

Humanity and humanism: The bioethical perspective of human evolution*

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An evolutionary perspective, combining theory and empirical testing, is the only view of nature that a present-day natural scientist can honestly take. This leads to a very far-reaching circular relationship between nature and our concepts of nature, since ultimately, from an evolutionary perspective, our concepts of nature are in fact nature's concepts of itself. We will look at some of the consequences of the peculiar relationship from an evolutionary, an ecological, a cultural, an anthropological and finally from a bioethical perspective, going full circle from the nature of humanity as a geological species to the humanistic responsibility for nature in general and for human nature in particular, which derives from these insights into humankind's place in nature.

FOR us scientists, there is certainly one common belief which we all hold: that the pursuit of knowledge for its own sake is one of the prime expressions of human dignity and is a fundamental human right.

Now, while the humanities and social sciences, though being essential forces of such pursuit, look at humanity's place in our world, as it were, from below upward, from the human individual to their roles in cultures and societies, thereby often particularly stressing the differences of customs, religions, traditions and historical developments between the various communities; for me, being a biologist, it seems much more natural to take the opposite perspective, so-to-say from upward down, from a bird's eyes' viewing angle, as it might be aptly called, namely from the population and the species level on the evolution of the whole of humanity, which after all is one, and only one biological entity with a common genetic history of its common gene-pool. This is why I selected this viewing perspective for the topic and title of this lecture, trying to bring together a biological as well as humanistic picture of our *conditio humana*. By combining an evolutionary and a bioethical assessment of this condition, I hope to arrive at least at the first stages of a joint identity of our undeniable dualistic human nature.

Human nature will be my topic: let us therefore begin with a critical glimpse on what Nature, whether written large or small, can actually mean to us now, since especially evolutionary science has taught us so much about it in the last two centuries. Evolution can certainly be regar-

ded as the most important natural process, certainly for us human beings, since we owe this process the very existence of humanity, that means: of the human species, in the first place. How humanism – our identity and self-esteem as moral beings – relates to this evolutionary insight, will be the central question of this article.

Humankind and nature – Humankind in nature

An evolutionary perspective, combining theory and empirical testing is the only view of nature that a present-day natural scientist can take. As a consequence, there is a very peculiar but nevertheless inescapable circular relationship between nature and our concepts of nature: ultimately, our concepts of nature are in fact nature's concepts of itself. It is this circular interaction between what nature is and what nature, through the human mind, thinks of itself that will be at the heart of my discussion on the place of humanity in nature and which will determine the future of our species and of its relationship with the natural environment, on which it depends.

But what does the word 'nature' mean when used by a natural scientist? For an evolutionary biologist who faces up to the logical conclusions to be gleaned from our evolutionary insights, nature can only mean: the universe and everything in it that is accessible to the inquisitive methods of science. Evidently, this would even comprise many universes – as long as they were more than theoretical cosmologists' pipedreams.

I am well aware that this is a rather bold statement: if something is real it belongs to nature and can be studied by science. Or, in reverse: if it cannot be investigated by scientific methods, it is not part or the reality of nature, as we perceive it. You may ask: does this mean, that nothing else but nature exists? To make such a statement would be clearly beyond the limits of science, because science has

*Based on the 6th Jawaharlal Nehru Birth Centenary Medal Lecture delivered at the Indian National Science Academy, New Delhi, on 28 February 2003 and at the Indian Institute of Science, Bangalore on 5 March 2003.

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no way to talk about or to prove anything that is supernatural. The supernatural is the realm of belief: science can neither prove nor disprove anything in this realm, not even its existence or non-existence!

There is a profound conviction held by scientists – whether explicit or not – that nature is always *one and the same*, that it includes the human species, as far as it can be studied by science, and that it can be investigated by all scientists – of all ages, past and future, of all places, of all races, of whatever gender. This is the foundation of our equally profound conviction that there can be only *one* coherent body of knowledge about nature, and that there will be no contradictions remaining unresolved at the end of our pursuit of that knowledge. In other words, we believe that there can be only *one* scientific truth with regard to nature, at least for us human beings, because there is only one humanity, one human species. Thus: some of our deepest epistemological convictions – at least for us scientists – derive directly from the biological unity of mankind. If that too is not a deeply moral fact, I do not know one.

