or private sector, whether in a research or clinical setting, to attempt to create a child using somatic cell nuclear transfer cloning. We have reached a consensus on this point because current scientific information indicates that this technique is not safe to use in humans at this time . . . [T]he significant risks to the fetus and physical well being of a child created by somatic cell nuclear transplantation cloning outweigh arguably beneficial uses of the technique At present, the use of this technique to create a child would be a premature experiment that exposes the developing child to unacceptable risks. This in itself is sufficient to justify a prohibition on cloning human beings at this time, even if such efforts were to be characterized as the exercise of a fundamental right to attempt to procreate. More speculative psychological harms to the child, and effects on the moral, religious, and cultural values of society may be enough to justify continued prohibitions in the future, but more time is needed for discussion and evaluation of these concerns.”) Cf. European Charter of Fundamental Rights, ch. I, art. 3(2), *available at* <http://www.eucharter.org> (“In the fields of medicine and biology, the following must be respected in particular: . . . the prohibition of reproductive cloning of human beings.”).

species with our kind; nor the person built up in a relationship over time to which we give a name, Fido or Whiskers, with the person, ourself, we build up over time; nor the individuality of another with our individuality.

The mixing of molecular material called genetic, in greater or lesser quantity, is another matter. We are still absorbing our surprise at the relatively small number of genes in the human genome beyond the number in a fruit fly, and the “96 to 99”²³ in the percentage overlap between the chimpanzee genome and the human genome is mesmerizing, reminding us of how close a price of 99 cents is to a dollar.

But since genes are not identical units and it is so hard to think of the way they interact in quantitative terms, a quantitative measure of proportions of “animal” and “human” genetic material seems irrelevant to the question of relative humanness. The overlap between animal and human as now constituted could be taken as a sly message that the biblical account of the animals is not so very off the mark. By the end of the first chapter of Genesis it is clear they were not meant for food for human beings.²⁴ In the second chapter they are created after that wonderful observation, “It is not good for Adam to be alone.”²⁵ They appear explicitly as companions for Adam—the animal an “ezer kenegdo” in the original Hebrew, a term used elsewhere in the Bible to describe God in relation to humans and translated by Robert Alter as a “sustainer beside him”—before the turn to Eve who is “one flesh” with Adam.²⁶ Not until the covenant after the Flood are animals given over for nourishment of human beings, and even at that point animals’ capacity to enter into a covenant is recognized—five times the covenant is presented as “between Me and you and every living creature that is with you.”²⁷

A current hybridization proposal in Britain, mentioned earlier, illustrates the difficulties of a quantitative criterion at the genetic level. If a nucleus of human origin is substituted through cloning techniques for the original nucleus of a rabbit egg (or cow or goat), and the being so formed develops, each of its

23. See Chimpanzee Sequencing and Analysis Consortium, *Initial Sequence of the Chimpanzee Genome and Comparison with the Human Genome*, 437(1) NATURE 69, 70 (Sept. 1, 2005). See also NATIONAL INSTITUTES OF HEALTH, News Release Archives 2005, *New Genome Comparison Finds Chimps, Humans Very Similar at the DNA Level* (Aug. 31, 2005), available at <http://www.genome.gov/15515096>.

24. Genesis 1:29-30 (King James) (“And God said, Behold, I have given you every herb bearing seed, which is upon the face of all the earth, and every tree, in the which is the fruit of a tree yielding seed; to you it shall be for meat. And to every beast of the earth, and to every fowl of the air, and to every thing that creepeth upon the earth, wherein there is life, I have given every green herb for meat”).

25. Genesis 2:18. Cf. Vicki Hearne’s extraordinary book, ADAM’S TASK: CALLING ANIMALS BY NAME (1987).

26. ROBERT ALTER, THE FIVE BOOKS OF MOSES 22 (2004) (noting that “ezer kenegdo” in Genesis 2:18 is “notoriously difficult to translate”); Genesis 2:24. I am indebted to Madeline Kochen for discussion of the various translations of the term.

