

HUMAN-ANIMAL CHIMERAS: HUMAN DIGNITY, MORAL STATUS, AND SPECIES PREJUDICE

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Abstract: The creation of chimeras by introducing human stem cells into nonhuman animals has provoked intense concerns. Addressing objections that appeal to human dignity, I focus in this essay on stem cell research intended to generate human neurons in Great Apes and rodents. After considering samples of dignity-based objections from the literature, I examine the underlying assumption that nonhuman animals have lower moral status than persons—with particular attention to what it *means* to speak of higher and lower moral status—before evaluating the chimera research in question. I argue that (1) such experiments involving Great Apes should be prohibited out of respect for the research subjects and (2) such experiments involving rodents may or may not be permissible, depending on how we answer unresolved questions regarding rodents' moral status. In the end, concerns about human dignity prove insignificant.

Keywords: chimeras, embryonic stem cell research, Great Apes, human-animal chimeras, human dignity, moral status, rodents, stem cells, stem cell research.

Human-animal chimeras are creatures that result from introducing human cellular material or body parts into nonhuman animals, or vice versa. Mildly chimeric creatures have been with us for a while—rodents with human skin, muscle tissue, or immune systems, for example, and humans with pig heart valves to improve cardiac function. The creation of human-animal chimeras by introducing human stem cells into nonhuman animals is a relatively new development. Such chimeras can be created prenatally or postnatally. In the prenatal variety, which is of special interest to basic biology, human stem cells—whether derived from embryos, fetal tissue, umbilical cords, or postnatal humans—are introduced into embryonic or fetal animals, usually with the aim of exploring the stem cells' developmental potential. In the postnatal variety, human stem cells are introduced into developed (postnatal) animals, typically animals with some disease or impairment, in order to test more directly the therapeutic potential of stem cells for humans with similar diseases or impairments. This essay will mainly, but not exclusively, concern chimeras created prenatally.

The prospect of biologically blurring the human/nonhuman divide by creating chimeras has provoked intense concerns. Several commonly voiced concerns—including appeals to moral taboos, “unnaturalness,” and notions of species identities—have been extensively addressed and largely undermined by existing literature (see, e.g., Robert and Baylis 2003; Karpowicz, Cohen, and van der Kooy 2004). This essay will address objections that appeal to *human dignity* or *the allegedly unique moral status of human beings*.

As for the research to be considered, the essay will focus on transplantation of human stem cells with the aim of producing human neurons in two types of recipients: *Great Apes* (chimpanzees, bonobos, gorillas, and orangutans) and *rodents* (such as mice and rats). Several methods for achieving this aim are possible: (1) transplant of human embryonic stem cells (hESCs)—which have yet to differentiate into neural, blood, or other specialized stem cells—into animal embryos, leading in principle to a radical mixing of human and animal cells of all types, including neurons;¹ (2) transplant of either human *neural* stem cells (which have begun to differentiate) or more primitive hESCs into the brains of animal fetuses (see, e.g., Muotri et al. 2005); or (3) transplant of human neural stem cells or hESCs into postnatal animal brains. The focus on neurons is intended to provoke as fully as possible concerns about the mixing of characteristically human traits with nonhuman traits, since neurons enable the cognition and emotion often thought definitive of humanity. In this regard method (1) is the most interesting, and method (2) the second most, because the earlier the introduction of human stem cells, the greater the likelihood of extensively mixing human and animal traits. Great Apes are of special interest because their relatively large craniums and long brain-development time seem more conducive to the development of humanlike brains than in the case of other laboratory animals. Moreover, the moral status of these animals is often thought higher than that of other nonhuman animals (with the possible exception of dolphins), though less than that of humans. Rodents, meanwhile, are useful to consider because they are the most commonly used research subjects and because their moral status might be thought lower than that of Great Apes, inviting an illuminating contrast.

Underlying objections appealing to human dignity or allegedly supreme moral status is, of course, the assumption that *humans have higher moral status than nonhuman animals*. After considering samples from the literature in which dignity-based objections are voiced, the remainder of this essay will critically examine the underlying assumption—with particular attention to what it *means* to speak of higher and lower moral status—before addressing the ethics of chimera research that results in

¹ For a preliminary indication of the scientific viability of this approach, see James et al. 2006.

human neurons developing in Great Ape and rodent hosts. I will argue that (1) such experiments involving Great Apes should be prohibited out of respect for the research subjects and (2) such experiments involving rodents may or may not be morally permissible, depending on answers to unresolved questions regarding rodents' moral status. In neither case do concerns about human dignity prove significant.

Human Dignity and Species Prejudice

Various authors have argued that human-animal chimeras pose a threat to human dignity or to the idea that humans have supreme moral status. Let us consider some of these authors' claims.

James Robert and Françoise Baylis argue that human-animal chimeras would "introduce inexorable moral confusion in our existing relationships with nonhuman animals and in our future relationships with part-human hybrids and chimeras" (2004, 9). Chimeras would introduce confusion, they argue, by blurring the boundaries between beings with radically different types of moral status. "In the case of human beings, moral status is categorical insofar as humanness is generally considered a necessary condition for moral standing. In the case of nonhuman animals, though, moral status is contingent on the will of regnant human beings" (9).