As far as the unity of the universe is concerned, most scientists work on the assumption that there is only one ultimate explanation for all of nature. Of course, there are different perspectives, different ways of gaining access to this one world, different subjective experiences and expressions of such experiences, e.g. artistic, moral, religious ones, but there can be only *one and the same scientific truth* about nature. That, at least, is what scientists hope for and are convinced of. From such a perspective, existing or apparent contradictions in a scientific view of the universe are residual problems of unification to be solved by more extensive, more far-reaching or more deeply probing scientific research. They are not indications of a multiplicity of incompatible scientific explanations of nature. That is at least what most of us believe in.

If we trust in such unity and continuity within nature, which is, of course, more a postulate of practical reason than an absolutely proven fact, it must also follow that in reflecting and doing research on that most singularly challenging offspring of nature, the human species, whatever we achieve in terms of reliable knowledge about ourselves, whether with the methods of the natural sciences or with those of the social sciences or through humanistic studies, can only be different aspects of one and the same truth about ourselves; about what we are, where we came from and where we may be going, as long as we stay within the limits of science. To give one example most close to everyone: science has nothing to tell about personal survival after death or about reincarnation.

In such a broad perspective, the coherence of knowledge, on which Edward O. Wilson so articulately insists, is a logical consequence of the unity of nature, of the unity of humankind and of the unity of possible knowledge of both of them. Although, as far as I can see, and here I beg to differ from Wilson, this unification will not be achieved so

much by extending the concepts and insights of evolutionary biology to encompass all the aspects of our species life that can ever be discovered and studied, just because that species is indisputably a product of biological evolution. If this unification can at all be achieved then it is only by trying to integrate what the independent and cooperative biological, social, cultural, psychological or philosophical quests for knowledge about ourselves have been revealing, and will reveal, to be true. Thus, I can only interpret the call for coherence as a call for a uniting of forces in order to overcome the divisive and misleading dichotomies that have so persistently haunted our understanding of nature and of our place in it; for instance, when we draw a dividing line between the animal kingdom and humankind in evolution, between nature and nurture in the development of behaviour, between nature and culture in history, between natural propensities and moral rules in ethics, and so on. Only by overcoming such split-brained views of the human place in the universe, regarding *Homo sapiens* no longer as an inexplicable mixture of the natural and the supernatural, but as one being, natural down to its boots and up to the top of its mind, will we be able to gain a unified, a truly coherent and consilient perspective of all of nature, including ourselves. This may make it necessary to take a new look not so much at ourselves as at nature and at our concepts of what nature is all about.

The most important precondition for a rational, and at least to some degree predictive, view of our place in nature is that we should see ourselves not as some kind of fallen angel, an alien intruder, some aberrant or deranged scourge of nature, but as its constituent and heir. And not only as one constituent part of nature among many others, just an arbitrarily chosen biological species, but as a unique, a quite extraordinary kind of natural species, through which nature entered into an entirely new stage of evolution; a species that not only participates in its future evolution like any other species, but that increasingly commands and determines this future and is responsible for it, for better or worse. In evolving the human species, nature, as it were, began to take control of its own future, to give it purposeful direction, to assume responsibility for its own future development. But note that all of this only holds if we truly perceive the human species not as opposite to nature but as its most recent integral part, its own culminating invention. Though the word invention may sound too intentional for some of you, I must insist that, from such a comprehensive evolutionary perspective, human technological and economic inventiveness is nothing other than nature's way of intentionally acting upon itself and forming its own future. The result may be progressive success or disastrous failure, but in either case nature itself, through the actions of the human species, bears at least partial responsibility for the outcome. And because we talk here of nature's active way to influence its future, this becomes by necessity also a moral issue, a question of ethics, to be more precise: of bioethics, since it is through

the biological species *Homo sapiens* that nature acts on itself.

If that seems a strange way to talk about nature, I can only remind you that the evolutionary, the truly Darwinian perspective of putting humankind not against nature but fully inside nature has consequences in terms of feedback circularity that disturb our traditional ways of looking both at nature and at ourselves, consequences which have yet to be thought through to their logical conclusions. I shall try to take at least a few tentative steps in this direction. They will not be steps leading backward to a reductionist *regressus ad infinitum* but hopefully taking us forward to a productionist *progressus ad infinitum*.