27. See ALTER, *supra* note 26, at 50-52; Genesis 1:29-30; 2:18-20, 23-24; 9:3, 10-13, 15-17.

cells is said to have a mixture of 99.9% human genes and .1% animal genes from the rabbit's "somatic" or mitochondrial genetic material in the egg outside the nucleus that is not replaced when the nucleus is replaced.²⁸ But though the nucleus of each cell of the creature is of human origin, why 96% to 99% of the genetic material the nucleus contributes should be thought to be "human" rather than, say, "chimpanzee," given the chimpanzee/human genetic overlap, is a real question for purposes of quantitative identification of this being as human or animal—answerable only, I think, by saying interactions of an untraced kind transform the whole.²⁹

Of course it could also be said that a genetic overlap in numerical terms is relevant to the question "how human" a being is, in what lawyers would call a prophylactic way.

You have first to put aside, on some ground relevant to the question—the question how to treat another being—all the genetic variation that there is within what we call the human, which we know is considerable but know rather little about. The "human genome" fully sequenced by Craig Venter's project was Craig Venter's genome, and the "human genome" sequenced by the National Institutes of Health was put together from a small number of individuals chosen for their "diversity."³⁰ No longer in the identity picture is the capacity or incapacity of a being to breed with another being, the species line, because hybridization is precisely a way of circumventing incapacity to breed.

But if you do put aside this variation within what before the advent of hybridization would have been called a species, then pure quantity, it might be said, is relevant because what we human beings *are* is our genetic inheritance. The greater the numerical degree of genetic overlap between the human and the hybrid, the greater is the probability that what makes us human (whatever genetically it is) is included within the overlap.

The numerical overlap could thus be viewed as a cautionary line. One should treat a being with a genetic endowment above some "overlap line" in the specially protective way we treat a human being, "specially protective" including

28. See DEPARTMENT OF HEALTH (U.K.), *supra* note 2, at 98; BBC News, *supra* note 2. On cloning techniques generally, see NATIONAL BIOETHICS ADVISORY COMMISSION, *supra* note 22, at 13-38 (Chapter 2, "The Science and Application of Cloning").

29. See generally Chimpanzee Sequencing and Analysis Consortium, *supra* note 23.

30. Each was different, as individuals are, and, necessarily chosen in advance of the establishment of "the human genome," each was presumed to be "human" and not "subhuman." The anonymous group did not, I imagine, include individuals judged by the standards of the time to be "malformed" or "defective." On the source of the DNA sequenced, see Nicholas Wade, *In the Genome Race, the Sequel Is Personal*, N.Y. TIMES, Sept. 4, 2007, at F1; Nicholas Wade, *Whose DNA Is It? In a Way, Nobody's*, N.Y. TIMES, June 27, 2000, at F2. See also Robin McKie, *Human Genome is Mine, says 'Darth Vader' of Genetics*, THE OBSERVER, Apr. 28, 2002, at 3; NATIONAL HUMAN GENOME RESEARCH INSTITUTE, NATIONAL INSTITUTES OF HEALTH, News Release Archives 2003, *Human Genome Project Completion: Frequently Asked Questions: Whose DNA was sequenced for the Human Genome Project?*, available at <http://www.genome.gov/11006943>.

some limits on quantitative and utilitarian thinking with respect to the individual. Beings that fall below the line should not be so protected.

But the premise of such a justification of looking to genetic overlap is that all we *are*, what we bring to our incarnate presence, is our genetic code, which the systems of the world then act on and respond to in producing our changing form through life. If it were true that we *were* or that we actually *thought* we were the product however unique of just two factors—systems internal and systems external—there would be no reason to ask the questions hybridization is forcing us to ask. For purposes of action or restraint, we would not be distinguishable at base from any nonliving thing—the pebble in a stream whose internal systems have interacted with nature around it to give it its history and absolutely unique present form.³¹

