Chapter – IV

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The Moral Status of Gene

In a process almost as old as earth a huge panoply of organisms has evolved. The process has been one of chance and selection. For almost three billions years natural changes were taking place in this way. We have now come to the end of this familiar pathway. Genetics has unlocked the codebook of life, and long-hidden strategies of evolution are revealing themselves. We now possess the ability to manipulate genes and thus can direct the future course of evolution. To put it otherwise, choice is going to replace chance. Mutation and natural selection will continue, of course. But henceforward the old ways of evolution will be dwarfed by the role of purposeful human intelligence. In the hands of genetic engineers, life forms would become extraordinary Tinkertoys and life itself another designed problem. For the first time in human history the chief danger of human survival comes from man himself instead of forces of nature. The rapidly unfolding saga of science and technology was never more apparent than the present. Almost every other day we read further press reports of how scientists are busy trying to create new animals, plants, bacteria and viruses with the capacity to cure genetic diseases, solve world food shortages, and help the environment and so on. Things are developing so fast that few people are aware of the full impact of these lightning changes. Keeping in mind the magnitude of the genetic revolution we need to understand how it all works--- the huge benefits and the very real dangers. We need this technology very badly, but with it come major issues which need to be addressed now. The new revolution will vastly expand our capability both to wreak evil and to render good; it will thrust upon us awesome new powers and

responsibilities, from the capacity to mass-produce identical infants to the ability to stamp out congenital diseases. Now what is being debated is the adequacy of society's wisdom in dealing with the explosive increase in biomedical knowledge.

Let us juxtapose two diametrically opposite view about the new technology:

Biotechnology is ideologically neutral. Properly supported it can bring immense benefit to mankind, for it is infinitely adoptable to counter all sorts of unforeseen threats. If we cast it down through hostility or faint heartedness we shall all be looser.

Biotechnology is the expansion, institutionalization and misapplication of a particular scientific creed with the potential for the devaluation and exploitative manipulation of life.

In order to decide rightness or wrongness of these procedures we need to ask a question that strikes at the root of the issue. It is the question about the moral status of gene. That is we need to decide . Do genes have moral status ? In order to enter into the discussion of moral status of gene, we need to have a clear idea about the concept of moral status and the different standpoints about this.

What is Moral Status

The concept of moral status is a means of specifying those entities towards which we believe ourselves to have moral obligations, as well as something of what we take those obligations to be. To have moral status is to be morally considerable, or to have moral standing. If an entity has a moral status, then we may not treat it in just anyway we please. We are morally obliged to give weight in our deliberations to its

need, interests, or well-being. Moreover, we are morally obliged to do this, not merely because protecting it may benefit ourselves or other persons, but because its needs have moral importance in their own right. Inanimate objects are presumed to have no moral status whereas human beings are held to have a strong moral status. Some argue that the concept of moral status is inherently anthropocentric. There are good reasons to believe in this.

There is at least one obvious reason why we need to discuss the concept of moral status. Human beings are cleaverer and opportunistic creature who have in recent past come to possess an awesome capacity to do harm both to one another and to the rest of the world. Today our power to do harm is magnified by an ever-more-cleaver technology. The developments in the last century and in the present amply demonstrate the human capacity to perpetrate horror against one another on a scale which has no parallel in human history.

Secondly one obvious fact about us is that we have a natural capacity to care about other living beings and sometimes about things that are evidently lifeless. A normal human being strongly inclined to care about many of the beings with which he interacts and want to protect them. And our aesthetic, intellectual, and spiritual appreciation of even the non-sentient elements of the natural world impels us to oppose their wanton destruction.

The concept of moral status is one of the tools which we use to bring order to the welter of conflicting claims what we ought and ought not to do. It can play more than one role in moral theory and human moral psychology. On the one hand, the concept of moral status can be used to specify minimum standards of acceptable behaviour towards entities of a given sort. When such standards of

behaviour are violated we are justified in protesting, objecting and sometimes using force to prevent or deter further violation. On the other hand, the concept of moral status may be used to establish moral ideal, such as Jaina ideal.

In the history of philosophy we find two approaches of moral status: uni-criterial approach and multi-criterial approach. Christopher Stone describes the uni-criterial approaches to moral status as those which propose that there is a single key (property): life, or capacity to feel pain, or the powers of reason or something else, those things that possess the key property count morally — all equally and all in the same way. Those things that lack it are utterly irrelevant.[i]

Stone rejects this kind of moral monism. He refers to his view as moral pluralism. He and many others opine that moral status must be a multi-criterial one, comprising a number of distinct but related principles. Such principles includes the admittance that there is more than one valid criterion of moral status; (b) that there is more than one type of moral status, with different types implying different obligations on the part of the moral agents; (c) that the criteria of moral status must include both certain intrinsic properties. To adopt such a multi-criterial view of moral status is to recognize that many moral problems are more complex than they appear.

Criteria of Moral Status

Among the proponents of moral status theory Albert Schweitzer is one important figure. For him, being a living organism is the only valid criterion of moral status. On this view, organic life is both necessary and sufficient conditions for full moral status. Thus not only do all living organisms have moral status, but all of them have exactly

same moral status. Conversely, things that are not alive can have no moral status.