Let me now try, from such a philosophical vantage point, to look at our place in nature and at its bioethical perspectives in five steps, briefly sketching out some conceivable lines of development, but never forgetting that the horizons for different, unforeseen developments are wide open, that evolutionary creativity, unpredictable as it already is, has been multiplied thousandfold by having evolved the creative mind of the human species. It has thus literally not only entered into a new stage of creative liberty but can genuinely be said to have created the freedom of future development for man and nature, or, to be more precise, of man (and of course woman) *in* nature. I will look at these questions from an evolutionary, an ecological, a cultural, an anthropological and finally from a moral perspective, going in rapid succession all the way from the planets to human nature.

The evolutionary perspective

Let us first cast a quick glance at the consequences of ongoing biological evolution for our place in nature. Relentlessly driven along by the rapid pace of human cultural change, we are always in danger of suffering from the illusion of slow motion when we look at our biological environment. Humans long regarded it as completely stable, a fact aptly expressed by Carolus Linnaeus hardly more than 200 years ago: *Species sunt tot, quot creavit ab initio infinitum ens*. Well, we know better now. And we know better in three respects.

We know first that billions of species of microbes, animals and plants have evolved over maybe more than 3 billion years, that probably more than 99% of them have disappeared from the face of the earth, and that their extinction was due to natural causes.

Second, we know that due to the expansion of the human species over a period of several thousand years, both in numbers and in per capita consumption of natural resources, we are in the middle (not, as some see it, only at the beginning) of one of the major extinction events in the evolution of life on earth. With human occupation and exploitation of between 10 and 90% of the space of natural ecosystems and of a rising fraction of net biomass produc-

tion all over the planet, there can be no doubt that we are involved in, and in fact causing, one of the profoundest biodiversity changeovers ever, and a changeover within a shorter period on the geological time-scale than life on earth has ever experienced or suffered in the past. Unfortunately, the truth of this statement will be entirely unaffected by anything we may do to protect and maintain what is left of the biodiversity of our biosphere. So even though we may be able to ensure that a number of beautiful species, dear to our hearts, can survive in a kind of semi-domesticated, nature-reserve fashion, they will only be sad remnants of the splendour of their lives in their former natural environments, and for genetically inexorable reasons will never be the same again, reduced to genetically impoverished samples of former natural species. Some of them may only survive in the form of frozen germplasm in gene banks, maybe even only in genome sequences in genetic data banks, revived occasionally to demonstrate what generations before had been – Siberian tigers, African rhinos, giant pandas or river dolphins. But what will definitely have gone forever are the natural ecosystems to which they belonged and which cannot survive without symbiotic and competitive combinations of thousands of member species. Thus, conservation of select token species without the conservation of their natural habitats and of living, sustainable species communities, does not mean that we are maintaining viable elements of past nature. It is more like conserving odd bits and pieces from some kind of living museum of a part of ‘natural history’ – in the literal sense of the notion.

But third, we also know that at the same time the biosphere has been completely restructured under the impact of the human species, setting an entirely new agenda for the evolution of new species or for the expansion of existing ones. This agenda can draw on the new superabundant potential of 6, 8 or eventually as many as 10 billion human individuals and the multibillion tons of biomass represented by our slave species of domesticated agricultural plants and animals, which only number a few score. Probably never before has such a wealth of highly homogeneous food supplies been provided so rapidly for an unlimited number of parasites and pests (as we, from our egotistic viewpoint, regard them). This gives scope for an entirely new creative surge of bio-evolutionary developments which, though we in no way may welcome them, certainly bear witness to the creative powers of natural selection. And we know very well that the harder we fight these parasites and commensals, the more they will thrive and resist our efforts to eradicate them. Even if those efforts were effective enough to completely wipe out a whole species of parasite, as we might have done so with small pox virus, that would only clear a niche for the next inventive occupant to take possession of.