The second quoted passage seems confused. Assuming "moral status" and "moral standing" are interchangeable, it's incoherent to say that humanness is necessary for such status and then to refer in the next sentence to nonhuman animals as (contingently) having some such status. Further, since to have moral status is to have moral importance irrespective of one's instrumental use or mere interest to others, the Robert and Baylis view is better described as the view that humans have moral status, while animals, though sometimes of interest to humans, do not.

More importantly, the undefended claim by Robert and Baylis that the moral status of human beings rests on what they are whereas animals' value is determined by human attitudes seems uninformed and wrong-headed. It seems uninformed, first, in pandering to a pre-Darwinian worldview according to which nonhuman animals are part of nature and lack inherent value whereas humans are *sui generis*, apart from nature, and incomparably valuable. Further, the authors' claim indicates a lack of familiarity with the extensive literature on animal ethics. Anyone familiar with that literature knows that nearly all of the most respected scholars in animal ethics attribute at least some moral status (some moral, noninstrumental value) to sentient animals and would never dream of saying that "humanness is generally considered a necessary condition of moral standing" without further comment. The authors' approach is, I think, also wrongheaded—indeed, morally obnoxious—in suggesting

that nonhuman animals are essentially things whose value depends solely on the interests and whim of another kind of animal, human beings.²

In her commentary on Robert and Baylis's article, Cynthia Cohen argues that we must clarify "what it is to be human, even if only sketchily, if we are to claim that human beings have full moral standing" (2003, 3). Applying the term "human" to every member of our species, Cohen in effect apparently intends to ask what it is to be *Homo sapiens*. But, strictly speaking, what it is to be *Homo sapiens* is simply a matter of biology: It is to be an organism that has descended from a particular branch of the tree of terrestrial life, an organism whose genome lies somewhere within a particular range, or the like.³ While the best conception of what constitutes a species is a matter of dispute, the important point for immediate purposes is that species membership is a matter of biology.

But Cohen focuses not on biology (genetics, heredity, and so forth) but on phenotypic traits that she finds expressive of humanity. For example, "we consider self-consciousness and the ability to use language in speech more important to being human in most contexts than being left-handed or having a good olfactory system" (Cohen 2003, 4). For this reason she considers research that might create chimeras with such humanlike characteristics especially threatening to human dignity. Note, however, that in referring to certain cognitive capacities she has abandoned any effort to address what is *essential* to members of our species, for not all members of *Homo sapiens* have these capacities—even potentially. If what it is to be human is a function of such cognitive characteristics, and if being human is necessary for full moral standing, as she claims, then not all members of *Homo sapiens* have such standing. Cohen ultimately recommends unpacking the concept of "human" in terms of a cluster of characteristic traits (e.g., self-consciousness, linguistic capacity) rather than a precise set of necessary and sufficient conditions. By now it seems as if the concept she is addressing is really *personhood*, which is plausibly understood in terms of a cluster of characteristics, rather than *Homo sapiens* or humanity (understood biologically). Later I will argue that such a conceptual analysis of personhood will support the conclusion that Great Apes are so much like paradigm persons with respect to relevant characteristics that we ought to regard them as our equals in moral status.

Presumably, none of the authors under consideration would be comfortable with the thesis that certain nonhuman animals have full moral status. Some, in fact, regard animals as mere commodities. David Resnick states that violations of human dignity occur "when one treats a

² Also criticizing the authors' species prejudice, though in different ways, are various commentaries on the authors' article in the same journal issue: Rollin 2003; Savulescu 2003; Bok 2003; Castle 2003; and Urie, Stanley, and Friedman 2003.

³ For a defense of the criterion of evolutionary lineage over that of the genome, see Laporte 2004, 10–12.

whole human being, or a part of a human being closely connected to the whole human being, as a complete commodity”—for example, as something appropriately patented, which he assumes animals are (2003, 35). Other authors, while less likely to regard animals as mere commodities, assume without argument that animals have inferior moral status. As Phillip Karpowicz, Cynthia Cohen, and Derek van der Kooy put it, “animals may have a worth of their own, but theirs is not equivalent to human dignity” (2004, 333). Maintaining human dignity, they contend, permits the creation of chimeras so long as they do not have “the psychological characteristics associated with human brains” (334). But, as we will see, many nonhuman animals (whose mere existence surely poses no threat to human dignity) have some of the psychological characteristics associated with human brains, leaving unclear why human-animal chimeras that had some of these characteristics would threaten human dignity. Falsely dichotomizing the mental characteristics of humans and nonhuman animals will not help us achieve a clear view of moral status across species and of the ethics of creating human-animal chimeras.

After arguing that membership in the *Homo sapiens* species is the basis of our moral rights, George Annas, Lori Andrews, and Rosario Isasi claim that “cloning and inheritable genetic alterations can be seen as crimes against humanity of a unique sort: they . . . can alter the essence of humanity itself (and thus threaten to change the foundation of human rights) by taking human evolution into our own hands and directing it toward the development of a new species” (2002, 153). Although the authors do not mention human-animal chimeras, their claim that our moral status rests on species membership and is threatened by the prospect of creating a new species closely related to ours suggests that they would regard chimeras as a grave threat to human dignity.