We move then to the cellular level. The being in question would have a mixture of animal cells and human cells or cells of human origin, for example through introducing human embryonic stem cells into an animal at some stage of development or introducing cells each carrying genetic material of both human and animal origin (from the cloning technique we have just noted). If the question is the treatment of such a being before birth, one issue would be whether the embryo is human or human enough for purposes of the “fourteen day limit.” This is the provision in statute in Britain and in guidelines here which prohibits experimentation on a human embryo after the fourteenth day of development, the time when the neural streak appears and, perhaps more importantly for many, when the possibility of twinning has passed and the being is definitely an individual.³² Interestingly, the proposal to use cloning techniques

31. I recognize that this question or problem is often set out and discussed today as how to “explain” human dignity in terms of our current perception of organic evolution and its mechanisms. This becomes something of an academic exercise. The pressing question is rather the reverse, how to understand our current perception of organic evolution, our fascination with it and persuasion to it, while staying realistic and acknowledging our actual presence to one another—the mutual trust and recognition of each other as individuals on which we build any kind of belief about the world. I have tried to explore this, with regard to humans and animals both, in *THE SONG SPARROW AND THE CHILD: CLAIMS OF SCIENCE AND HUMANITY* (2004) and *The Mystery of the Individual in Modern Law*, 52 *VILLANOVA L. REV.* 1 (2007). For a broad and sensitive contribution to efforts to incorporate the evolutionary insight into human self-understanding, and for the history of these efforts, see *GEORGE LEVINE, DARWIN LOVES YOU: NATURAL SELECTION AND THE RE-ENCHANTMENT OF THE WORLD* (2006).

32. See, e.g., *Human Fertilisation and Embryology Act, 1990*, ch. 37, § 3(3), (4) (Great Britain). Compare *id.* with NATIONAL RESEARCH COUNCIL COMMITTEE ON GUIDELINES FOR HUMAN EMBRYONIC STEM CELL RESEARCH, *GUIDELINES FOR HUMAN EMBRYONIC STEM CELL RESEARCH* 57 (2004) [hereinafter *NRC GUIDELINES*] (providing guidelines for United States investigators); INTERNATIONAL SOCIETY FOR STEM CELL RESEARCH, *GUIDELINES FOR THE CONDUCT OF HUMAN STEM CELL RESEARCH* § 10.3a (Dec. 21, 2006). On the reasons for the fourteen day limit, see, for example, NATIONAL INSTITUTES OF HEALTH, *REPORT OF THE HUMAN EMBRYO RESEARCH PANEL, VOL. 1* at 45-47 (“Time Limit for Human Embryo Research”), 65, 67 (“Principles and Guidelines”), *VOL. 2* at 55-56 (“Limitations Imposed on Permissible Research”)(1994); 73 *Parl. Deb., H.C.* (6th ser.) (1985) 682 (remarks to House of Commons by Kenneth Clarke, Minister for Health in Great Britain:

to replace the nucleus of an animal egg with a human nucleus and let the resulting being develop has been accompanied by a pledge to observe the fourteen day limit.

With a cellular focus, rather than a “looks” focus or a “molecular” focus or a “gene” focus, one could, again, look to relative number, here the relative number of cells designated “human” or of human origin. In fact the focus moves rapidly from the quantitative to the organization of differentiated cells and to organs. Then the question is whether to privilege some organs – if the being has a liver, a hand, an eye, a heart, or blood that is of animal origin on the human side or of human origin on the animal side. A decision must be made that some organs are more important to humanness or contribute to humanness more than other organs. In the ongoing work to make possible organ transplantation from animal to human, “xenotransplantation,” an effect on the individual identity of a being, that would be acknowledged as human before the combination of organs, has not been an issue, and we might think it unlikely that human identity would be affected by the growth of an organ “within” from cells of animal origin, rather than its implantation fully grown in xenotransplantation. Perhaps the same can be said in reverse, that human organs in an animal would not affect its animal identity. It is not entirely clear why it would not. There is much we do not know about the subtleties of the contributions of organs small and large to characteristics of the integrated “whole being.” Some take the hand or the throat to be the essential organ in the evolutionary development of the human. At one time or another the heart, the blood, or the liver (think of Homer’s *Iliad*³³) were much more closely tied, in a privileged way, to the essence of a being, and such privilege may at some point fit again into the way we explain things. Nevertheless, I would think a mixture of organs in a hybrid would not determine humanness or nonhumanness or the degree of it.