Thus, in summary, this brief overview of clearly foreseeable evolutionary aspects of nature (including ourselves) demonstrates very clearly that biological evolution

will never stand still. Precisely because our super-dominant species has such a cruelly effective impact on much of existing biodiversity, it is at the same time a highly effective agent in accelerating the process of new evolutionary development. Only someone seeing biological nature purely in terms of species counts – 100 species of birds or butterflies gone, but replaced by 100 species of nematodes, fungus or mites – could look upon this process of decline and rise with equanimity. For those of us who cherish the richness, beauty and creative complexity of existing biological nature it is a process of heart-rending destruction and emotional loss. It challenges our deepest moral convictions to not destroy what we can never make reappear. But no-one knows how to return humankind from its present overwhelming state to one in which it could peacefully live alongside the richness of former natural life. We will have to face up to the cruel and deeply immoral, but nevertheless inevitable reality of an evolutionary sea-change caused by our imperialist, colonialist species. And that change will impose on future human generations the need to fight and to come to grips with an onslaught of evolutionary forces trying to thrive on what we regard as our resources, and above all on that most easily accessible resource of biomass on earth, the members of the human species. This is the second deeply ethical issue of on-going evolution, an issue of the bioethics of survival: we cannot abstain from taking part in this crueling evolutionary rat-race, if we want to survive as a human species under humane conditions. Trying to not take part as an actor would mean to take part nevertheless: as a victim! It is a most excruciating ethical dilemma which we have to face since it faces us!

The ecological perspective

This brings me directly to the second, the ecological, perspective of the human condition in nature. Human ecological relationships evolved over millions of years, if we look at the hominids, and several hundred thousands of years if we restrict our focus to *Homo sapiens*. That process took place under conditions that, for 99.9% of the human population, no longer exist. Since the invention of plant agriculture and animal husbandry about 10,000 years ago, the human species has actively, purposefully, persistently, successfully and irreversibly remodelled its relationship to the biotic and abiotic environment, bringing about the evolutionary changes I have just recounted. In the most advanced agricultural civilizations, artificially managed agro-ecosystems dominate over two-thirds, and in some cases as much as 90%, of the inhabitable land. These areas have been increasingly placed under the tutelage of scientific knowledge and the use of ever more highly sophisticated modern technologies, which have artificially kept them in a state of very high productivity of consumable biomass, a state characteristic of very early stages of natural ecological successions. In other words, billions of

humans can only survive by continuously and artificially managing a sizeable fraction of the biosphere in a way that, though it provides our species with essential resources, can, by its very nature, never achieve a state of stable ecological equilibrium, because that would run counter to the dictates of maximum productivity, which we have to rely on.

If we now include the human exploitation of forests, rivers, lakes or marine ecosystems and add to that the pressing need to keep at least a marginal fraction of natural ecosystems unexploited in their pristine state by actively sheltering and guarding them against further human exploitation and intrusion, it will be evident for anyone considering these bare facts about the present state of the biosphere that not only the vast areas of land we exploit directly for agricultural production, but almost the entire biosphere is an essential ecological resource for human survival and will increasingly need to be purposefully and responsibly managed by our own species. It is not because we flatter ourselves in our preposterous hubris that we are able to manage the whole planet better than nature, left alone, could do it. It is because, for all the limitations of our insights and capabilities, we cannot escape this responsibility, the responsibility to deal, as far as is humanly possible, with the mess that untrammelled population growth and the relentless progress of human cultural evolution with its ever-increasing consumption of resources has made of the biosphere. It is thus not a *delusion de grandeur* that obliges us to accept the role of managing our behaviour (or rather misbehaviour) *vis-à-vis* the biosphere. It is the sad and inescapable dilemma of someone who has carelessly set fire to his house and has the moral obligation to at least do everything in his power to get the blaze under control, even though he is fully aware that he will never be able to rebuild the house as it has been before. ‘Managing the biosphere’ thus means not an entitlement to carry on recklessly doing whatever comes to mind and exploiting whatever looks exploitable, but in the first place to gain as clear an understanding as possible of the conditions needed for a surviving, sustainable biosphere and of the things that must be done – and must not be done – in order to reach that goal. And in the second place it means organizing and controlling our own behaviour – morally, legally, technologically, economically – in such a way that we have a real chance of attaining that goal.

To sum up my second point about the state of nature from an ecological perspective: the human species, whether we like it or not, has become the super-dominant species in the global biosphere and therefore has to manage the biosphere by controlling not so much the natural environment as humankind itself, its reproductive and propagative behaviour, its habits of exploitation, consumption and waste disposal. Thus, from an ecological viewpoint, nature has overwhelmed itself by evolving our species.

