

Morality and the 'Naturalness' of transgenic animals

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Genetic Modification of Animals

We speak about genetic modification when one or more genes (DNA-molecules with a certain function within the cell or organism) or combinations of DNA-molecules (so-called gene-constructs) are introduced into the animal involved. One method which is often used is that the DNA-molecules are injected with a very fine needle in the fertilized egg. We speak about transgenic animals when the genes come from a different species. This method may be used for different purposes: to increase production in animal husbandry, to make animals resistant to diseases, or to change animals in such a way that they produce certain medically useful products in their milk. Once the genetically modified animals are developed they may also be multiplied by cloning techniques.

Mice are used to a great extent nowadays in biomedical research to study the function of human genes, especially in connection with their role in human diseases. The animals are manipulated in order to use them as research models. For this purpose genes may also be 'knocked out', to see what happens or, when they are not functioning well, to replace them by other genes. The techniques of genetic modification are potentially very powerful techniques, especially if combined with other reproductive techniques such as in vitro fertilization, the freezing and transportation of embryos, embryo transplantation, etc. Economic competition and the curiosity of the scientists drives this technique forward, and it is not surprising that many people are concerned about these developments. In the beginning of the so-called recombinant-DNA debate in the seventies, the emphasis was on safety issues (the safety of human beings). In connection with plants it is the deliberate release of genetically modified plants into the environment, and the ecological risks of doing so which attracts attention. When we come to animals and human beings the main concern is of an ethical nature.

Ethical Aspects

In the public discussion about genetic modification of animals in the Netherlands the concept of the 'intrinsic value' of animals plays an important role. According to many authors in the field of animal ethics only a particular class of sentient animals, with the capacity to suffer pain, have an intrinsic value. I have called this a zoocentric moral view on animals.¹ In the zoocentric view a comparison is made with human beings, where the concept of intrinsic value has been in use for a long time. Certain human experiences (of freedom, or pleasure) are said to be of intrinsic value when this value can not be derived from any higher value. Similarly zoocentric ethicists argue that what sentient (vertebrate) animals and human beings have in common is that they can experience pleasure and pain in a more or less conscious way, and therefore animals have (experiences of) intrinsic value as well. This zoocentric view is a well established view, in the sense that in many countries laws for the protection of animals are based on it. In animal experimentation laws for instance, the main emphasis is on the prevention of the suffering of animals.

Those who stick to this zoocentric view follow the same kind of reasoning with respect to the genetic modification of animals. Bernard Rollin is a good example.² According to Rollin genetic engineering must be seen as a morally neutral tool. Morality comes in when the animals suffer as a result of genetic engineering. A consequence of this theory of animal ethics is that Rollin sees no moral problems with adapting animals to the system of intensive animal husbandry by means of genetic manipulation, for instance through the modification of an animal's instinctive needs or the reduction of stress. As long as the animal has a certain need, it may suffer when it cannot fulfil this need, but when we can take away the need through genetic engineering there will be no suffering.

¹ H. Verhoog, 'The concept of intrinsic value and transgenic animals.' *Journal of Agricultural and Environmental Ethics*, 5/2, (1992), pp.147-160.

² B.E. Rollin, 'The Frankenstein thing: the moral impact of genetic engineering of agricultural animals on society and future science', in *Genetic Engineering of Animals. An Agricultural Perspective*, eds. J.W. Evans and A. Hollaender (Plenum, New York, 1986), pp.285-297; B.E. Rollin, *The Frankenstein syndrome. Ethical and social issues in the genetic engineering of animals* (Cambridge University Press, Cambridge, 1995). (Editor's note: See review in *Animal Issues*, 1/1, 1997.)

Many people feel an intuitive resistance to this view; they think that the housing system should be adapted to the needs or characteristic 'nature' of the animal and not the other way around. I argued against Rollin³ that in order to determine whether animals are suffering, or that their wellbeing is disturbed, we usually refer to the animal's species-specific needs. When we allow unrestricted manipulation of these needs, we might lose the only yardstick we have to determine whether the animal is suffering or not.