The above view impels us to define the philosophically important term 'living things' or 'life'. The ordinary concept of life has two primary elements, both of which appear in the standard dictionary definitions. One primary element is that living things are neither inanimate, nor dead. The second element is that living things are generally capable of ingesting food metabolizing it produce energy growing, reproducing their kind, and maintaining their internal stage within limits compatible with survival. But the above definition does not give us enough clarification of the concept of life. They carry no guarantee of an unambiguous answer regarding the aliveness of novel entities, or familiar entities in novel circumstances. For example, in 1960s, when it has become possible to maintain human beings on mechanical life-support systems for a period of time after their brains had completely and permanently cease to function, urgent questions arose regarding the status of this brain-dead individuals. This disagreement is due to the fact that an ordinary concept of life does not include criteria that are precise enough to resolve all possible disputes about lives-boundaries. Brain-dead persons whose heartbeat and breathing are artificially maintained are evidently alive in some respects, but no longer alive in others: substantial parts of their bodies are still functioning, but their brains are not and never will. The question, then, is not whether they are alive according to the ordinary concept of life; for to that question there can be no clear answer. Rather, the question is whether it is morally desirable to refine our concept of life so as to include these human beings among the living, or whether it is morally better to regard them as having already died.

Nevertheless philosophers would like to have a clear and

simple definition of 'life' that captures the intuitive core of the concept. It is now generally recognized as unsatisfactory to define 'life' in terms of the presence of some special vitalistic or spiritual entity or power. Such definitions rely upon empirical hypotheses which find no support from contemporary biology.

A more promising approach is to define living things in terms of their teleological (goal-directed) organization. Paul Taylor, for instance, defines an organism as "a teleological center of life, striving to preserve itself and realize its good. . . To say it is a teleological center of life is to say that its internal functioning as well as its external activities are all goal-oriented, having the constant tendency to maintain the organism's existence through time and to enable it successfully to perform those biological operations whereby it reproduces its kind and continually adapts to changing environmental events and conditions. It is the coherence and unity of these functions of an organism, all directed toward the realization of its good, that make it one teleological center of activity".[11]

Teleological organization helps to explain why living things seem fundamentally different from things that are dead or inanimate. Yet teleological organization, at least as Taylor defines it, is not a necessary condition for life. Suicidal individuals, whose external activities are currently directed towards self-destruction rather than survival, reproduction, or adaptation to the environment, may nevertheless still be alive.

Teleological organization is not a sufficient condition for life either. The existence of human-made artefacts which pursue goals through complex feedback mechanisms shows that this form of organization is not unique to the entities that we are at present willing to

call living organisms. Taylor's response to this objection is that teleologically organized machines are not alive, because "[t]he goal-oriented operations of machines are not inherent to them as the goal-oriented behavior of organisms is inherent to them. . . the goals of a machine are derivative, whereas the goals of a living thing are original. The ends and purposes of machines are built into them by their human creators".[iii]

Unfortunately, this argument begs the question: for how are we to determine whether a teleologically organized system has goals of its own, rather than merely derivative goals, except by first determining whether or not it is alive? If we regard the goals of machines as not really their own because human beings built those goals into them then what are we to say about a (thus far hypothetical) 'test-tube amoeba' — one 'built' by human beings, but otherwise indistinguishable from a naturally generated amoeba? Surely the test-tube amoeba's artificial origin would not disqualify it as a living thing. Moreover, it is not clear that the goals of organisms are any more their own than are those of machines. Individual organisms do not design and create themselves, any more than individual machines do. Their teleological organization is largely the result of the physiological structure and composition that they inherit from their progenitors.

Sentience and Utilitarian Calculus

Some philosophers opine that only sentient beings have moral status. In recent times Peter Singer is a strong advocate of this theory. Sentience is the capacity to feel pleasure or pain. Feelings of pleasure or pain are experiences, but not all experiences are feelings of pleasure or pain. Thus to be sentient is to be capable of at least some of many forms of suffering and enjoyment --- from simple feelings

of pain or pleasure to more complex emotions, modes, and passions. It is clear that normal human being, once passed some early developmental stage, are sentient: but what about other animals. Descartes held that all non-human animals are automata, incapable of either thought or sensation. His primary argument for this is that animals do not use language, and that only language users can think or feel. He also argues that if animals could think or feel, then they would have immortal souls, which they do not.[iv]

Peter Carruthers defends a contemporary version of Descartes's first argument. He, however, believes that animals have experiences, but he holds that they are never conscious of their experiences.

Peter Singer's utilitarian theory is presented in his 1979 book *Practical Ethics*. Singer describes himself as a preference utilitarian. Preference utilitarianism is a modification of the classical utilitarian theory. For the classical utilitarian the fundamental moral principle is that actions are right in proportion as tend to promote happiness. wrong as they tend to promote the reverse of happiness. Preference utilitarian defines happiness as the satisfaction of preferences. In singer's view, all valid moral claims can be derived from a single principle: the principle of equal consideration of interests. This principle requires that the comparable interest of all sentient beings be given equal weight in our moral deliberations.[v]

Giving equal consideration to the comparable interests of all sentient beings does not mean treating them exactly alike, since animals of different species often have different needs and interests. For instance normal adult human beings can benefit from the right to vote in political elections, but animals of other species cannot. Animals

do, however, benefit from pleasure and freedom from pain. The principle of equal consideration means that the moral weight of a being's pains and pleasures does not depend upon its species: 'How bad a pain is depends on how intense it is and how long it lasts, but pains of the same intensity and duration are equally bad, whether felt by humans or animals. '

Singer argues that all and only sentient beings have moral status, because all and only sentient beings have interests. The principle of equal consideration applies only to the interests of sentient beings, for the simple reason that these are all of the interests that there are. The capacity to experience suffering and enjoyment is, he says, a prerequisite for having interests at all, a condition that must be satisfied before we can speak of interests in a meaningful way. . . If a being suffers there can be no moral justification for refusing to take that suffering into consideration. . . . If a being is not capable of suffering, or of experiencing enjoyment or happiness, there is nothing to be taken into account.[vi] The term 'interest' is highly ambiguous. When we say that someone has an interest in something, we may mean that they take an interest in it, i.e. that they consciously desire and pursue it. Alternatively, we may mean that, whether or not they take an interest in it, having it would be in their interest, i.e. beneficial to them. As a result of this ambiguity, there has been much philosophical debate about the sorts of entities that can really have interests. At the one extreme, R. G. Frey argues that only human beings have interests.[vii] At the opposite extreme, some environmental ethicists argue that all living things (and possibly some that are not living) have interests, because they are teleological systems which have a good of their own.