Suppose that certain human-animal chimeras are so genetically different from human beings and the relevant animal species that, however we understand species differences, the chimeras count as a new species. How would this threaten humanity or human dignity? Annas, Andrews, and Isasi worry, *inter alia*, about actions that may “alter a fundamental characteristic in the definition of ‘human’” (2002, 153). Here, like Cohen, they either (1) wrongly think that the biological kind of which we are members has a *meaning* or *definition* in the ordinary sense of those terms (as opposed to being a natural kind united by biological relations) or (2) mean by “human” something above and beyond membership in our species, contrary to their explicit claim that the cherished quality of being human rests in species membership *per se* (152–53). Further, it’s highly implausible to assert that the emergence of a new species would somehow damage the “essence of humanity”—whatever that means exactly. How could it?

Most fundamentally of all, the idea that our moral status is based entirely in the biological matter of species, as the authors repeatedly

suggest, is indefensible. Scientists recently claimed, though the claim proved controversial, that a distinct hominid species, *Homo floresiensis*, existed only twelve thousand to thirteen thousand years ago.⁴ Found with their remains were sophisticated tools, suggesting that these hominids were fairly advanced, even if less so (on average) than our species. Suppose for now that the controversial claim of a distinct species is correct; alternatively, consider the most advanced, tool-using hominid species other than *Homo sapiens*, whatever species that was. Presumably *some* members of this relatively advanced hominid species were cognitively comparable to some present-day humans (perhaps normal young children) whose moral status is beyond question. So, to deny that these hominids—or beings like them and like us—lacked(ed) moral status merely because of species difference is the height of bigotry. Even if biology were so morally important—and it isn't—there would be no reason to think that *species* markers are so important to moral status. After all, these recent hominids, like many other hominids, were members of our genus, *Homo*. And all members of the genera *Australopithecus* and *Paranthropus* were, like members of *Homo*, hominids, another biological grouping.⁵ And, of course, all of these and many other animals are apes, primates, mammals, vertebrates, and so on. To single out species as the unique biological basis for moral status is as silly intellectually as it is self-serving for those in whom species prejudice operates strongly. As I've argued elsewhere, the thesis that all humans, and only humans, have moral status is further undermined by the considered judgment that cruelty to (sentient) animals is wrong, a judgment whose coherent defense requires attributing some moral status to the victims of cruelty.⁶

Two other samples from the literature, both more thoughtful and less prejudiced than those discussed above, prove instructive to consider. Examining concerns appealing to human dignity, Jamie Shreeve writes that "the better a chimera serves as a research model for actual human biology [a human–Great Ape chimera being optimal], the more risk there is that it will acquire human attributes that would preclude or even criminalize its use in research" (2005, 43). It apparently doesn't occur to Shreeve that Great Apes may *already* have attributes that morally preclude their use in research—or, more precisely, research likely to harm them solely for others' benefit. Somewhat similarly, Robert Streiffer (2005) discusses ethical issues concerning the creation of chimeras who, due to the presence of certain human-typical traits, would have higher moral status than the animals into whom human stem cells were

⁴ See Knight and Nowak 2004 and Gugliotta 2005. Regarding the controversy, see Wilford 2006.

⁵ For an excellent introduction to hominid evolution, see Wood 2006.

⁶ See DeGrazia 1996, chap. 3, and DeGrazia 2002, chap. 2. Both works contain additional arguments for my claims about moral status.

introduced. Like Shreeve, he assumes that no currently existing nonhuman animal has full moral status. So do the other authors whose contributions have been discussed in this section.

Is that assumption true? We need to consider, first, what it means to speak of one type of being, or one individual, as having greater moral status than another. Once that conceptual matter is sufficiently clear, we can ask whether there are good grounds for claiming that humans have greater moral status than nonhuman animals.

What Does It Mean to Speak of Higher and Lower Moral Status?

Perhaps surprisingly, the conceptual issue of higher and lower moral status has received scant attention in the literature.⁷ Before addressing it, let us return to the more fundamental concept of moral status. To say that a being has moral status is to say, for starters, that how we treat that being—say, a dog—matters morally. We should not kick dogs, for example. If, however, the only reason we shouldn't kick dogs is that doing so might damage what is legally regarded as someone's property, or that doing so might upset animal lovers, that would mean that dogs have no moral status. For, on this account, there would be nothing about harming the dog that is itself morally problematic; it's just that doing so has negative effects on human beings. According to the view that dogs have moral status, by contrast, part of the reason cruelty toward them is wrong is that it harms them for no compelling reason (explaining why such cruelty seems wrong even if the dog has no "owner" and no one will discover the cruelty). To have moral status, then, is to have direct or independent moral importance. For beings who have moral status, to be treated merely as tools or property—with no independent regard for their welfare—is to be treated wrongly. Nearly all leading work in animal ethics—and, I submit, the only plausible interpretation of the wrongness of cruelty to animals—supports the judgment that sentient animals, who by definition have an experiential welfare, have (at least some) moral status.