A way to accommodate this intuitive resistance is to rethink the concept of intrinsic value. The original meaning is that an animal has a value of its own, independent of any instrumental value an animal may also have for man. To respect animals for their own sake, we have to transcend the utility relationship and emphasize their relative independence ('autonomy'), their species-specific nature and their integrity. In Rollin's view it is not the nature of the animal itself which matters, but the actually felt experiences related to the satisfaction or frustration of the needs involved in the having of such a nature. I hold that the characteristic nature itself, the species-specific characteristic way of being of an animal (its 'essence'), matters morally. To argue for this position one has to emphasize the role of the philosophy of nature in connection with (animal) ethics⁴.

The Moral Relevance of 'Naturalness'

In the present intellectual climate the very idea that the 'naturalness' of something has moral significance needs further clarification. To say that naturalness *has* moral significance suggests that we derive norms and values from nature, and this is seen by many people as an example of the so-called 'naturalistic fallacy'. In short, this fallacy says that the 'ought' (what we ought to do) can not be derived from the 'is' (factual statements about reality, about nature).

³ H. Verhoog, 'Ethics and genetic engineering of animals' in *Morality, Worldview and Law* eds. A. W. Musschenga et al (Van Gorcum, Assen), 1992, pp.267-278.

⁴ In a recent analysis of the public debate about genetic engineering of animals, aiming at a research agenda of important ethical questions, one of the questions which came out was: 'What are the implications of the attitudes towards the naturalness and natural values for policy on the genetic modification of animals and the ethical weighing procedure required for that policy?'. J. Vorstenbosch and L. van Voorthuisen *Ethiek, politiek en genetische modificatie van dieren* (Netherlands Office of Technology Assessment, The Hague, 1992).

I would like to discuss this question of the naturalistic fallacy in the context of the meta-ethical question how we can know that a certain human action is morally good, how we can justify it. In philosophical ethics any appeal to a human or divine authority is not acceptable. It is said that the human moral agent should come to an autonomous, free judgement, and the reasons for coming to this judgement must be public. An appeal to one's personal feelings or one's intuition is not enough.

A judgement can only be free when it is not forcefully imposed upon oneself. To morally legitimate one's actions by appealing to nature or natural laws ('it is good because it is in agreement with natural laws, or because it is natural') is problematic because it overlooks the freedom of human beings. Our behaviour may, in a third-person perspective, be influenced by many 'outside' factors (genetic, physiological, social), but in a first-person perspective the experience of freedom is basic. On that basis we expect from people (not from animals) that they can account for their moral decisions; we hold them responsible for their choices. Holding people responsible for their behaviour would be senseless without the principle of freedom. When we say that people behave the way they do because it is encoded in their genes or ingrained in their brains, or because it is their 'nature' to act that way, this statement can be interpreted in two ways. In the third-person perspective it can be seen as a particular explanation of behaviour. When used in a first-person perspective, as a moral justification of one's behaviour ('I had to do it, I had no choice because it is in my genes'), then it is a case of a naturalistic fallacy. We also speak about biological or genetic determinism in this context.

The meta-ethical reason why we cannot derive an 'ought' from an 'is', or values from facts, is not primarily a logical problem, but has to do with the difference between a first-person perspective based on our immediate experience and a third-person perspective in which human behaviour is described and/or explained from outside. A philosophical-anthropological theory must include the idea of freedom and morality as one of the basic characteristics of the human species, of being human. A consequence for normative ethics is that what we ought to do (as opposed to what is) refers to something which is not yet there, an unrealized potential or goal, which might be realized in the future if we want it. Values are involved in all human behaviour. They are not derived from the facts of nature; they are signposts pointing into the future.

Normative valuation, pointing out what we ought to strive after, always involves both a human being as subject and an object which is valued. When the focus is on the human being, the object valued is said to have an instrumental value. It is instrumental/contributive to the realisation of an intrinsic value of human beings. When, in valuation, the human being is focusing on the object for its own sake (because it has a good of its own), then the intrinsic value of the object is emphasized. The relation is non-instrumental in this case.