Except for the brain. The brain seems different. That organ serves very much as a proxy for characteristics that we value as human. With regard to relative numbers of cells, the fact that the brain of a mouse may contain one hundred percent human neural cells is more troubling than the fact that it may contain two or ten percent—the number alone is troubling, and there is the implication that the possibility of “humanness” would then reside in the cells

“The basis for the 14-day limit was that it related to the stage of implantation which I have just described, and to the stage at which it is still uncertain whether an embryo will divide into one or more individuals, and thus to the stage before true individual development has begun.”). See also DAVID ALBERT JONES, *THE SOUL OF THE EMBRYO: AN INQUIRY INTO THE STATUS OF THE HUMAN EMBRYO IN THE CHRISTIAN TRADITION* 224-227 (2004). The fourteen day point is also the point after which precursors of the central nervous system appear. See NATIONAL INSTITUTES OF HEALTH, *supra*, VOL. 2 at 56.

33. THE ILIAD OF HOMER 480-81 (Richard Lattimore trans., University of Chicago Press 1951) (Hecuba: “I wish I could set teeth in the middle of his liver and eat it. That would be vengeance for what he did to my son.”). On the hand, see Raymond Tallis’s intriguing account, *THE HAND: A PHILOSOPHICAL INQUIRY INTO HUMAN BEING* (2004).

themselves. But the form and architecture of the brain, its “organness,” may be of greater significance as a proxy for the characteristics the brain’s life makes possible, and we in fact see proposals to periodically sacrifice developing mouse-human hybrids with brains of various proportions (up to 100%) of human neural cells to examine the developing architecture, with the thought of perhaps stopping the experiment if architecture appeared that was typical of those brains of beings “fully human” that have been examined.³⁴ The problem is that it appears that characteristics we recognize as having ourselves can be associated with cells of animal origin organized into brains of varying animal structure, operating as always with and through the contributions of organs beyond the brain, and brains resembling human structure can be associated with experience quite foreign to human experience.³⁵

We seem to leave behind these inconclusive numerical and material criteria when we move to characteristics themselves. I should note in passing, however, that there does seem to be something of an acquisition of human or animal identity at the cellular level, indicated by the fourteen day limit itself which I mentioned. At fourteen days of embryonic development the human genetic fingerprint as currently conceived and the differentiation of human cells at that point are wrapped, swaddled we might say, in the mantle of human individuality, and thereafter the being is no longer treated like the developing embryo identified as “animal.”³⁶ Yet insofar as an animal is an individual in human sight, despite being an animal, and it has recognizable characteristics that we name with the same names we use for human characteristics that we value, then the cells, the very cells that we predict will become such a being if the systems of the world treat them favorably, are wrapped in a similar but unseen mantle. Whatever our developed religious commitments or convictions, there is an acknowledgment widely at work that living matter is truly incarnate—spirit and matter twisted around one another like the separate strands of DNA. It seems, at the moment, that from the fourteen day point onward, cells, if they include among them precursors of the cells that carry electrical and chemical charges which we call “neural” cells, are accorded respect in a way other aspects of the material world are not, even while ontology is recapitulating phylogeny. Furthermore, under current law they are accorded respect on something of an ascending scale as development proceeds, if, that is, they are designated “human” or perhaps “human enough.” The difference in the end, I wonder, may be only that embryos with neural differentiation that are designated “animal” must simply develop longer before the special respect attaches that is embodied

34. See, e.g., Greely et al., *supra* note 3, at 37.

35. See, for example, the description of the structure of the brain of the mormyrid fish, which perceives and communicates through electrical fields, in SIMON CONWAY MORRIS, *LIFE’S SOLUTION* 184-86, 189-90, 194-96 (2003). See also *id.* at 254-61, on the structure of cetacean brains.