With the concept of moral status reasonably clear, what does it mean to say one being has more of it than another? If moral status is all or nothing, so that a being either has it or does not, then the comparative language is clear. To assert, as much of moral tradition assumes, that humans (or persons) have greater moral status than animals is to say that the first group has what the second group lacks. Of course, one might assert such superiority on behalf of a larger set of beings, such as sentient beings. Both the traditional view and this radical view hold, in effect, that

⁷ There are exceptions. For example, Lori Gruen (2003) implicitly addresses the issue in distinguishing *moral considerability*, which is all or nothing, and the *moral significance* of a morally considerable being's claims or interests. And Elizabeth Harman (2003) addresses the issue explicitly.

every entity is either a being with (full and equal) moral status or a thing, period. But must we dichotomize so?

Conceptually, no such dichotomy is necessary, because it is perfectly coherent to think of moral status as admitting of degrees. Note, again, an implication of my thesis that any adequate analysis of cruelty's wrongness must acknowledge the moral status of cruelty's victims. Since sentient animals can be treated cruelly, my contention implies that they have moral status. Thus, either they have the same moral status as human beings or they have some, but less, moral status—which would then come in degrees. The greater one's attachment to moral tradition, the more attractive will be the view that humans, or persons, have higher moral status than do most or all nonhuman animals (even if, as I've argued, the latter have some moral status). There appear to be two coherent ways to unpack the idea that humans have greater moral status, which admits of degrees, than do animals.

Most people, including most animal protectionists, believe that it is generally worse to kill a person than to kill a chicken (even if killing chickens is morally problematic). This seems especially clear if we consider cases of painless killing, making the *prima facie* wrongness of causing suffering irrelevant to the comparison. Now, if we hold that chickens, as sentient creatures, have moral status, how should we understand the thesis that it's generally worse to kill persons than to kill chickens? Two models can be distinguished.

According to what we may call the Unequal Consideration Model of Degrees of Moral Status, a sufficient explanation for why it is generally worse to kill persons is that they are due full moral consideration, whereas chickens are due some, but less, consideration. To explain what this means we must consider the meaning of equal moral consideration. To grant *equal consideration*, as I will use the term, to X and Y is to judge that *we ought to attribute roughly equal moral weight or importance to X's and Y's comparable interests*.⁸ Persons have interests in, among other things, experiential well-being, life, and autonomy. Sentient nonpersons, including sentient animals, have interests in experiential well-being and (let us assume for the sake of the present discussion) life.⁹ If both persons and animals have an interest in life, does that mean their respective life interests are comparable in the sense relevant to the above formula?

⁸ The language of equal consideration was employed very influentially in Singer 1975. Many authors adopted this language, using it in roughly the same way as Singer. I attempted to make its meaning more explicit in DeGrazia 1996, especially chaps. 3, 8, and 9.

⁹ Animals also have interests in liberty and functioning, but it's debatable whether these interests are independent of experiential well-being or just aspects of it. See DeGrazia 1996, chap. 8. In referring to "interests," I do not suggest that the subject necessarily conceptualizes and takes a conscious interest in life, liberty, or whatever. I use "interests" to refer broadly to components of well-being, those things in which an individual has a prudential stake.

Probably not. The relevant sense of comparability is prudential: having roughly the same thing at stake, from the perspective of one's overall well-being or interests. Persons generally have an enormous stake in remaining alive, insofar as continued life is a necessary condition for much of what they (prudentially) value, which is tied up with long-term projects and life plans. Having much less temporal self-awareness, chickens presumably do not have the same stake in staying alive as opposed to having a good quality of life, or experiential well-being, as long as they are alive. That means that a stronger moral presumption against killing persons than against killing chickens is compatible with equal consideration. What we need, in order to understand the idea of unequal consideration, is an example of a comparable interest that persons and sentient nonpersons share.

Experiential well-being is the best possible example. All sentient creatures have an interest in experiential well-being. For simplicity, let's focus on the avoidance of suffering. Not suffering to some degree seems more or less equally important, prudentially, regardless of who the subject is, insofar as the primary evil of suffering is its experiential or intrinsic badness. (By contrast, the harm of death seems primarily instrumental—bad because of the opportunities it precludes.) So is it worse to cause suffering to a person than to cause the same amount of suffering to a deer? To focus on how much we owe to the deer and person, respectively, let's ignore indirect effects of the suffering on other individuals, such as deer enthusiasts, the person's loved ones, and society as a whole. According to the Unequal Consideration Model of Degrees of Moral Status, it is morally worse to cause a certain amount of suffering to a person than to cause the same amount of suffering to a deer. The two beings have prudentially comparable interests in not suffering, but the person's interest has greater moral weight than does the deer's interest. Wherever persons and sentient nonpersons have comparable interests, those of persons carry greater moral importance. In this sense, persons have higher moral status.