The attribution of intrinsic value to an object is a free human decision in the sense that we are not in any way forced to make the attribution by our own nature. This also is the case when the object is a human being. That animals by (logical) necessity must have intrinsic value, or ought to be given intrinsic value because of certain facts about their nature, is not the case either. This does not mean that no reasons can be given why animals are appropriate objects of moral concern; I can try to make it plausible to someone who in the first instance does not believe it. One reason could be the fact that we usually deal with domestic animals who are to a smaller or larger degree dependent on human beings. Looking at them from a (socio)-ecological perspective we might say that we have made them a part of the human community. When they suffer because of our treatment we are responsible for this. When talking about wild animals we might be impressed by their relative autonomy, by the evolutionary wisdom or (God's) creativity expressed in the animal's form and behaviour. Who are we in nature that we have the right to use animals for any purpose we like? The attribution of intrinsic value comes down to a human decision about which entities we want to bring into the moral domain.

In the anthropocentric view non-human living entities are not included in the moral domain, and therefore their intrinsic value is not acknowledged. They only have an instrumental value. In the zoocentric view only those natural entities are included in the moral domain which have conscious experiences (sentient animals). In the biocentric view all living beings can have both instrumental and intrinsic value for human beings.

When it is correct to say that attributing intrinsic value to animals or other organisms is a normative decision, then having intrinsic value is dependent on and inseparable from the act of moral valuation. It is only *after* the decision has been made that animals have a good-of-their-own, that the characteristic nature of the animal becomes morally relevant. When we take animals from the natural environment to which they are

adapted and bring them into a human environment, then it is our knowledge of the 'nature' of the animals which must guide us in finding out what the animals need for their well-being. On the basis of this knowledge certain standards or norms can be established for keeping animals.

Cartesian dualism and 'Naturalness'

Also important in our consideration of the relation between facts and values is the Cartesian dualism associated with modern natural science. Many of the confusions inherent in discussions about morality and nature are due to this Cartesian dualism between man, defined as 'subject' (*res cogitans*) and nature, defined as 'object' (*res extensa*). Epistemologically we can say that the acquisition of knowledge by necessity presupposes a distinction between a knowing subject and an object to be known. In this distinction the object may be something we experience as being outside of us (a table, another person, a flower, etc.), but it may just as well be an inner experience which may become the object of our knowledge. This epistemological distinction, based upon our direct experience (first-person perspective) does not say anything about the nature of the object perceived. The problems with Cartesian dualism do not arise if interpreted in this epistemological sense. The problems crop up when it is interpreted as an ontological distinction between two completely distinct and unrelated worlds, *res cogitans* and *res extensa*.

The ontological distinction is at the very basis of modern natural science, where nature is tacitly defined as *res extensa*, and where it is seen as the task of science to discover the 'objective' laws of nature, which are seen as totally independent of our 'subjective' (personal) experiences of the world. It is then, that the domain of values and the domain of facts become two completely separate domains. As subject, the human being stands outside nature. Rationality, self-consciousness and freedom are seen as characteristics of the human subject, and to attribute these qualities to nature, as *res extensa*, is considered to be anthropomorphism.

Also moral valuation is seen as a typical characteristic of the subject, as 'subjective'. Values are then seen as a product of the human mind; they are not found in nature as *res extensa*. It is believed to be the explicit task of natural science to discover the primary, objective qualities or

properties of nature. They are supposed to tell us what is 'real', independent of the world as it is experienced by the human subject.

In such an ontologically interpreted dualistic framework it becomes logically impossible to derive values from facts, ought from is. Notice that 'facts' and 'is' do not refer to nature as directly experienced by man, as part of his life-world, but to the impoverished nature of *res extensa*, devoid of any subjective qualities. This is what Kass⁵ refers to when he says that 'our natural science is, quite deliberately, most unnatural'. The gap between nature studied scientifically and life lived naturally is seen by him as the result of the deliberate choice of modernscience for 'objectivity'.

In his book 'The phenomenon of life' Jonas⁶ says:

The contention -almost axiomatic in the modern climate of thought- that something like an "ought" can issue only from man and is alien to everything outside him, is more than a descriptive statement: it is part of a metaphysical position which has never given full account of itself.

If the Cartesian dualism underlying modern science is a 'deliberate choice', not being itself the result of our understanding of the world, but an assumption which defines a particular way of looking at the world, then the question arises whether we could make a different choice. Jonas looked for what he called a reunion between the subjective and the objective. He believed that the realisation of such a reunion could only be effected from the objective end, through a revision of the idea of 'nature', postulating a continuity, rather than a duality between mind and nature. In the dualistic view ethics belongs to the subjective side, without any objective foundation. When a continuity between mind and nature is postulated, ethics could be conceived as part of the philosophy of nature, grounded in 'an objective assignment of the nature of things'.