Seen thus, history is only another word for ongoing evolution. As a product both of nature and of culture, the hu-

man species in this perspective is an artefact of its own making, its own creation, in a word: self-made Man. But through the evolution of our species nature has, for the first time in billions of years, also found a way to reflect on its own condition and to take measures for controlling its own future development. Thus, when humans try to learn how to manage the biosphere, it is not human hubris acting against nature, it is nature's way of continuing its evolutionary path to progressive organic complexity and flexibility. Having gained awareness of itself through the human mind, nature has found the means of continuing its evolution beyond the reaches of biological-genetic evolution alone.

Science and technology can thus be regarded as the tools by means of which nature can proceed along the path it took when it gave birth to the human species and the conscious human mind. While biological evolution in what we might call its Darwinian state is characterized by the unintentional trial-and-error adaptation of gene pools by natural selection, the rise of the human species has given nature the possibility of achieving conscious awareness of its situation and of the causes and consequences operative within itself; and this has enabled it to proceed further in a goal-directed, purposeful way through the cultural evolution of humankind. This is not in opposition to nature or against the natural laws of creation. On the contrary, it fulfils the potential for creativity so deeply engrained in evolutionary nature.

Let me add one word of warning here. Most of us have heard and read about the anthropic principle, maintaining that all basic parameters of the physical universe have been set (by chance or by benign intervention) in just such a way that life and ultimately the human species with its conscious mind could evolve; and we have heard of the Gaia hypothesis, suggesting that for billions of years the biosphere has been a homoeostatic, self-regulating feedback system that has kept conditions on our planet within the range that makes them suitable for sustaining life on earth. Wonderful, if not miraculous perspectives on nature, but at the same time dangerously misleading ones, if we take the evolutionary message, thus interpreted, seriously. For if the human species is truly a natural product of the very same natural process of evolution that has maintained stability so miraculously over millions if not billions of years, then why worry at all about the future? Why should the united benign forces of the anthropic and Gaia principles suddenly fail, just because *Homo sapiens* has appeared on the face of our planet? Why should mother Gaia not take care of herself with her newest great-great-grandchild on board, just as she did before? What could be 'unnatural' about human activities if they have evolved so naturally? In one or the other disguise we have all come across such arguments for trustingly marching on as mankind has done so successfully over the past few thousands of years, putting our fate as faithfully into the hands of

self-controlled mother Gaia as we used to consign it to the benevolent care of God the Father.

The misconception concealed in such a seemingly logical evolutionary argument is that it ignores one fact: by setting free the creative, insightful human mind able to intentionally construct its own future, nature has, as it were, left the table of evolutionary roulette. In this game, nature gambled for its own future over billions of years and it did so with a great deal of good fortune. But now it has entered a completely new phase of its evolution. The name of the new game is cultural evolution, and the rules are not derived by the time-proven feedback loops of the past but are constantly re-invented by the insightful creativity of the human mind, sometimes responsibly, sometimes irresponsibly. We alone are capable of this. And it is with us that the moral responsibility rests! This is the third bioethical challenge for us which derives from the ecological state of humanity in nature. We have to develop these new feedback loops in order to stabilize the new anthropogenic nature; if we want to survive we will have to invent and manage them ourselves with the help of human insight and competence, i.e. by science and technology.

The cultural perspective

However, restricting our viewpoint to keeping the biosphere sustainable, which is just another way of saying that we want to keep it a suitable place for humankind to survive in, is a gross underestimation of what human culture, or rather human cultures in all their diversity, can mean for the state of nature. In the first place, we should never forget that the notion of culture is derived from the Latin verb *colere*, i.e. cultivating the land to grow plants for consumption by humans and their domesticated animal slaves, servants and companions. This means that at its very basis, culture is not a human activity directed against nature but the aim of making natural productivity usable by humans. Nature in its uncultivated state is not a very hospitable place for human survival. While we may be most seriously alarmed by the thought of large predators hunting humans for prey, the real natural enemies are, of course, minute parasites causing infectious diseases and, above all, poisons of all kinds that plants and animals have developed to defend themselves against herbivores and predators, including us humans. Therefore the real work of cultivation was not so much improving the harvest but the purposeful continuation of what biological evolution had already been doing for billions of years: selecting according to suitability and thus producing adaptations to the new, anthropogenic environment. Deep down, cultural evolution thus meant nothing other than the continuation of natural evolution, but directed intentionally, for our own purposes. Therefore, it is entirely appropriate to regard artificial, man-made agricultural ecosystems, from the early

beginnings in Mesopotamia, the Nile, Indus or Huangho valleys, the highlands of Central and South America or New Guinea to the present day, as nature in cultural disguise, and to see the agricultural face of our earth as part of nature in the 'Anthropozoic' age.