But there is another way to understand moral status as admitting of degrees. For even those who assert a principle of equal consideration across species acknowledge that not all interests are comparable. Among those who believe that sentient animals have an interest in life, most hold that persons have more of an interest in life. According to the Unequal *Interests* Model of Degrees of Moral Status, the reason why it's generally worse to kill persons than to kill chickens is that the equal consideration to which persons and chickens are entitled gives equal moral weight only to comparable interests. Since the life interests of chickens and persons are not comparable, because persons have a greater stake in staying alive, the reason for the greater presumption against killing persons is simply that doing so harms them more. Other things being equal, it's worse to cause more harm than less harm. In this restricted sense, which refers to the noncomparability of certain interests possessed by persons and animals, both have moral status, but persons have more.

In interpreting a set of moral judgments about animals, it can be difficult to distinguish the Unequal Consideration Model and the Unequal Interests Model. Both models, after all, are likely to support many common judgments: that it's morally problematic to kill persons and chickens but worse to kill persons, that it's morally problematic to cause any being to suffer, and so on. The optimal test case is, again, whether it is equally problematic to cause persons to suffer and to cause sentient nonpersons to suffer. But even thought experiments designed to zero in on this issue can be complicated by other factors that may make it difficult to isolate the variable of *degrees of consideration*: What is the relationship between agent and victim? What of the instrumental harm of suffering, the way it distracts one from pursuing one's goals—can't that vary in relevant ways? And so on. Nevertheless, the difference between the two models of degrees of moral status is a meaningful difference that is significant in the context of animal research (see DeGrazia 2002, chap. 7), including research producing human-animal chimeras.

Do Human Persons Have Higher Moral Status Than Nonhuman Animals?

Do humans have higher moral status? With respect to nonsentient animals, which entirely lack the capacity for felt sensations or conscious experiences, I suggest that the answer is straightforward: Yes, human beings have higher moral status than nonsentient beings, because the latter have no interests and therefore no moral status.¹⁰ (In referring to human beings here, I have in mind those members of our species whose moral status is not contested; thus I set aside consideration of human fetuses, anencephalic infants, and adults who, though alive, have permanently lost the capacity for consciousness. Hereafter I will refer to human *persons*.) This brings us to the harder question: Do human persons have greater moral status than sentient nonhuman animals—in particular, Great Apes and rodents?

To address this harder question, we need to ask about personhood: what it is, what beings are persons, and how personhood relates to moral status.¹¹

Personhood

In ordinary life, when we use the term “persons” we are usually referring to specific human beings. The term refers uncontroversially to normal human beings who are beyond infancy and toddler years. As paradigm

¹⁰ For arguments in support of the view that all and only sentient beings have interests and moral status, see, e.g., Singer 1975, chap. 1; Feinberg 1984; Steinbock 1992, chap. 1; and DeGrazia 1996, chap. 3.

¹¹ Much of the following discussion of personhood and Great Apes draws from DeGrazia 2006, 40–43, 44–45.

persons, normal human children, adolescents, and adults are psychologically complex, linguistically competent, and highly social. But what about human beings who are much less psychologically developed, linguistic, and social, such as fetuses, babies, and elderly individuals in the late stages of dementia—are they persons? Are any nonhuman animals?

At this juncture we need a more refined account of personhood, although the following remarks will provide only a sketch.¹² The concept of personhood clearly extends beyond our species. As suggested earlier, it applies to some members of now-extinct hominid species. (Naturally, their being persons did not require possession of the *concept* of personhood any more than the existence of bronze required someone to have the concept of it.) Moreover, we often categorize as persons certain fictional nonhuman beings and some nonhuman beings whose existence is debatable. Thus E.T. the extraterrestrial and the speaking, encultured apes of *The Planet of the Apes* strike us as persons. If God and angels exist, they are persons. The term “person,” then, does not mean “human being” or even “human being [with certain capacities].” Rather the term refers to a kind of being picked out by certain psychological traits or capacities: beings with complex forms of consciousness, such as self-awareness over time, sociability, and rationality. Thus there might be persons who are not hominids of any kind.

Some hold that the term “person” is not merely *descriptive*, referring to a being with certain capacities, but also *prescriptive* or *moral*, conveying *someone with (full?) moral status*. But whether or not “person” combines descriptive content with some such moral content, the term clearly has descriptive content. And because many people today challenge the assumption that moral status requires personhood—as I did in arguing that sentient animals have moral status—it will be advantageous to focus on the term’s descriptive meaning.

The philosophical literature on personhood largely converges on the conception of persons as *beings with the capacity for sufficiently complex forms of consciousness*. Most leading analyses, that is, are compatible with this definition so far as it goes (see, e.g., Frankfurt 1971; English 1975; Singer 1993, 110–11; Schechtman 1996; Warren 1997, chap. 4; and Baker 2000). It is important to avoid the error of conceptualizing persons simply as beings with the capacity for consciousness, for this would—quite implausibly—extend to all sentient beings, including birds and reptiles.¹³ Also noteworthy is the role of the term “capacity.” When we speak of the capacity for complex forms of consciousness we include persons who are,

¹² For greater detail, see DeGrazia 2006, 40–43; DeGrazia 2005, 3–7; and DeGrazia 1997.