What, then, is meant by the claim that all and only sentient beings have interests? Bernard Rollin explains as follows:

Any animal, even man, is not explicitly conscious of all or probably even most of its needs. But what makes these needs interests is our ability to impute some 'mental life', however rudimentary, to the animal, wherein. . . it seems to care when certain needs are not fulfilled. Few of us humans can consciously articulate all of our needs, but we can certainly [sometimes] know when these needs are thwarted and met. Pain and pleasure are. . . the obvious ways these facts come to consciousness, but they are not the only ones. Frustration, anxiety, malaise, listlessness, boredom, [and] anger are among the multitude of indicators of unmet needs, needs that become interests in virtue of these states of consciousness.[viii]

This is essentially the point that Singer is making when he says that only sentient beings can have interests. Sentient beings are, by definition, the only entities that can experience either suffering or enjoyment. Non-sentient organisms may have needs, and thus a good of their own, but this is not an experiential good; they experience nothing unpleasant when their needs are thwarted, nothing enjoyable when their needs are met. Consequently, they cannot 'mind' what happens to them, in the ways that sentient beings can.

Unfortunately, the Sentience Only view has implications which are very troubling. One such trouble is pointed out by environmental ethicists. They reject the Sentience Only view because it denies moral status to plants, species, and other non-sentient elements of the biosphere. Ecologists argue that natural plant and animal species, populations, and habitats can all have moral status. Aldo Leopold, the intellectual founder of the contemporary enviornmentalist movement, called for an ethic in which human beings are seen as members of the biological community, having moral obligations to the community's other members. Within such an ethic, an organism's

moral status is based upon its ecosystemic relationships to the rest of the biosphere.

Personhood View

Some thinkers consider personhood as the solitary criterion of moral status. A distinction is often made between maximalist definitions of personhood which make moral agency, or at least the potential for it, a necessary condition for being a person; and a minimalist definition, which do not require moral agency, but only some capacity for thought and self-awareness.

Kant's definition of 'person' is a maximalist one. He holds that personhood consist in rational moral agency. His theory is that being a moral agent is (1) a necessary condition for any moral status; and (2) a necessary and sufficient condition for full moral status.

Tom Regan defends another form of personhood view which is based upon what amounts to a minimalist definition of personhood. He holds that all "subjects-of-a-life" have moral status, and that all of them have the same moral status. In his view, normal mammals over a year of age are subjects-of-life, and thus have the same moral rights as human beings. This version of the personhood view accords strong moral status to many sentient beings, but withholds all moral status from many others. Subjects-of-a-life are beings that posses certain mental and behavioural capacities, in addition to the capacity for conscious experiments. Regans's subjects-of-a-lives have many of the mental and behavioural capacities of Kantian persons, but differ in that they need not be even potentially capable of rational moral agency.

The concept of personhood, however, is difficult to define in part because there is a strong conceptual link between being a person

and having full moral status. Thus those who advocate equal moral status for animals of particular types often maintain that these animals are persons, while their opponents maintain the opposite. Similarly, abortion opponents often claim that human embryos are persons from conception onwards, while those who believe that women have the right to choose abortion are likely to maintain that fetuses do not become persons until some later stage of development, e.g. when they become viable or when they are born. These disputes about the boundaries of personhood arise not only because the protagonists hold different beliefs about the mental capacities of non-human animals or human fetuses but also because they have prior and conflicting beliefs about the moral status of these entities.

Such considerations have led some philosophers to conclude that the term 'person' is strictly an honorific one, indicating only that the entity in question has a special moral status. On this view, the concept of a person has important ethical content but no descriptive content. Thus, the claim that something is a person implies that it has a strong moral status, but not that it has any empirically observable property, such as life, sentience, or rationality.

Michael Tooley adopts this approach in his 1972 article 'Abortion and Infanticide'. There he says that the concept of a person is 'a purely moral concept free of all descriptive content'. He suggests that 'the sentence, "x is a person" . [is] synonymous with the sentence "x has a (serious) moral right to life."' But in his 1983 book of the same title, Tooley concludes that the ordinary concept of a person does have descriptive content. He notes that even philosophers who deny that persons have a special moral status regard the term 'person' as meaningful, and use it to refer to much the same entities that others refer to as persons. Nevertheless, Tooley points out 'the assignment of

descriptive content to the term "person" is ordinarily guided by moral considerations'. In other words, our willingness to regard a particular entity as a person often depends in part upon our prior beliefs about its moral status.