36. See, e.g., NATIONAL INSTITUTES OF HEALTH, *supra* note 32, VOL. 1 at 45-47, 65, VOL. 2 at 56.

in criminal statutes, administrative regulations, and constitutional provisions protecting the interests of animals who have particular characteristics.

So, to “characteristics,” the qualitative criterion of relative humanness that marches us into the eugenic problem.

Let me state the situation more particularly, this time with reference to the identity that a “species” has provided for an individual in the past. In our present usage, including scientific usage, what makes a species a “species,” what gives an individual being a generic name beyond Joe or Whiskers, is not only an individual’s ability to reproduce something like itself, but an inability to reproduce something that does not look like itself, whatever the variations of detail upon which natural selection might work. The species boundary is determined, whenever there is sexual reproduction, by an inability to breed. Those with whom an individual can breed have the same species name beyond their individual names, while those with whom an individual cannot breed have a different species name beyond their individual names. Categorization of individual animal beings can follow different criteria than this – working animal, livestock, game animal, wild animal, service animal, companion animal – just as human beings have been classified along lines of race, color, and physiognomy – Darwin’s “civilized” and “savage,” “Caucasian” and “Australian.”³⁷ But species identity that takes into account the death of individuals, together with reproduction or what “springs off” living individuals, has staying power inasmuch as “what” is present in the world is what can reproduce. “What” cannot breed together do not leave offspring in the world, do not leave beings asking us present with them to say what they are and then determine what our behavior is to be toward them, either as individuals while they live, or as a kind.

Hybridization circumvents that species barrier, and can present us with beings asking us, like Adam was asked at the beginning, to say what they are, give them a name, and decide how to treat them. If we treated all flesh with respect insofar as we were able, as the Jains in India are said to do, the question would not be such a terrible one. We could think not upon the horrors of the nineteenth and twentieth centuries but upon the achievements of our immediate past, especially the spread of an inner resistance to the ancient pull to enslave.³⁸ But as we know there are vast differences today between the way we treat flesh we identify as human and all other flesh, differences that have as their poles love at one end and confinement and torture at the other – the horrors of the factory farm, the testing laboratory, and, it must be said, what can happen in the university research laboratory. These we justify in utilitarian terms. Human

37. See ROBINSON, *supra* note 20, at 34-35.

38. Evolutionary biology stated in terms of high and low and the human eugenics movement emerged at the same time in the mid-nineteenth century. It is intriguing that the human eugenics movement, looking to the elimination of categories of human beings, also emerged at the same time enslavement was being taken away as an optional course of action after perceiving a human being as of a lesser kind.

identity is not only an intellectual, aesthetic, or religious matter. Companionship and delight for us may be there beyond human identity, but horror and extermination lie beyond it in much greater measure.

What do you do when species become unstable? This was Darwin's question too, and *On the Origin of Species by Means of Natural Selection, or The Preservation of Favoured Races in the Struggle for Life*³⁹ was Darwin's answer. Now the question is being put to us in a new way. But this new way does not take our own human identity as a given. It asks us to say anew what we are, what it is to be human.

Three significant documents have appeared in the last several years, addressing hybridization from within the scientific community. Congress has not addressed it, except in an appropriations act four years ago in response to the effort to patent a hybrid of human and chimpanzee in roughly equal parts, which provided that no funds could be "used to issue patents on claims directed to or encompassing a human organism."⁴⁰ There was no explanation of what Congress thought "encompassed a human organism."