In the tradition of Whitehead, Jonas, like several other 'organicist philosophers',⁷ refuses to interpret the world as a purely material mechanism, driven forward by efficient causes, devoid of any subjectivity, mind or inwardness. In Jonas's philosophy of nature man's

⁵ L.R. Kass, *Toward a more natural science. Biology and Human Affairs* (The Free Press, New York, 1985), Preface, p.ix.

⁶ H. Jonas, *The phenomenon of life* (Harper and Row, New York, 1966), p.283.

⁷ We can think here of the work of several European continental scientists-philosophers, such as Goethe, Portmann, Buytendijk, Viktor von Weizsacker, Plessner and others. Some of these are introduced by Marjorie Grene in *Approaches to a philosophical biology*, (Basic Books, New York, 1968).

subjectivity has become a part of nature; it is no longer alien to nature, as it is when nature is interpreted as *res extensa*.

What is appearing in man's consciousness, thoughts about nature for instance, can now be seen as far less estranged from nature than in the Cartesian dualistic view. The epistemological point that thoughts about nature arise in human consciousness and depend on our own activity, can not be denied however. What is denied is that the 'content' of these thoughts necessarily comes from man only and not from what is going on in nature. The same could be true with respect to values, and in particular with the intrinsic value of animals. When you look at an animal as a Cartesian object in an anthropocentric context, you may not be able to discover its intrinsic value. You have to see the animal in a more phenomenological way as a being with subject-character as well, with whom we can communicate (we may call this a second-person perspective). As they sometimes say in environmental ethics: by really participating in nature in a deep-ecological way, natural entities can become partners of whom we learn that they have a good of their own. By learning this and by listening to what they have to tell us, respect for them arises in a self-evident way.

The Role of Philosophies of Nature

We have come to the conclusion that in a biocentric view the characteristic 'nature' of the animals involved has become a morally relevant category. We have also seen that one's philosophy of nature affects one's view of the relation between facts and values. The role of philosophies of nature also comes to the fore in another way. Some biologists might argue that speaking about the characteristic or essential nature of an organism refers to an outdated, typological way of looking at animal species. And, when it is not possible to define what is specifically 'good' for the animal, does not also the concept of intrinsic value become implausible? As an illustration I would like to refer to an article by Mauron,⁸ in which he criticizes the view put forward by Jeremy Rifkin that 'the crossing of species borders and the incorporation of genetic traits from one species directly into the germ-line of another species represents a fundamental assault on the principle of species integrity and violates the right of every species to exist as a separate,

⁸ Alex Mauron, 'Ethics and the ordinary molecular biologist' in *Scientists and their responsibility* eds. W.R. Shea and B. Sitter (Watson Publishing International, Canton, 1989), pp.249-265.

identifiable creature'. Mauron points out that speaking about species as separate, identifiable entities is 'essentialistic language', which is incompatible with the anti-essentialist philosophical outlook immanent in much of current biology after the Darwinian revolution. In this philosophical outlook the emphasis is on competition between individual organisms within populations.

To most biologists, Mauron says, the new technical opportunities to mix genetic material from different sources, is a natural extension of the way these biologists are trained to think about individuals, genomes and species. Given the anti-essentialist philosophical outlook the development of genetic engineering can be seen as a 'logical development'. To assume that there *are* inviolable species barriers he considers to be wishful thinking; as humans we may want to *establish* such barriers for ethical reasons, say between man and other animals, but we cannot 'read' such barriers in the state of nature. To do so would imply the use of an arbitrary concept of 'naturalness'. Mauron reaches the following conclusion:

All this points to a form of naturalistic fallacy that often muddles the discussion of genetic engineering and many other issues concerning the impact of science on society. I do not think that the "naturalness" of an action has any bearing on its ethical standing. Of course, many things that are done under the guise of "respecting nature" are valuable and well worth doing. Why not acknowledge that they are so for man-centered reasons (improving his safety or quality of life)?⁹