The theories of moral status which we have considered thus far have two assumptions in common. First, each assumes that there is one and only one property which is (I) necessary for having any moral status, and (2) sufficient for having full and equal moral status. Albert Schweitzer nominates the property of being a living organism: Peter Singer opts for sentience, or the capacity to experience pleasure and pain: Immanuel Kant champions personhood, which he defines as the capacity for rational moral agency. And Tom Regan makes (or comes close to making) this claim for the property of being a subject-of-a-life. However, all of these uni-criterial theories are inadequate. Each of these properties is a sufficient basis for a particular sort of moral status. Respecting life, avoiding cruelty to sentient beings, not harming subjects-of-a-life, and treating moral agents as ends in themselves, are all sound moral principles when properly interpreted. Yet none of these principles in isolation from the others yields a plausible account of moral status. This is a good reason for abandoning the assumption that moral status can be based entirely upon anyone property.

A second assumption, which these theories share is that the property which serves as the sole criterion of moral status must be an intrinsic property. An entity's intrinsic properties are those which it has and which it is logically possible for it to have had even if it were the only thing in existence. By contrast, its relational properties are those which it has, but which it is not logically possible for it to have had were it the only thing in existence. Life, sentience, and the capacity for moral agency are in this sense intrinsic properties, whereas being a

grandmother, or recently naturalized citizen, are relational properties.

Now let us state two versions of the Relationships Only view. On either version of this view, an entity's moral status depends entirely upon certain of its relational properties; its intrinsic properties are irrelevant to what we owe it in the way of moral consideration. J. Baird Callicott holds that an entity's moral status depends upon its social and ecological relationships, i.e. its membership and role within a social or biological community. Nel Noddings argues that the relationship of caring is the basis of all human moral obligations. In her view, we have moral obligations only towards beings for whom we are psychologically capable of caring, and who in turn have the capacity, at least potentially, to be aware of and responsive to our care.

Each of these theories contains important insights; social and ecosystemic considerations can sometimes justify the ascription of stronger moral status to a group of entities than could be justified by the intrinsic properties of these entities. Nevertheless, neither version of the Relationships Only view provides an adequate account of moral status. Our obligations to living things, sentient beings, and moral agents are not entirely contingent upon the prior existence of social or ecological relationships between ourselves and them. Nor are these obligations entirely contingent upon our psychological capacity to care for such entities. There is, therefore, much to be said for the Relationships Plus view, which permits ascriptions of moral status to be justified on the basis of both intrinsic properties and relational ones.

Callicott is a philosophical interpreter and proponent of the environmental ethic pioneered by Aldo Leopold. On Leopold's theory, as Callicott expounds it, all of our moral obligations arise from the fact that we are members of communities. In Leopold's words "All ethics so

far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in the community, but his ethics prompt him also to co-operate. . . The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land."[ix]

Callicott argues that Leopold's land ethic was inspired in part by Hume's moral philosophy. Hume argued that the primary foundation of morality is not reason, but sentiment. We are social creatures, equipped with an instinctive tendency to approve of attitudes and behaviours that serve the 'public utility', and to disapprove of those that harm it. Thus, it is natural for us to be pleased by such social virtues as 'friendship and gratitude, natural affection and public spirit, ... a tender sympathy with others, and a generous concern for our kind and our species'. Moral concepts and principles arise from this natural tendency to approve of that which serves the good of the human community. Reason enables us to serve the public good more effectively, e.g. by establishing principles of justice, legal rights and duties, and systems of legal enforcement. Through reason, we can extend our sympathies beyond the small community of family and friends within which they initially develop, to larger groups of human beings, and eventually to all of humanity.

Darwin also argued that human morality has an instinctive emotional foundation. His theory of the evolution of biological species through the natural selection of hereditary traits provides an explanation of how our distant ancestors must have come to have the social instincts that make morality possible. Human beings are mammals, and dependent upon parental care during an unusually long infancy and childhood. We are also primates that normally live within

social groups larger than the 'nuclear' family. Under these conditions, our ancestors would have benefited from the development of co-operative-as well as competitive-social instincts.

The Land Ethic

To this Humean Darwinian account of the psychological foundations of human morality, Leopold added the proposition that human beings naturally belong not only to social communities, but also to biological communities. Just as human beings are not naturally asocial beings who must somehow be persuaded to become social, so other living organisms are not biologically isolated individuals, thrown into the world to interact with one another as chance would have it. On the contrary, plant and animal species have co-evolved as functional parts of complexly ordered biological communities, or ecosystems. Biological communities include not only living organisms, but also such things as soil, water, and air. Biology and ecology teach us that we are akin to all terrestrial life, and wholly dependent upon the earth's ecosystems for our continued existence. 'The land ethic', Leopold says, 'simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land. ' Just as it is appropriate to regard actions that are conducive to the good of the human community as morally good and those that are harmful to it as morally wrong, so it is appropriate to adopt the principle that 'A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. . . [and] wrong when it tends otherwise.' This principle, Leopold says, 'changes the role of Homo sapiens from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such.'

Callicott argues that Leopold's land ethic differs from both utilitarian and deontological theories, in that the principles through which it ascribes moral status are holistic rather than individualistic. This does not mean that the land ethic ascribes moral status only to species, ecosystems, or the biosphere as a whole. It means, rather, that our moral obligations to individual organisms and groups of organisms are not based upon their intrinsic properties. Rather, 'the good of the community as a whole. . . serves as a standard for the assessment of the relative value and relative ordering of its constitutive parts'. Although a small number of species would become extinct without human intervention, human activities have frequently brought about the extinction of far more species than natural processes would have done. Since natural biological diversities is vital to ecosystems, organisms of ecosystemically important species that are endangered by past or current human activities must be protected.