Learning by trial and error, or rather, by trial and success, selection by consequences under limiting constraints, gaining experience, insights and wisdom under the pressing needs of subsistence were thus all factors prompting our ancestors to improve cultivars and cultivation processes. In the same way, any future progress by the agrobiological sciences in developing higher-quality, higher-yield, more pest-resistant, environmentally less vulnerable strains of agricultural plants will continue to produce a new kind of nature out of the stocks of existing natural resources. In their quest for ways of influencing the productive yield of genetic resources, our ancestors could only select what had been provided by mutational chance or accident. Today, however, recombinational genetic technologies enable us to not only emulate the selection side of biological evolution, but also to greatly increase the variation potential from which we can select. It seems difficult to regard this step as any more 'unnatural' than the traditional paths of cultural selection that have been the very basis of evolution of human culture, and thus also of human nature. Therefore, agricultural biotechnology and genetic technology are only a logical continuation of human evolution in its interaction with living nature. Of course, this makes it in itself neither harmless and natural nor unnatural and dangerous. In each and every case of its application for responsible, justified purposes, it has to prove its worth prior to wide-scale use. To see in this a violation of natural creation is the expression of a rather limited understanding of what this creation is actually about. The opposite view makes more sense. The creative powers of modern biotechnology could well be regarded as the logical continuation of that very same kind of natural, evolutionary creativity that opened the door for the arrival of the human species in the first place, thus paving the way for human intellectual creativity as an extension of evolutionary genetic creativity. There seems, therefore, to be more 'natural' justification in the application of science-guided biotechnology than in the un-biologically dualistic view of the living world as divided between biological nature on the one side and non-biological human culture, science and technology on the other.

Of course, it will take all our ingenuity and inventiveness to sustain a global population that runs into the multi-billions and at the same time to assure the survival of the planet against the enormous odds of a world that will continue to surprise us with unforeseen challenges rather than providing us with the entitlement for a self-made Garden of Eden. But it is one thing to agree that *any* application of *any* technology needs responsible assessment of costs and benefits and is not in itself justified merely because it can be regarded as entirely natural; it is quite another to refute

the misguided argument that scientific and technological progress is bound to be unnatural or even anti-natural because it can only be achieved through human culture and not through natural biological processes independent of human intellectual creativity. It is simply not true that human intellectual inventiveness and our freedom from a purely genetic programming of behaviour makes our specific cultural creativity an unnatural usurpation of forbidden powers that invariably smacks of the immoral. It is in fact this very creative freedom that makes us the 'moral animal', that is, the only species in constant need of moral guidance in order to make good, responsible use of the freedom it has. Responsibility is not the opposite of creative freedom, it is its inevitable consequence, if you will, the price we have to pay for having freed ourselves from the dictates of purely genetic determination of our behaviour.

The anthropological perspective

This brings us to the fourth perspective of the place of the human species in nature, the anthropological view, the view taken from the standpoint of the individual human being. Since, like the entire species, every human individual is the outcome of natural evolution, whatever we do to our biological constitution will influence the future of nature by changing our own nature. Most of us will, of course, when pondering this situation, immediately think of the newly developed possibilities of interfering with human reproductive processes and especially of genetic manipulation of the human germ line. I will return to these aspects shortly, but it seems to me that we should again stand back for a moment and consider whether human rights and human dignity have only become an issue, and have only been endangered, as a result of the recent developments in reproductive and genetic technology, whereas previously human individuals had lived under perfectly natural and morally controlled conditions.

I think that posing the question in such a way already means answering it in the negative. One could hardly imagine anything that would more cruelly deprive human individuals of their inalienable human rights to a life in personal freedom and bodily indemnity than what highly respectable, so-called 'high' cultures under the close moral tutelage of equally revered, so-called 'high' religions have imposed at least on some substantial sections, sometimes even majorities of their populations, notably on women: slavery, caste-systems, witch-hunts, religiously motivated mutilation, torture, capital punishment for innocent victims. Even in the most exhaustive account of sadistic practices, there is nothing that has not been inflicted at some time or another on millions of people in the name of religious duty and devotion. And these practices are still with us today. Human cultures of the past have never shied away from inflicting the gravest damage on humans with-

out any regard for their dignity, and they have done this with the same equanimity they display in inflicting similar damage on other species. Respect for human freedom and dignity has never hindered them from subjecting growing girls and boys to the most rigorous indoctrination in order to make them conform to a society's habits and norms. From the standpoint of enlightened human dignity, some such time-honoured practices can only be regarded as abominable violations of inalienable human rights.