In the absence of statutory guidance, a "Committee on Guidelines for Human Embryonic Stem Cell Research" from the National Research Council of the National Academy of Sciences issued "Guidelines for Human Embryonic Stem Cell Research" in 2004, which *inter alia* took up hybridization.⁴¹ An ad hoc working group on "Moral Issues of Human-NonHuman Primate Neural Grafting," with twenty-two members, published a report on that form of hybridization in the journal *Science* in 2005.⁴² In December 2006 an international task force formed by the International Society for Stem Cell Research published its own "Guidelines for the Conduct of Human Embryonic Stem Cell Research," which again addressed hybridization.⁴³

The ad hoc working group's report on human-nonhuman primate hybridization is the most revealing. At its beginning the group says,

We unanimously rejected ethical objections grounded on unnaturalness or crossing species boundaries . . . [A] concern is that H-NHP [human-nonhuman primate] neural grafting is wrong because it transgresses species boundaries. However, as the recent National Academy Report notes, the notion that there are fixed species boundaries is not well supported in science or philosophy . . . [W]e, like the National Academy, see "no new ethical or regulatory issues regarding chimeras themselves."⁴⁴

39. See DARWIN, ORIGIN OF SPECIES, *supra* note 20.

40. Consolidated Appropriations Act, Pub. L. No. 108-99, § 634, 118 Stat. 3, 101 (2004).

41. NRC GUIDELINES, *supra* note 32.

42. Mark Greene et al., *Moral Issues of Human-NonHuman Primate Neural Grafting*, 309 SCIENCE 385-86 (July 2005).

43. INTERNATIONAL SOCIETY FOR STEM CELL RESEARCH, *supra* note 32.

44. See Greene et al., *supra* note 42, at 385.

The pronouns “we” and “us” appear frequently in this Report. But from what stance are these beings speaking? How confident they are that they themselves are human. Without the species line, the “crossing” or “transgressing” of which raises no special question for them, how do they know?

What would they say to you or me, these twenty-two who were unanimous, if you or I raised the question whether these twenty-two were human, or sufficiently human? Certainly they know that genetically, in numerical rather than qualitative terms, they are already heavily “animal,” and that individuals now called human vary or are assumed to vary (since each individual cannot be examined) in the genetic mechanisms found within the body. Indeed individuals vary by quantitative measure apparently more within the old Darwinian “races” than between the races, and not just the so-called “deformed,” the so-called “defective,” or the so-called “disabled.”⁴⁵ If sexual breeding is bypassed and the species line marked by it is dissolved, each of the twenty-two in the ad hoc working group is only, to begin with, a living being drawn from two (or more) living beings differing in their physical makeup as all living beings seem to do.

On the question of humanness (including their own humanness) these twenty-two beings must move and they do move to the characteristics they value. “Value,” we may note, is explicitly excluded from scientific thought along with its parent “purpose” to give scientific method its demonstrated power, but here it reenters their thought. Value must reenter when the underlying question is one of action, action that could be taken or not taken, or could be aided, permitted, or restrained. With the move to valuing characteristics we are taken full circle back to the field of “animal law” that I described earlier, in which beings referred to in statutes or constitutions as just “animals” are categorized and ranked for purposes of decisions whether to recognize that they have interests of their own, and whether to protect their interests or weigh them against interests that are distinctively “ours.”

To see this for oneself, I should say, one has only to read a collection of judicial opinions from trial and appellate courts in ordinary cases involving animals, for example denying force to provisions in wills for destruction of companion animals, or recognizing a trust with an animal beneficiary, or interpreting restrictive covenants in neighborhoods, or choosing a measure of damages in tort, or recognizing standing in human beings to sue on animals’ behalf, or finding “ripeness” for judicial review after weighing harms to animals, or applying import restrictions to protect them abroad, or, over and over, drawing the contours of criminal prohibitions against killing or torturing them.⁴⁶

45. See, e.g., NATIONAL INSTITUTES OF HEALTH, HUMAN GENETIC VARIATION 7-8 (1999).

46. See the collections in contemporary teaching materials in animal law in the United States, for example, WAISMAN ET AL., *supra* note 12; DAVID FAVRE, ANIMAL LAW: WELFARE, INTERESTS, AND RIGHTS (2008).