Nel Noddings's Ethic of Care

Noddings holds that moral status is a function of the emotional relationship that she calls caring. It is this relationship, she says, that gives rise to all moral obligations. Our 'first and unending obligation is to meet the other as one-caring'. Noddings regards caring as a human universal, in that all psychologically normal human beings are capable (at least potentially) of caring for other human beings. The desire to be in caring relationships is, she holds, the original and enduring basis of all human morality.

In a caring relationship, the 'one-caring' is receptive to the feelings and needs of the 'cared-for', and is therefore spontaneously motivated to meet those needs. This is a 'feeling-receptive' mode, although it does not always involve strong emotions. Reason is in

constant use, determining the best means of meeting the needs of those for whom we care, and setting priorities; but the motivation to care is emotional and instinctive rather than rational. 'The relation of natural caring' is, Noddings says, 'the human condition that we, consciously or unconsciously, perceive as "good." It is that condition toward which we long and strive, and it is our longing for caring-to be in that special relation that provides the motivation to be moral.'

The Moral Status of the Gene

Having discussed different criteria of moral status let us ask: Do genes have moral status? Can we, in other words, have moral obligations towards the DNA of human beings or other organisms? Our question is not whether we can have obligations regarding genes. We obviously have moral obligations towards other human beings regarding what may and may not be done to (parts of) their bodies, including their DNA. The question is, rather, whether we can have moral obligations towards genes, independent of any obligations we may have towards the organisms of which they are, were, or will be part.

I shall argue that genes do not have independent moral status. However, there are powerful objections to some current or potential uses of recombinant DNA techniques. For instance, it would probably be irresponsible deliberately to produce hereditary alterations in human germ line DNA, so long as the risks to future persons are not well understood. However, it is implausible to construe obligations to avoid irresponsible uses of genetic technologies as obligations to DNA. A better approach is to focus upon the likely benefits, risks, and harms to present and future human and nonhuman organisms, and ecosystems, of each application of genetic technology. According

DNA a special moral status, unlike that of other bodily parts, organs, or systems, can only distort the ethical issues.

We have got an overview of some major theories of moral status, each of which provides a basis for the recognition of moral obligations towards living organisms of specific types. None of the theories provides a basis for the recognition of obligations towards parts of organisms. There are, however, medical, ecological, social, and other long-term risks associated with the development and marketing of recombinant DNA techniques. If these risks are sufficiently severe, then perhaps they may be used to argue for a special moral status for DNA. This would mean that we could have moral obligations towards genes, separate from our obligations to the organisms from which they are derived, or of which they are or will be part.

The suggestion might seem plausible, especially in the light of the symbolic and, religious meanings that genes have accrued in some cultural contexts. However, these special symbolic meanings are not well grounded in empirical evidence about the biological functions of DNA. Moreover, according moral status to gene may facilitate the moral, social, economic, and ecological analyses that are essential to the development of enforceable national legislation and international agreements regarding acceptable and unacceptable uses of genetic technologies.

We usually assume that human beings have moral status, but that their blood, bones, and other body parts, systems, or tissues do not. Of course, it is generally wrong deliberately to injure, a person's body; but the wrong is assumed to be a wrong against the person, and not against the injured part. We also assume that any nonvital body

part, such as a tonsil, may --- with the person's consent --- be removed, if it has become incurably diseased, and a serious liability to the person's health. These common-sense assumptions are consistent with the major philosophical theories of moral status. Each of these theories promulgates a single criterion of moral status, based upon some property possessed by some or all living organisms.

Each of these theories focuses upon an intrinsic property of some organisms, which is relevant to the moral consideration that we owe to them. However, none of these theories is plausible as a complete account of moral status. To more accurately represent common-sense convictions about moral status that we are unlikely to surrender, we need to combine the insights of these and other theories. We need to take into account not only whether an organism is alive, and its sentience and mental sophistication, but also its importance to the ecosystem in which it exists and its social or other relationships to human beings. Respect for all living organisms is a worthy ideal; but it is necessary to permit the destruction of some organisms --- e.g., pathogenic microbes --- on the basis of reasons that would not justify the destruction of equal numbers of human beings.

Similarly, it is reasonable to hold that not even spiders should be made to suffer needlessly; but it is unreasonable to demand that human beings be as deeply concerned with the suffering of spiders as with the suffering of other human beings. Regan rightly argues that we have stronger moral obligations towards more mentally sophisticated beings, such as humans and other mammals, who probably can suffer more intensely than spiders, and who also probably have lives that are of greater value to them.

Yet, however smart some nonhuman mammals may be, we

cannot always treat the protection of their lives as a moral imperative on a par with the protection of human lives. For instance, it is sometimes necessary to kill mice and rats that invade our homes and food storage areas, or to introduce cats or other predators. Kant is probably right to hold that moral agents are entitled to a higher level of respect for their lives and liberty than are most sentient nonhuman animals. The possibility of reciprocity and cooperation between moral agents makes this higher level of respect possible: and because it is possible, it may be held to be morally obligatory. Kant's mistake is to suppose that we can never have moral obligations towards living things that are not moral agents.

My purpose, however, is not so much to compare the relative merits of these four theories, as to note their agreement on the point at issue. On none of these theories is there a plausible basis for asserting that we can have moral obligations towards part of a human being that are not entirely derivative from our obligations towards the human being. The same criteria that help to explain why organisms have moral status, and why some of them have a stronger moral status than others, also help to explain why the parts of organisms do not have independent moral status.