¹³ P. F. Strawson (1959, 104) implies such excessive inclusivity in suggesting that any beings with both mental and bodily characteristics are persons.

say, dreamlessly sleeping and not exercising the capacity. Some will interpret “capacity” here to include not only present capability but also the potential to develop it, implying that normal human fetuses and infants are persons. Here we need not decide whether that extension is legitimate. We can proceed by focusing on paradigm (uncontroversial) persons and eliciting enough content to enable us to reach significant results.

Can we say more than that persons are beings with the capacity for sufficiently complex forms of consciousness? We can. Personhood is associated with a cluster of more specific properties without being precisely analyzable in terms of any specific subset: autonomy, rationality, self-awareness, linguistic competence, sociability, moral agency, and the capacity for intentional action. Not all of these properties are strictly necessary for being a person, as suggested by the personhood of normal three-year-old children lacking in autonomy. Nor is it sufficient to have just one of these properties; many animals are capable of performing intentional actions yet fall far short of personhood. A person is someone who has enough of these properties, where “enough” takes account both of how many of these properties are instantiated and of the degree to which each is instantiated: a being with the capacity for *sufficiently* complex forms of consciousness (each of the properties representing a form of consciousness).

While personhood can be unpacked in terms of the properties just mentioned, or perhaps some similar list, it is nevertheless a vague concept. We cannot draw a precise, nonarbitrary line that specifies what counts as “enough” in terms of the relevant properties. The concept of personhood has blurred boundaries much as the concepts of adult and child have blurred boundaries. Although we can make such concepts precise for specific practical purposes—say, defining “adult” for the purposes of a legal right to vote—the basic concepts themselves are vague.

Despite the vagueness of personhood, its content allows us to identify paradigm persons and, beyond such easy cases, other beings who are sufficiently similar to warrant inclusion under the concept—such as the more psychologically complex earlier hominids. Let us now consider some nonhuman animals.

Great Apes and Borderline Personhood

The Great Apes include (“common”) chimpanzees, bonobos (often called “pigmy chimps”), gorillas, and orangutans. Might they be persons? Consider the relevant capacities.

While Great Apes’ capacity for intentional action is apparent in virtually everything they do, it is more strikingly displayed in activities that express unusual deliberateness, planning, or reasoning—activities that also indicate a degree of rationality. Chimpanzees, for example, regularly use tools, such as stems to probe for insects, moss for sponges,

and rocks to crack nuts (see, e.g., McGrew 1992, 44–46). Meanwhile, all Great Apes engage in social manipulation, such as deception, of their group members (see, e.g., Byrne 1996; de Waal 1997, 39–40; Tomasello and Call 1997, 235–59). Moreover, they are self-aware in several ways. Bodily self-awareness, which is manifest in all intentional action, is more impressively revealed in Great Apes' imitation of bodily gestures (see Wise 2000, 204–5, for a summary of the evidence), use of televised images of their out-of-view arms to reach hidden objects (see Tomasello and Call 1997, 52), and use of mirrors to examine otherwise undetectable markings on their own bodies.¹⁴ Social self-awareness, meanwhile, is evident in Great Apes' natural social structures, which feature long-term relationships, dominance hierarchies, and shifting allegiances; individuals need to know their positions in the group, and the associated expectations in interacting with others, in order to thrive (see Maple 1980, chaps. 2, 3, and 6; Byrne 1996; Goodall 1986, chaps. 7, 8, 18, 19). Naturally, evidence for their social self-awareness counts as evidence for their sociability. But an especially striking manifestation of sociability is found in primitive culture: the transmission from one generation to the next of such novel behaviors as using leaves for medicinal purposes, building nests, and fashioning certain types of tools. Distinct behaviors across populations within a single species are attributed to culture where plausible genetic or environmental explanations for the differences are lacking (see, e.g., McGrew 1992 and Vedantam 2003). Finally, there is some evidence of moral agency among Great Apes. The strongest is observation of apparently altruistic actions that seem neither conditioned nor instinctual—for example, chimpanzees' adopting and protecting an abandoned, disabled infant boy (Agence France-Presse 2002). More debatable is whether everyday displays of what appear to be compassion, courage, and other qualities that count as moral virtues in humans, but may have a biological basis, should count as genuinely moral in Great Apes, whose capacity for full-fledged moral agency (including deliberation and moral judgment) is itself uncertain.¹⁵

On the whole, Great Apes are fairly well endowed with personhood-relevant properties. Yet, except for a few who have been subject to intensive language training with human trainers, they are not so well endowed with these traits that they clearly qualify as persons.¹⁶ Normal

¹⁴ Gordon Gallup (1977) demonstrated such mirror use in chimpanzees and orangutans. Regarding gorillas, see Patterson and Gordon 1993, 71.

¹⁵ I explore this issue in DeGrazia 1996, 199–200. For an excellent recent discussion, see Shapiro 2006.