I think that Mauron's reasoning is based on a number of doubtful assumptions. First of all, to speak about 'species integrity' or to show respect for the integrity of a species or the species-specific characteristics, one need not necessarily believe in discontinuity or constancy of types, which is considered by Mauron to be characteristic of essentialism. The evolutionist Gould,¹⁰ who cannot possibly be called an 'essentialist', speaks about the integrity of animal species because of their long evolutionary history. That the characteristics of species can change over time is not the morally relevant point; also individual organisms such as human beings, change over time, but this does not affect their integrity. The point is that the constitutive characteristics of a species are not just accidental ones, chosen by man to categorize a class of more or less similar animals; the point is that they are the result of a

⁹ Ibid., p.255.

¹⁰ S.J. Gould, *An urchin in the storm* (Penguin, London, 1990).

long evolutionary process, which has led to a more or less harmoniously balanced whole, in close relation with a particular environment. With such a species-concept in mind, the interference with modern techniques of genetic modification, thereby creating 'trans-genic' animals, might be seen as an assault on the integrity of a species. The existence of species barriers (no exchange of genetic material) between most species of animals is an empirical fact, which has little to do with the idea that species change over time.

The question now is, whether the existence of these empirical barriers has any moral relevance for human behaviour with respect to these animals. Mauron says that we may want to establish these barriers for ethical reasons (thereby making them 'inviolable'), but we cannot 'read' such barriers in the state of nature.

The last quotation clearly shows that Mauron holds an anthropocentric view of nature. Within this view it is true by necessity that something can only be valued by human beings for man-centred reasons. That all valuation is a human activity does not imply that the *content* of the valuation does only depend on a specific interest we as humans have in the outcome of the valuation. In a zoocentric and biocentric view it is possible for humans to value something for its own sake.

Finally I would like to say a few words about Mauron's interpretation of the naturalistic fallacy. He says: 'I do not think that the "naturalness" of an action has any bearing on its ethical standing'. In connection with the topic under discussion this is a very confusing statement. Rifkin did not say that it is 'unnatural' to cross species barriers, and therefore we are not allowed to do it. I am not sure what his reasons are for accepting the principle of species integrity. He may have had philosophical or religious reasons, but whatever the reasons, a naturalistic fallacy need not be implied. In a non-anthropocentric normative theory for establishing the moral quality of human behaviour with respect to animals or nature, the principle of naturalness plays a very important role. Out of respect for the intrinsic value of an animal we ought to treat animals, as much as possible, in such a way that we do not infringe upon their species-specific characteristics; we should take into account their 'characteristic nature'. In a biocentric view we are not talking about the naturalness of 'human action', but about the role in human action of the nature of the object of human action.

Interesting in Mauron's article is the acknowledgment of the anti-essentialist philosophical outlook immanent in much of current (neo-

darwinian) biology. This does not mean, however, that essentialist outlooks are totally lacking in modern biology. One example to the contrary is Brian Goodwin, who is generally seen as a representative of a structuralist approach within biology. Structuralism has been portrayed by Resnik¹¹ as the rebirth of 'rational morphology', a kind of typological thinking which dominated biology in the pre-darwinian period. Goodwin¹² himself has described the conflict between structuralism and neo-darwinism as a conflict between typological thinking, which sees reality in an underlying nature/kind/type, and population thinking, according to which the type is a human abstraction, only the variation between the individuals is real.

Because of Goodwin's structuralist philosophy of nature he is critical of many aspects of genetically engineering plants and animals. In his paper 'Species as natural kinds that express distinctive natures'¹³ he again contrasts his approach with the neo-darwinistic one, according to which species have arisen by historical contingency, through random genetic variation and selection of the fitter variants. In Goodwin's structuralist approach species acquire a status that they do not have in Darwinism, as natural kinds with distinctive natures. Such a view, he says, invites a relationship to organisms that recognises their intrinsic qualities, so that they are valued for their beings rather than simply for their utility.

In Goodwin's book 'How the leopard changed its spots'¹⁴ he says: 'An organism or a work of art expresses a nature and a quality that has intrinsic value and meaning, with no purpose other than its own self-expression'. Goodwin pleads for the need of a science of qualities, as complementary to the traditional natural science of quantities.