One reason for regarding living organisms as worthy of moral consideration, as we have seen, is that they are teleological systems, with a good of their own. They are organized to maintain and reproduce themselves; and to interact with their environments in ways that have evolved because they tended to serve these ends. The teleological organization exhibited by organisms is only derivatively exhibited by their parts. Tissues and organs take on specific forms and functions in particular plant or animal species, because these traits have promoted (or at least been compatible with) the transgenerational

reproductive success of ancestral organisms. Thus, the "goals" of a liver, or any other bodily organ, are other-directed in ways that the goals of the organism generally are not. That is one reason why it is generally inappropriate to demand that parts of organisms be accorded independent moral status.

In the case of organisms that are sentient, there is an even stronger reason for according moral status to them rather than to their parts. Sentience --- the experience of pleasure, pain, and other felt mental states --- occurs at the level of the organism. I may feel pain in my foot, but it is unlikely that my foot has private pains that I cannot feel. To feel such private pains, it would need a central nervous system of its own, and it does not appear to have one. Pain, emotions, and other felt experiences, are states of organisms, not of their isolated parts. Thus, it is reasonable to argue that we have special obligations to sentient organisms, such as not to needlessly cause them pain or suffering. But if parts of organisms cannot experience pleasure and pain, then we do not have that reason for recognizing moral obligations towards them.

Similarly, memory, conscious anticipation of the future, and intentional action in pursuit of conscious goals, are capacities possessed by certain organisms, i.e. those that have sufficiently sophisticated brains. The moral respect that an organism may deserve by virtue of these mental capacities does not transfer to the creature's constituent parts, which are not endowed with the same capacities. And moral agency, while it may exist only amongst beings who have social as well as intellectual capacities, is nevertheless a capacity exercised by individual organisms. The biological parts of organisms are not moral agents, and cannot plausibly be held to have the rights that follow from moral agency.

These points may help to explain why it is odd to suggest that genes enjoy a moral status independent of the organisms of which they are part. If blood and bones do not have such status, then why should DNA? Present and future human and nonhuman organisms can be harmed by damage done to their DNA; but they can be harmed by damage to virtually any organ, system, or subsystem within their bodies. We do not need to accord moral status to parts of organisms in order to explain why it is morally wrong avoidably to harm the bodies of living persons, or to cause needless suffering to sentient nonhuman animals.

A Pragmatic Case for the Moral Status of Genes?

But perhaps there are reasons for treating DNA differently from other body parts. There are strong arguments for regarding human germline DNA as an inappropriate target for alteration at least at the present time. There are also legal, social, and ecological arguments against the patenting and monopolistic commercial exploitation of either human or nonhuman genes. If people throughout the world agreed to grant a special moral status to genes, perhaps some of the gravest risks posed by the new genetic technologies could be avoided.

In *The Biotec Century*, Jeremy Rifkin explores the medical, ecological, and social risks of the unfettered commercial development of technologies of genetic manipulation. For instance the release of genetically altered plants, animals, and microbes over large parts or the earth may damage natural ecosystems. Just as the introduction of nonnative species of plants and animals has often led to the decimation of native species, so genetically altered plants and other organisms may compete, or hybridize, with wild species and

subspecies, thereby decreasing valuable natural biological diversity.

Genetically engineered plants and animals also threaten to reduce the genetic diversity of human cultigens, by replacing older and more diverse domesticated varieties of plants and animals. This diversity is important to the avoidance of large-scale catastrophes caused by excessive reliance on genetically homogenous stock and crops, which have uniform vulnerabilities to parasites, diseases, and other threats. The use of transgenic animals for research and as a source of transplant organs and pharmaceuticals introduces another set of potential dangers, including the risk of infecting human beings with new animal viruses, for which no treatments exist. Transgenic animals themselves may be caused considerable suffering by the biological effects of the insertion of foreign genes, which may disrupt their growth and development in unpredictable ways.

The risks attendant upon the emerging ability to alter the genes of living human beings are also great. Even the alteration of somatic cell DNA, for legitimate therapeutic purposes, carries some risk of inadvertently damaging germline DNA, thereby causing new hereditary illnesses or disabilities. If the current de facto moratorium on alterations of germline DNA is eventually ended, human beings in the distant future may face hereditary health problems caused by the side-effects of well-intended alterations carried out in earlier generations.

They may also inherit a social world more deeply divided by socioeconomic class and ethnicity. Lee Silver envisions a time when those who can afford it routinely use genetic therapy to "improve" upon their germline DNA. In his scenario the class distinction between the wealthy "GenRich" and the impoverished "Naturals" becomes so deeply institutionalized that there is no movement from one class to the

other, and no intermarriage between them; and in time humanity divides into mutually infertile species.

This unappealing scenario has a degree of plausibility, not because the genetic engineering of more capable human beings is likely to be easy, but because of the widespread belief in the almost exclusively genetic determination of human abilities. In a world of genetically enhanced children, this belief is likely to lead to systematic discrimination against the genetically "imperfect" or "unimproved." As Ruth Hubbard points out, the idea that traits like intelligence are determined primarily by the genes is eagerly embraced by supporters of the status quo; for it seems to show that the wealthy classes and nations owe their wealth to inherent genetic superiority.

Another legitimate concern is the rush by corporations, many of them large Transnationals, to gain patent rights to the use of genetic material from plant and animal species from around the world, and even to portions of the human genome. The granting of ethically inappropriate and overly-broad patents, e.g., to the genomes of plants or animals that have been known and used by indigenous people for generations, is a form of what some call "biopiracy." The potentially enormous profits to be made in this genetic goldrush make it reasonable to question whether the corporations will spontaneously share the proceeds with the nations and ethnic groups from which genetic material is taken, or undertake sufficiently careful evaluations of the medical, agricultural, and ecosystemic risks.