The range of characteristics noted and valued in animal law is wide—responsibility of a moral kind on the part of an animal in a relationship of authority pointed toward a common purpose, possession of a language or a culture, social and family life, parental bonding, capacity for “psychological well-being”⁴⁷ (a phrase in the Animal Welfare Act of 1985), capacity for suffering that is different from physical pain, capacity for pain itself, companionable relationships with beings called human, love, loyalty, courage, on and on. Human beings do not always have the edge in some of these qualities, even in the eye of human judges in legal opinions. And what has been the result and somewhat the aim of legal inquiry into these is individuality in the living unit being considered, with all that flows from recognition of individuality.

In the ad hoc working group’s report on hybridization by neural grafting, these capacities and characteristics merge with more general phenomena for which their words are general, “sentience,” “consciousness,” “self-awareness,” “anticipation, and perhaps fear, of individual death.” And they merge with capacities or characteristics pointed to by words used outside law or reports of this kind, to which the novelist J. M. Coetzee and the biologist Lewis Thomas turn, “fullness of being” or “joy.”⁴⁸ The philosopher Alasdair McIntyre goes to recent work on dolphins to consider “virtues” and especially ways we with human life might break a self-imposed dichotomy between “natural” selfishness and “inexplicable” altruism, looking out to animals to recognize our own individual dependence on other human individuals, early in life, late in life, and in-between.⁴⁹

The scientist and bioethicist authors of the recent reports on hybridization are not judges, not legislators, not jurors, not representative at all as those involved in law’s development are asked to be. In contrast to the range of valued characteristics in animal law that has emerged over many years from judges, legislators, and jurors, what these scientists and bioethicists move toward as the characteristic of concern to them is, in the words of the ad hoc working group, “humanlike cognitive capacities” which can be assessed by “performance on cognitive tasks” and “observance of behavior,” not through relationships of a mutual kind but on the basis of behavior viewed from afar. The ad hoc working group goes on to recommend that

experiments involving H-NHP neural grafting [“human” to “nonhuman” primate] be required, wherever possible, to look for and report changes in cognitive function. Explicit data collection on cognition and behavior will help to ensure that ethical guidelines can be developed appropriately as the field advances.⁵⁰

47. Animal Welfare Act (as amended), 7 U.S.C. § 2143(a)(2)(B) (2007).

48. J.M. COETZEE, *THE LIVES OF ANIMALS* (1999); LEWIS THOMAS, *THE FRAGILE SPECIES* (1992).

49. ALASDAIR MCINTYRE, *DEPENDENT RATIONAL ANIMALS: WHY HUMAN BEINGS NEED THE VIRTUES* (1999).

50. See Greene et al., *supra* note 42, at 386.

“Cognition,” with its root in the word “knowledge,” can include much. But if one reads the background to its use here, “the cognitive” is something far more limited than the range of valuable human characteristics. Not surprisingly it focuses upon abilities to engage in manipulation of units (including living units) and perform tasks suggested by mathematical and quasi-mathematical logic. “Cognitive capacity” is closely related to “rationality” in both scientific and economic and social scientific thought generally.⁵¹

Certainly choice of this particular capacity to value represents a breach in a vision of the world from which science *qua* science excludes value and purpose. Even the great Jacques Monod, after insisting that postulates of purpose anywhere in the universe are “animisms” that “exist at odds with objective knowledge, face away from truth, and are strangers and fundamentally *hostile* to science,”⁵² acknowledges cognitive capacity as a value. But it is presented as the only value. Where the question what is human is concerned, and what others will allow scientists or doctors to do to a creature, or scientists or doctors as humane citizens will allow themselves or others to do in particular cases,⁵³ this capacity is not the only value. It is not even the most highly prized. The power of scientific thought in understanding and predicting the behavior of the systems of the world may be fully acknowledged while, at the same time, love, loyalty, capacity to bring out music, companionship that makes one not alone, cooperation, indeed physical strength may be much more highly prized than the capacity to manipulate. What is being shown in current reports focusing in on this capacity, when the question is the human, is the eugenic frame of mind, so easy, so very easy to slip into.