For Goodwin it does not seem to be any problem to relate his structuralist realist philosophy of biology with the idea of intrinsic value. We can conclude that a biocentric normative theory seems to be more plausible for a biologist adhering to a more holistic philosophy of nature, whereas the molecular biologist Mauron uses a nominalist

¹¹ David Resnik, 'The rebirth of rational morphology: a process structuralism's philosophy of biology', *Acta Biotheoretica* 42, (1994), pp.1-14.

¹² G. Webster and B.C. Goodwin, 'The origin of species: a structuralist approach', *Journal of Social and Biological Structures*, 5, (1982), pp.15-47.

¹³ Brian Goodwin, 'Species as natural kinds that express distinctive natures: the case for a moratorium on deliberate release' in *Coping with deliberate release. The limits of risk assessment*, ed. A van Dommelen (International Centre for Human and Public Affairs, Tilburg, 1996), pp.73-78.

¹⁴ B.C. Goodwin, *How the leopard changed its spots. The evolution of complexity* (Scribner's Sons, New York, 1994), Chapter 7.

philosophy to legitimate his anthropocentric normative theory. This brings me to the last part of my paper.

The 'Unnaturalness' of Modern Science

Let us return to Kass' statement that natural science is quite deliberately most 'unnatural'. Kass pleads for a more 'natural' science, that is closer to our immediate experience, whereas Wolpert¹⁵ holds that 'natural' thinking, by which he means day-to-day common sense thinking, will never give an understanding about the nature of things. Doing science requires one to remove oneself from one's personal experience, and he mentions molecular biology to illustrate this. For Wolpert there is no room for Kass' more natural science or for Goodwin's science of qualities; it is science or nothing.

In contrast to Wolpert I think that within biology as a whole we have scientific disciplines which are closer to our everyday experience of nature and disciplines which are far away from it. When we enter a modern scientific laboratory we discover very little of the 'nature' as we experience it in our everyday life.

Biologists and historians of biology are well aware of the tension which exists, since the nineteenth century in particular, between the naturalists and the experimentalists.¹⁶ It looks as if, on the eve of the coming 'age of biotechnology' this tension is intensifying. There seems to be an increasing gap between the study of nature as directly given in our life-world and a 'second nature' made in the laboratory. Transgenic creatures first have to be 'made' before they can be studied.

To understand the ethical questions which have arisen in discussions about the genetic engineering of animals it looks as if we have to pay much more attention to the processes of transformation which take place when nature as given becomes the object of experimental science. This question has not received much attention in the philosophy of science. It is only recently that sociologists of science and some

¹⁵ Lewis Wolpert, *The unnatural nature of science* (Faber and Faber, London, 1993).

¹⁶ Dobhansky speaks about the distinction between Cartesian and Darwinian aspects of biology. It is sometimes expressed as the distinction between restricted sciences, dealing with closed systems (usually in the laboratory) and unrestricted sciences, dealing with open systems. Mertz and McCauley (*Synthese* 43/1, 1980) analyze the differences between laboratory ecology and field ecology; field ecologists speaking about the 'unreality of laboratory research'.

philosophers of science have started to pay attention to the role of the experiment in creating a 'second nature', which is sometimes far removed from the 'first nature' of our direct experience.

I would like to give one example which illustrates this development. Michael Lynch¹⁷ describes the transformation in experimental biology of the 'naturalistic animal', the animal as we know it in our daily experience, into the 'analytic animal' as object of natural science. He describes how laboratory procedures assure the removal of the characteristics which make up the naturalistic animal; the result is an artefact. In the laboratory, phenomena are created and perpetuated, which could never have arisen in nature.

Could it be that molecular biologists such as Mauron can not accept the moral relevance of the concept of naturality, because they are no longer dealing with given nature, because their work has become totally 'unnatural'? If reductionistic experimental molecular biology is constructing a second nature in the laboratory, then the 'objective facts' of the molecular biologist can be seen as the final result of a process of transformation of nature, taking place in the laboratory. In experimental science 'objectivity' is more and more losing the meaning it has for the naturalist (describing and explaining nature as directly given in our experience); objectivity is defined as reproducibility of results and in biology this can usually only be obtained under laboratory conditions. Reproducibility is a necessary condition for the application of knowledge in technology.