If the potential biological and sociological consequences of the marketing of new genetic technologies are this dire, then perhaps a long-term ban on at least some of the riskier applications is called for. Perhaps some DNA, such as human germline DNA, should be

accorded a sacred status that precludes altering it.

Some extraordinary religious and symbolic meanings have already become associated with the human genome. As Dorothy Nelkin and M, Susan Lindee point out, human DNA has been used as a symbol of individual human identity, and of the human spirit soul, or essence. Many people are horrified by the prospect of cloning human beings from the DNA of adults or children, in part because they fear that humans whose genetic constitution is not unique would not be real human beings, with individual minds, wills, and souls. Many are inclined to view the human genome as "a sacred territory, a taboo area, that by virtue of its spiritual importance should never be manipulated"

The tendency to attribute a special moral or spiritual signiflcance to DNA can be found in both religious and scientific writing. For instance, opponents of abortion have pointed to the presence of the full complement of chromosomes in the nucleus of a human zygote, as evidence that the zygote is already a human being, possessed of the right to life. John Noonan maintains that conception is "the decisive moment of humanization." Scientists, too, have been willing to view the gene "not only as a powerful biological entity but, also as a sacred text that can explain the natural and moral order". For instance, Richard Dawkins speaks of genes as, in effect, the true locus of human agency. He is aware that "Genes have no foresight. They do not plan ahead". Yet he describes their activities as though they were conscious agents, with a sense of self, and their own self-centered interests. Both Noonan and Dawkins impute to genes properties that might once have been attributed to the soul. For Noonan, genes constitute the human essence, that which makes us uniquely valuable beings. Thus, a single cell may be regarded as the moral equal of an adult human being, if it contains a complete set of human chromosomes. For Dawkins, genes

are powerful--- even godly --- beings, which call us into existence, and which enjoy a form of immortality that human and other organisms do not.

Empirical Arguments Against Sanctification

Both these authors ascribe to DNA a more impressive form of causal agency than the empirical evidence warrants. It takes more than a package of DNA to constitute an organism. The DNA within a human zygote does not make the zygote already a human being, or even necessarily a potential human being. Without the soon-to-be-pregnant woman, and her personal, social, and biological support systems, the zygote has no potential to become a new human being. The invention of ectogenesis machines would not fundamentally change the absolute dependence of the DNA upon the rest of the embryonic organism, and its nurturing environment.

Even in favorable circumstances, the form and behavior of an organism is only partially determined by its nuclear DNA. In Stuart Newman's words, DNA provides "a list of ingredients, not a recipe for their interactions". Genes function as parts of organisms, responding to complex influences from elsewhere in the organism and the larger environment. That is why even monozygotic twins are often different in appearance and personality, and why cloned humans, originating from different ova and gestated in different wombs and/or at different times, would be even more different from one another. DNA is not the sole source and shaper of organisms, and neither is it an immortal being. It is not an immaterial entity that is eternally reincarnated in new physical bodies. It is a physical part of living and mortal organisms, one that has a central but not omnipotent role in the organism's development, functioning, and reproduction. Like other parts of an organism, it

usually dies (i.e., stops functioning and begins to degenerate) more or less at the same time that the organism does. Like any other part of the organism, it is replicated, more or less accurately in the organism's progeny. To speak of genes as immortal is, at best, a misleading way to indicate that their replication is sufficiently consistent that plant and animal species often retain fairly stable hereditary traits over long periods of time.

In short, we can look to genes to explain much about biology, but we should not expect to find in them the essence of humanity, the locus of human agency, or the fulfillment of the dream of personal immortality. Like other elements of living organisms, genes are replicated in new organisms because they have served the reproductive success of ancestral organisms. That we need DNA in order to develop, live, and reproduce, does not make our genes the sum of our humanity, or our omnipotent masters, any more than our need for kidneys makes us into passive vehicles for the production of more kidneys

Pragmatic Arguments Against Sanctification

We have argued that genes are unsuitable candidates for independent moral status. It is possible, nevertheless, that many cultures will come to treat them as sacred, for pragmatic and perhaps spiritual reasons. But, despite the dangers of the new genetic technologies, there are at least two good reasons to resist the sanctification of the gene.

In the first place, the moral objections to particular applications of genetic technology are contingent upon current estimates of their dangers, as weighed against the realistic hope or benefit. The possibility of harm to future generations and planetary

ecosystems must be taken seriously, even though the magnitude of the risks is still uncertain. The risks of altering the human germline DNA, at the present time, almost certainly outweigh any likely benefits, or any that could not be achieved in other ways. But this may not always be the case. Suppose it were possible to modify the human immune systems to resist HIV, or some other lethal and pandemic pathogen, through carefully targeted modifications of the DNA of human gametes or zygotes. Might there not be a point at which the expected saving of life would ethically outweigh the risk of harmful side-effects? It would be premature to suppose that modification of the human genome will always be more dangerous than the alternatives. Yet the ascription of either sacredness or moral status tends towards permanence, and towards strong resistance to reevaluation in the light of changing conditions.