That “cognitive capacity” is the particular capacity these particular authors of these reports are endowed with in greater measure than others is not disqualifying, no more than Darwin’s identification with his “civilized” racial status destroys the value of his insights. They and others like them are trying to be helpful. But they only propose. Over time “we,” that greater person who is not confined to the length of an individual life, must conclude, and conclude every time we act over time as time goes on.

In observing this I think we may be observing that it is responsibility that marks us as human, responsibility the one aspect of sentience we specially bring

51. See further discussion of this in Joseph Vining, *Legal Commitments and Religious Commitments*, 44 SAN DIEGO L. REV. 69, 77-78 (2007); VINING, *supra* note 31, at 134-135; and Vining, *The Resilience of Law*, in LAW AND DEMOCRACY IN THE EMPIRE OF FORCE (James Boyd White & H. Jefferson Powell eds., forthcoming).

52. JACQUES MONOD, CHANCE AND NECESSITY: AN ESSAY ON THE NATURAL PHILOSOPHY OF MODERN BIOLOGY 171 (1971).

53. It should be noted that though review boards for animal experimentation have a largely scientific composition, their members are mandated by the Animal Welfare Act to “represent society’s concerns regarding the welfare of animal subjects used” –not their concerns in their identity as scientists but society’s concerns, theirs as citizens under the law. Animal Welfare Act, 7 U.S.C. § 2143(b)(1).

into the living world. The work of Vicki Hearne and Barbara Smuts⁵⁴ should keep us open to the possibility that even this may be shared with nonhuman beings: so let me say “general responsibility,” for life itself, for the world, for vulnerable individuals including ourselves each a vulnerable individual.

But, ultimately, contemplation of hybridization over time, even anticipatory discussion now of how to treat one or another hybrid if hybridization develops and spreads, may tease out not so much what makes us distinctive, or what makes us human who can be, as we know, so inhuman. It may tease out more what makes life in the universe so interesting and beautiful. It may help us resist the eugenic temptation. It may turn us around to value characteristics not for their closeness to what we see in ourselves or in some individuals we know, but for their strangeness, to value capacities we may not have. We know this is possible—mathematicians or saints give us who are not mathematicians or saints vicarious access to real worlds beyond those we experience directly. Then it may turn us again and lead us back from strangeness to a common music, that can appear time and again in evolutionary development and may not be the product of our history alone at all. The evolutionary biologist Simon Conway Morris has so beautifully traced this.⁵⁵ The bird, the whale, the lowly mouse,⁵⁶ and who knows what other forms of life can sing. Music may speak more truth to the mind than anything in words or numbers, and animals may participate with us in it. How fully they do we have only begun to perceive.

After extended contemplation of hybridization we may well wish to pull back and do none of it. Even experimentation with it, in a situation of such uncertainty about the identity of the individuals being experimented upon, may risk giving up too much of the humanity we have achieved at so great a cost. But extended contemplation of what really is possible could just possibly lead us to a capacity for relationships of a kind that would make human beings, as now constituted, “not alone” in the universe. Instead of stopping with conclusions about how to treat individual mixtures of the human and the animal, we may move toward conclusions about how to treat all flesh. Growing out of the conflicted and inconsistent ways in which we have behaved in the past, we may be looking toward a new dispensation for life on earth.

54. See, e.g., HEARNE, *supra* note 25; Barbara Smuts, *Reflections*, in COETZEE, *supra* note 48, at 107-20; Barbara Smuts, *Encounters with Animal Minds*, 8 J. CONSCIOUSNESS STUD. 293 (2001).

55. See CONWAY MORRIS, *supra* note 35, at 225-27, 436.

56. T.E. Holy & Z. Guo, *Ultrasonic Songs of Male Mice*, 3 PUB. LIBR. SCI. BIOLOGY 2177 (2005). My SONG SPARROW, *supra* note 31, looks at individuality in birdsong and its implications. A hybridization experiment on vocalization, by genetic engineering, has been done—replacing the mouse FOXP2 gene with the human version. See Nicholas Wade, *Neanderthals Had Important Speech Gene, DNA Evidence Shows*, N.Y. TIMES, Oct. 19, 2007, at A14.