When dealing with imagined or real dangers for human dignity stemming from the new potentialities inherent in reproductive and genetic technologies, it is therefore crucial not to be fooled into thinking that, just because they are new and hitherto unknown, their indisputable hazards are in any way more serious or despicable than the time-hallowed arsenals that humanity itself has devised in its ongoing bid to deprive human individuals of their freedom and dignity. This is evidently not the case for thousands and thousands of healthy boys and girls who owe their lives to artificial conception and embryo transfer. More often than not, these children receive more care and affection than many of their unfortunate fellows conceived inadvertently and born unwanted under perfectly 'natural' circumstances. Nor do I see why the future of human nature in a form that respects individual rights and dignity should be unacceptably compromised if, after pre-implantation or pre-natal diagnosis, severely genetically malformed and permanently disabled individuals are not exposed to the horrors of a brief life under appalling conditions and an early death. Opting for the alternative to not abort such poor, genetically doomed beings, simply on the grounds that it is (indisputably) 'natural' would mean declaring what occurs by the agency of natural forces to be the ultimate moral imperative, a naturalistic fallacy that equates what is with what ought to be in a way that moral philosophers have long warned against. And even in the case of the possible cloning of human individuals, which most of us would want to see precluded by force of law, for good moral and social reasons, we should bear in mind that even if it did occur the result would be a completely new human being equipped with all human rights and the undiminished entitlement to the respect of his or her dignity. Unfortunately, we can be quite sure that as a rule they would be born as miserably malformed cripples – one of the reasons why we should not allow reproductive cloning of humans, because there is no morally acceptable reason for it anyway – only despicable greed for media attention.

It is imperative to emphasize at this juncture that to argue in this way is not synonymous with advocating any kind of eugenic amelioration of the gene pool of the human population. Nor can this view in any way, logically nor morally, support such misguided eugenic goals. Also, there is little or no substance to the conviction that the increasing costs of health-care budgets would force us to earnestly consider such eugenic cleansing of the human gene pool, for the following reasons, among others:

- The increase in the overall cost of health care is caused much more by rising medical expenses incurred during the last years of ageing patients' lives than during the first years of genetically severely handicapped individuals.
- Even with the best medical treatment, very seriously genetically handicapped human beings die in the first few months or years of life, well before reaching reproductive age, and thus cannot contribute to any genetic burden on the human population.
- Of those who do survive to reproduce, because they are not so severely handicapped, one person's handicap more often than not is another person's special gift.
- Overall degradation of the human gene pool has never been proven and seems highly improbable, since its genetic composition is mostly dominated by the more than 90% of the human population that receives woefully little medical attention.
- In the remaining 10% of the human population, who can afford to receive such special medical attention, the costs of health care seem to be fuelled less by genetic deterioration than by the rise in the number of medical practitioners.

It is therefore not only immoral and illogical to envisage eugenic gene-pool management of the human population, it is also quite improbable that there is any real danger that the human species is threatened by impoverishment or extinction because of exaggerated health-care efforts for genetically severely handicapped new-born individuals.

Therefore, it seems to me that, while we have good reason to look with sober judgement and full moral responsibility on all these new, and sometimes not-so-new perils of scientific and technological progress, we should not be carried away too readily either by unwarranted fears from the new and hitherto unknown, or by the 'sweet temptation of feasibility'. There is every reason to keep an open mind and seriously consider what the advances in human biology might have to offer us in our attempt to prevent or cure suffering and to help human beings live fulfilled and un-deprived lives. Not everything that is feasible needs to be done; but not everything doable is to be rejected either. There is certainly much that should not be pursued at all, out of respect for human freedom and dignity. But it seems to me that this aspect of the future of nature, namely the future of our human nature, is so much more clearly determined by the powerful processes of cultural evolution, especially by the almost unfettered 'cloning' of misleading ideas, superstitions, prejudices, anxieties, chauvinist beliefs and unethical desires via indoctrination, suggestive advertisement and immoral (and sometimes even allegedly moral) coercion, that when we think about human nature we would be well advised not to worry so much about the most novel hazards but rather about the most perilous and more often than not quite ancient dangers to human nature. To forbid so-called 'thera-

peutical cloning' by law, which is actually stem cell culture after somatic nuclear transfer with the hope of treatment for debilitating diseases, seems a moralistic over-reaction, which though sounding guided by ethics may actually be doubtful on moral grounds.