¹⁶ I argue elsewhere that at least one known bonobo, one gorilla, and one orangutan—all relatively successful subjects in ape language studies—clearly qualify as persons (DeGrazia 2006, 46–48). Language training is important both because linguistic competence is a criterion associated with personhood and because language seems to extend a being's conceptual reach and, with it, certain other cognitive capacities.

human children, by comparison, are clearly capable of introspective awareness (having knowledge of their own feelings, desires, and beliefs), robustly competent in language, and more likely to show signs of autonomy. My suggestion, therefore, is that normal, postinfancy Great Apes are *borderline* persons. In other words, given the vagueness of the concept of personhood, there is no definite yes-or-no answer to the question of whether they are persons. It's not that we don't know enough about them to say whether they are persons. Rather, they exist in the gray area between paradigm persons and the vast majority of animals who definitely are not persons.

Great Apes are borderline persons.¹⁷ Persons, of course, have full moral status (whether moral status is all-or-nothing or admits of degrees). What is the moral status of borderline persons? *Human* borderline persons, I take it, have full moral status. Consider, as examples, an ordinary toddler of eighteen months or an adult whose retardation is somewhere between moderate and severe. Although they require paternalistic protections, being unable to care for themselves, it would be wrong to regard them as any more eligible than ordinary persons for use as a means to societal good. One might believe that it is the toddler's *potential* for unambiguous personhood that confers full moral status on her (or even that such potential makes her a person now). The example of the retarded adult is important, therefore, in showing that potential personhood is not crucial to the full moral status of human borderline persons.

The basis for judging that human borderline persons have full moral status is that they are very close to qualifying as persons and therefore well endowed in terms of qualities relevant to moral status. This is true on any reasonable model of moral status. If (paradigm) persons do not have greater moral status than (paradigm) non-persons, because all sentient beings have full moral status, then borderline persons obviously do. Matters are a little subtler if there are differences of degree among beings with moral status. Let's consider the possibilities.

On the Unequal Interests Model, all sentient beings deserve equal consideration, but their interests can differ in ways that matter to moral status. For example, a bird is harmed much less by death, typically, than is a person. But such differences between borderline persons and paradigm persons—for example, paradigm persons' more highly developed intentions for the future—are so modest and subtle that they constitute a terribly thin reed on which to hang a claim of unequal moral status; with differences so slight, it seems theoretically and practically wiser to judge that they make no difference to moral status.

¹⁷ So, I argue, are dolphins (2006, 48–50). See also Marino 2002.

On the Unequal Consideration Model, among sentient beings the (paradigm) persons deserve greater consideration than the (paradigm) nonpersons. Why? It's not because persons and nonpersons are utterly dichotomous in their characteristics; they're not. Sentient beings can perform intentional actions. Many or most have some types of self-awareness (e.g., bodily, social) even if not introspective awareness. The more sophisticated among them demonstrate nontrivial forms of practical rationality, solving problems in their environment and so on (see DeGrazia 1996, chap. 7). The most plausible specification, then, of the Unequal Consideration Model is a gradualist one, a sliding-scale model, according to which sentient nonpersons deserve consideration *in proportion to their cognitive, emotional, and social complexity*. On this gradualist model, there are differences in moral status among sentient nonpersons and not just between them and persons. It follows from this that borderline persons would deserve, at most, just slightly less consideration than persons—another thin reed on which to hang a claim of different moral status. I say *at most* slightly less consideration because one might also interpret differences in moral consideration that different beings deserve as emerging only in comparisons of paradigm persons and paradigm nonpersons—borderline persons lying in the ambiguous gray area between.

It appears, then, that on any reasonable model of moral status borderline persons—whether human or nonhuman—have full moral status, or (though this may come to the same) ought to be regarded as having it. To treat borderline persons accordingly is to regard them much as we regard human children: not as substantially autonomous or as having full-fledged moral agency but as deserving moral protections of full strength. In research, this means that they may not be treated as mere means to social utility. Rather, they should be involved in research only if it is more or less compatible with their best interests, posing no more than minimal risk to them, except where greater risks are justified by therapeutic potential to the subjects themselves. If they can meaningfully assent or dissent from participation, they should not be used as subjects if they dissent (unless participation is of pressing therapeutic urgency *for them*, a condition that will be met only rarely). In general, the attribution of full moral status to borderline persons means that they have rights to life and liberty, as persons do, and that the concepts of murder and slavery apply literally when borderline persons are wrongfully killed or forced to work for others.

This has important implications for our treatment of Great Apes in research. As borderline persons, they have moral status equal to our own and should be treated with as much deference as we would treat human children who were unable to understand our speech. They should no longer be regarded as fair game to be sacrificed for the advancement of biomedicine.

Do Sentient Nonpersons Have Less Moral Status than Persons?

Do sentient animals who are neither paradigm nor borderline persons have less moral status than persons? Let's focus on rodents, the animals most commonly used in biomedical research, including stem cell research. There are three possibilities corresponding to three reasonable models of moral status.

If all sentient beings have equal moral status, then persons have no more moral status than rodents. A proponent of this model is nevertheless likely to agree that there are some important differences with respect to persons' and nonpersons' interests—for example, that premature death or significant limitations of liberty are likely to harm persons more than rodents. Whether such prudential differences amount to significant moral differences depends on the details of the theory. If all sentient animals have rights not to be killed, for example, the difference in life interests is unlikely to make any significant difference in the research context. On a more consequentialist approach, by contrast, the lesser harms involved in taking rodents' lives and significantly restricting their liberty are likely to mean that rodents may be used in research that harms them more often than would be acceptable in the case of human subjects.