The second reason to resist the ascription of sacred status to the gene is that it will tend to suggest, wrongly, that applications of genetic technology that do not involve the direct alteration of genes are always less morally problematic than those that do. But many or the possible harms to present and future human beings resulting from these technologies are not genetic harms, i.e., harms to their DNA. For instance testing to detect genetic markers for a particular illness, such as Huntington's Disease, does not in itself alter the DNA within living human beings. However, it can lead to serious problems for individuals, such as the denial of medical insurance or employment discrimination. No putative moral obligations to DNA can have been violated: but the information has been used to the unfair disadvantage of the individual. The denial of employment based upon genetic liabilities that do not preclude doing the job well is unjust, for much the same reason that racist or sexist discrimination is unjust. Denying medical insurance, on

the grounds that the applicant has genes that are likely to cause illness, is also unjust, especially in the absence of alternative means of access to adequate medical services. The genes of persons who are discriminated against in these ways will not feel wronged; but of - persons will.

Similarly, many of the important objections to the patenting of plants, animals, and parts of the human genome cannot be expressed in terms of obligations to genes. When John Moore's spleen tissue was used without his knowledge to develop a patented cell line now thought to be worth billions of dollars the offense was not to Moore s cells, but to his legitimate expectation that they would not be commercially exploited without his consent. Although he may have suffered no medical harm from the appropriation of his cells, he was wronged by the secret taking of potentially valuable parts of his body, to which he provided access only to facilitate his own medical treatment. He was entitled ---morally, if not legally --- to the opportunity to give or withhold consent to this use of his cells; and perhaps also to make his consent contingent upon receiving a modest share of any profits.

Similarly, when plant and animal resources of a region are found to be valuable for genetic research or commercialization, simple justice would suggest that profits be shared with the people of the region. Quite often, they have known of the species for generations, and made use of its medicinal, nutritional, or other properties. Patenting the species may reasonably be regarded a theft of their moral property. The patenting of biological resources that are derived from the bodies of human beings is also arguably a form of wrongful taking. When patents were sought in 1993 on a virus derived from the cell line of a Guaymi Indian woman from Panama, Isidro Acosta, President of the Guaymi General Congress, protested in the following

terms: " I never imagined people would patent plants and animals. It's fundamentally immoral, contrary to the Guaymi view of nature, and our place in it. To patent human material. . . to take human DNA and patents its products. . . that violates the integrity of life itself, and our deepest sense of morality."The offense here is perceived by Mr. Acosta as an offense against life itself; and perhaps he is right. But there is also an offense against the woman, who presumably did not donate biological material in order that it could be commercially exploited, with no benefits accuring either to her or to her community. This offense is more readily explained in terms of established moral and legal concepts than in terms of the sacredness of DNA. The disrespect to the Guaymi woman is clear enough; but disrespect to life, or to DNA, is a more subjective charge, difficult to prove or disprove. After all, who can say whether DNA is harmed by being patented, or recombined into new patterns?

The ascription of moral status to the gene does not help us to understand either the impact of genetic technologies upon individual persons and groups, or its potential contribution to economic inequality, globally and within nations. There is no necessary connection between the alteration of plant or animal genes, and the granting of patents on the use of particular species or genes. National and international law could promulgate the principle that knowledge about human and nonhuman genes is an international "commons," free to be accessed and utilized by anyone, for any ethically defensible purpose. Altering DNA, or marketing products of recombinant DNA techniques, is neither good nor evil except insofar as it produces harms or benefits to human and other organisms; and it is on these that our moral analysis needs to be focused.

Regulation without Sanctification

In an episode of the television series Deep Space Nine, a young physician is revealed to have been subjected to illegal genetic enhancement therapy as a child, because his ambitious parents were unsatisfied with the speed of his intellectual development. These treatments make him legally ineligible for his job on the space station, or any other post. While it is harsh to visit the sins of the parents on the child, a long-term ban on the alteration of either human somatic DNA or human germline DNA, solely for the purpose of enhancing socially valued traits, might be called for. Even therapeutic alterations of germline DNA could be very dangerous in the present state of the art: but attempts to improve upon genetic traits that are clearly within the normal range are even more dubious. The risks of harmful side-effects for future persons who have not consented to be genetically altered mitigates against trying to 'fix' parts of the genome that are not broken.

Arguments for a special moral status for genes are more religious than secular in nature, depending as they do upon empirically unsupported beliefs about the moral and spiritual significance of DNA. These religious or quasi-religious views are entitled to respect, so long as they do not issue in demands that are seriously harmful to persons who do not share those beliefs. Except in special circumstances (e.g., certain sorts of criminal investigation), nothing should ever be done to any part of the body of a competent person, or to biological materials derived from it, that is contrary to that person's will. When the parts or products of a person's body are used in ways that violate their deeply held moral or religious convictions, the insult is deep. Such insult should be avoided, regardless of whether the person's convictions are widely shared. Yet, because personal or cultural convictions about the

sacredness of genes are neither generally shared, nor well based in empirical science, they are inadequate as a guideline for the development of law and public policy.

We have argued that genes have no moral status, and no special sacredness, separate from that of the organisms of which they are part. Like other body parts, our chromosomes can malfunction in ways that endanger our health and survival. When they do, altering them becomes a morally legitimate option — provided that the knowledge exists to do this safely, and without risking the health of present or future persons. Similarly, genetically altered crops may significantly benefit growers and consumers. There is no a priori reason not to permit such alterations — provided that we know enough to avoid the associated risks, such as the risk of genetically contaminating wild species, or fostering a dangerous level of human dependence on genetically uniform crops.

Unfortunately, we are far from having this knowledge. What we need now is not a new moral status for genes, but an enhanced appreciation of the vulnerability of future human and non-human organisms, and natural ecosystems, to the unwise development and use of genetic technologies.

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