The moral, the final bioethical perspective

That brings me to my fifth and final consideration with regard to humanity in nature. I have, I hope, been able to make it clear enough why I believe that the future of nature, at least from now on (though actually it has been the case for quite some time already) cannot be treated as if it were independent from the future of what is traditionally regarded as being beyond nature: human life and culture, the world of human thought and imagination, the mental world in which everyone of us lives just as self-evidently as in the natural surrounding world. In fact, none of us would for even one moment deny that it is the world of the human mind that is the very core of our human nature. In comparison, everything else normally trotted out as what makes us distinctive from our animal relatives, upright posture, hairless skin, feeding or mating habits, or whatever else, seems insignificant. The only exception to this is language. But it is, of course, our capacity for the creative use of language that, more than anything else, is the tool with which we can gain awareness of the mental worlds of others and with which we can give others access to our own private theatre of imaginative plays, creative narratives, original thoughts, arguments and feelings.

Since we owe this capacity for, and expression of, conscious thought and emotion to our outsized brains, themselves the product of the natural evolution of our species, one cannot focus on humanity's place in nature without ultimately focussing on what this mental world and its further development may mean for our common survival and future development.

If it is true that, through the evolution of the human species and particularly the human brain, nature has found a way to reflect upon its past and present conditions, and even to some limited degree on possible future developments; if, in a word, nature has become conscious through human consciousness and free to act through the human freedom to act, then it has brought itself to the point where, for nature, the future is no longer limited solely by the physical laws and boundary conditions existent in our universe. It is a point where the future becomes a potential to be realized, a goal to be achieved and worked for, something 'made' above all by ourselves, not in the sense of being completely under the control of what we can do, but very much in the sense of imposing responsibility on conscious actors for their conscious actions. That means that 'making the future', not to talk about 'making a future'

even though this has also much to do with it!, is something very different from letting it just occur by behaviour; it means the obligation to act in accordance with the dictates of reason and moral norms and to be responsible for what we 'make'. Of all creatures in nature, it is only the human species through which nature can act in this way. Therefore, precisely because we have evolved the capacity to not only behave but to act purposefully and to thus 'make a future' for ourselves and the world, we cannot escape the responsibility to do so.

It is this fact of our nature which makes us dependent on humanistic, on moral guidance, that is, on guidance about how to pass judgement on what is good or bad and how we should lead our lives. To ask about the sense of, and the sense in, our lives is just another way of asking for moral guidance so that we know what is good and what is worth striving for, worth working and, if necessary, suffering for. Nature has not released us on the world without giving us a well-equipped package of desires, emotions, hopes and fears, longings and needs in order to keep us going and keep us searching and inquiring. But with all these inborn emotional driving forces we are like a self-starting locomotive fully equipped with an engine and fuel, but much in need of a clear vision of where to go and a map telling us how to get there. Clearly, there are some who feel that to keep this engine running and to experience the good feelings that go along with it may be all there is to make life worth living and hence a sufficient answer to the question about the meaning of life. But most of us, at least at times, want to reach beyond that, to define a goal to achieve and ways of achieving it during the course of one's life.

Evidently, this is the point where the biologist should stop and defer to the moral philosopher or the religious teacher; at least some of them are truly humanistic scholars and teachers who do not incite chauvinistic convictions of superiority and prejudice against other beliefs but who help to guide uncertain souls by giving them answers to the issues of moral behaviour based not only on scientific knowledge but on moral norms and beliefs. But even then we should remain aware that in doing this we are not leaving the boundaries of nature. What we are doing is giving the 'moral sciences', as the humanities and social sciences used to be called so aptly, their proper place in discussing the future of nature and humanity's place in it. The answers that humans give to such questions will always have to be scientific *and* moral answers, in fact bioethical answers, at one and the same time. Only both together can fully grasp humanity's place in nature, in the future as in the past, only together they may fathom the depths of the natural-cultural relationship between humanity and humanism and give our self-guided evolutionary future a truly bioethical perspective.