This view upon science goes very much against the view of positivistically inclined scientists such as Wolpert, who believe that the science which abstracts from our direct experience of nature is describing nature as it 'really' is (primary qualities), the 'objective facts', totally devoid of any subjectivity. According to more relativistic philosophers and sociologists of science, these facts of the laboratory must be seen as products (constructs) of human thinking and experimentation. Facts are not simply given in experimental science, they are always the result of specific interpretations of what is perceived.

According to such a non-positivistic analysis there are good reasons to believe that the experimentally transformed second nature of the molecular biologist is not value-free. It may not just be describing nature

¹⁷ M.E. Lynch, 'Sacrifice and the transformation of the animal body into a scientific object', *Social Studies of Science*, 18, (1988).

'objectively' ('true' to the object), but transforming it on the basis of a very specific design. The experimental design in biotechnology is based on a specific anthropocentric attitude towards nature: interfering in nature in order to gain control over nature. We could even say that the nominalistic concept of nature of some of the more extreme defenders of relativism provides a perfect legitimation for genetically engineering nature. If nature is no more than a human construct, then there is nothing in nature itself preventing us from reconstructing it, nothing of intrinsic value, withholding us from disturbing the integrity of either individual organisms or, indirectly, of the species to which they belong. And ultimately, why should we refrain from the patenting of transgenic organisms when such organisms are seen as human inventions, as artefacts, which did not exist before the interference of the genetic engineer? Arnim von Gleich¹⁸ gives a good characterisation of the classical ideal of the 'hard' sciences, versus that of the 'soft' sciences. Hard sciences are reductionistic, experimental sciences, characterised by various forms of abstraction, quantification etc. and aiming at intervention in and control over nature. Very different are the ideals of the 'soft' sciences, which stay much closer to the life-world as experienced by man. The mechanistic concept of nature is replaced here by an organismic one; methodical reductionism is replaced by a holistic approach and experimentation is taken as a dialogue with nature, and not as a subordination of nature. 'Soft' for von Gleich does not have the negative inclination it usually has within the community of natural scientists.

Conclusion

In experimental reductionistic science we see a progressive transformation of given nature, as directly experienced in our life-world, to a second or more or less artificial nature. In this process the qualitative aspects of nature, which are so evident in our life-world, are lost sight of. The more science is impregnated with instrumental values, the more difficult it becomes to see the intrinsic value of nature. There is an inbuilt tension between the very process of objectifying nature, demanded by the ontological interpretation of Cartesian dualism, and the idea that animals (or nature) have intrinsic value. The realm of values and the realm of knowledge get divorced from each other.

¹⁸ Armin von Gleich, *Der wissenschaftliche Umgang mit der Natur*. (Campus Verlag, Frankfurt, 1989).

The word 'intrinsic' is closely related to the word 'essence' or 'essential', the characteristic nature of something. The anti-essentialism of modern (molecular) biology may be needed for greater control over the processes of life but, in a time of increasing alienation from nature and environmental catastrophes, it always has to be balanced by more holistic approaches. The moral relevance of 'naturalness' can more easily be experienced in our direct sensorial contact with nature. With the more phenomenological method of von Gleick's soft science, or Goodwin's science of qualities, we can deepen this experience. The 'qualitative' knowledge which results from the application of this method is very much needed for the evaluation of modern biotechnology, and to redress the exaggerated claims of molecular biologists, of which Mauron is only one example.

Biography

Henk Verhoog was born in 1938. He studied biology at the University of Amsterdam and since 1968 has been an Associate of the Institute of Theoretical Biology of Leiden University (now a section of the Institute of Evolutionary and Ecological Sciences). His philosophical dissertation was about 'Science and the social responsibility of natural scientists' (1980). His research interests and publications are in the field of the relationship between science and ethics, and also the philosophical aspects of the human-animal (human-nature) relationship. Henk Verhoog teaches biology students about the social and philosophical (ethical) aspects of biology. He has been a member of state advisory boards on the ethics of animal experimentation (until 1993), and the genetic modification of plants and animals. From October 1999 he will be an Associate of the Louis Bolk Institute in Driebergen.