Like this model of equal moral status, the Unequal Interests Model of Differences in Moral Status holds that all sentient beings deserve equal consideration and that there are significant prudential differences between persons and sentient nonpersons. The latter model, however, claims that these prudential differences justify attributions of unequal moral status, language that would mean little if the view did not accept some morally significant differences in how persons and rodents may be treated. What emerges, then, is that the Unequal Interests Model must be at least partly consequentialist and will allow, more specifically, that rodents may sometimes be used in research that harms them when similar treatment of persons would be unethical.

On the Unequal Consideration Model, persons clearly have greater moral status than rodents. Rodents may sometimes be used in promising research that harms them for the advancement of biomedicine. Their partial moral status does not support the rights and robust moral protections that persons enjoy.

Implications for the Creation of Human-Animal Chimeras

Let's take stock. As borderline persons, Great Apes have full moral status. Rodents, as sentient nonpersons, may or may not have less moral status than persons and borderline persons, depending on which model of moral status is most defensible. If there are degrees of moral status among beings who have it, then persons have greater moral status than rodents; otherwise, they do not. What are the implications for the creation of

human-animal chimeras—in particular, chimeras resulting from the transfer of hESCs or neural stem cells into Great Apes and rodents?

Possessing full moral status, Great Apes should not be used in research unless (1) their participation is realistically expected to pose no more than minimal risk to them or (2) greater risks are justified by the prospect of direct veterinary benefit to them and the absence of alternatives offering a better benefit/risk ratio. Moreover, if Great Apes find participation aversive, making clear signs that they don't want to continue, these communications should count as dissent and should disqualify the subjects from further participation—unless they face substantial veterinary need and participation in the study is the best hope for meeting it. These very stringent ethical standards for the involvement of Great Apes in research are appropriate in view of their moral status.

The chimera studies under consideration, which are intended to lead to the growth of human neurons in primate subjects' brains, would not meet these ethical standards and therefore should be prohibited. Because we have no clear understanding of what would happen to the research subjects, the risks facing them would be quite substantial. Meanwhile, the purposes of such studies would primarily be human centered: (1) to advance biology by better understanding how ESCs and neural stem cells work and (2) to advance the gradual development of treatments for such diseases as Alzheimer's and Parkinson's. In other words, the ape subjects' interests would be subordinated to social utility. To be sure, the studies might eventually advance veterinary care for Great Apes, but even pursuit of this goal would involve using the subjects for others' benefit; after all, they themselves would be harmed without compensating benefit. Such treatment of beings with full moral status is wrong.

What of the chimera studies involving rodents? Here matters are murkier. Let's assume that some such studies offer excellent prospects for gaining important biological knowledge and eventually helping many people struggling with dementia and other conditions. In that case, rodent subjects may be used if there is no alternative that would avoid using rodents (or other animals with equal or higher moral status) and either (1) the Unequal Consideration Model is correct or (2) the Unequal Interests Model is correct and the experiments' promise is sufficient to pass consequentialist muster without violating any appropriate deontological constraints (the last qualification being relevant in a mixed consequentialist-deontological approach). If, however, there is a viable alternative to using rodents, or neither condition (1) nor condition (2) is satisfied, then it would be wrong to use rodents.

Suppose for the moment that studies leading to the proliferation of human neurons in rodents' brains are ethically permissible. No doubt the commentators discussed in the section "Human Dignity and Species Prejudice" would welcome this conclusion. Few of them, however, would agree with me that *these studies would pose no risk to human dignity whatsoever*. The commentators are worried that animals might become

more personlike. Suppose this were true. Suppose (quite unrealistically) that the rodents achieved the cognitive complexity of, say, a borderline person or person—someone with full moral status. Even if, as we are assuming for now, human persons have greater moral status than rodents, no one's dignity or moral status would be threatened by the prospect of increasing the number of individuals with full moral status. Imagine that, incredibly, several living members of *Homo floresiensis* or another hominid species were discovered on an island; they would be borderline or paradigm persons. There is no intelligible reason for thinking this discovery would threaten the moral status of *Homo sapiens* persons any more than the constant increase in our species' population threatens our dignity. So the transformation of a rodent into a more personlike chimera or, more realistically, a Great Ape into a more humanlike person would not threaten human dignity.

There is, however, a moral reason to be concerned about chimera research that might transform a rodent into a being with full moral status (assuming for now that rodents have lesser moral status). The reason for concern is that what begins as a creature appropriately used for research purposes if certain conditions are met would become a being who isn't appropriately used in this way (cf. Streiffer 2005, 362). Suddenly a being with full moral status would exist. Assuming she would face nontrivial health risks as a result of participating in the study, she would have been treated unethically in view of her moral status. Moreover, what life would await her? What family or community would embrace her? We should not intentionally bring into the world any borderline or paradigm person who is unlikely to enjoy the social supports that such a being deserves, providing another reason not to pursue the studies under consideration.

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