# TRANSHUMANISM
## The convergence of evolution, humanism and information technology

*Jos de Mul*

> Humanism (...) is nothing other than confidence that the intellectual powers necessary to raise life to its highest possible level are inspired by association with people in the present and in the past who possess(ed) these powers.
>
> *H.J. Pos*

In the past centuries the humanism has developed itself through a great number of confrontations and interactions with other movements. As Harry Kunneman, the present rector of The University for Humanist Studies in Utrecht and one the leading intellectuals of the humanist movement in the Netherlands, has rightly observed this means that in the past humanists were often on the offensive: "As defenders of a universal vision of humanity they waged war against traditionalism and religious dogmatism, in the name of values such as fairness, equality, humanity and unrestricted self-realization. In this struggle they had history on their side, the history of western civilization and therefore the history of mankind, too, from the radiant beginning of true *humanitas* in ancient culture to the prospect of 'prosperity and well-being for all' offered by industrialization, modernization and scientification. The positive self-image of twentieth-century humanism is marked at its most profound by a self-confident modernity, by the proud consciousness of representing the positive, future-orientated power with respect to religion and tradition".[1] At the beginning of the twentieth-first century, according to Kunneman, the roles appear to have been reversed. In the confrontation between humanism and postmodernism, in particular, it is the humanists who have been forced on the defensive. Not accustomed to arguing from a defensive position, humanists often avoid this confrontation by idly dismissing postmodernism as 'unrestrained relativism' or 'pure nihilism'. According to Kunneman this is a less than fruitful strategy, not only because postmodernism voices worthwhile criticism on the close links between technological-scientific rationality and faith in the makeability and controllability of the world and modern humanism, but more particularly because postmodern criticism is based on values which occupy a central role in humanistic tradition - such as self-realization, *savoir-vivre* and radical self-criticism. In Kunneman's view postmodernism is a radicalized form of humanism, which allows humanists to rethink more radically humanistic notions such as individuality, autonomy and community (76).

Although in his article Kunneman subscribes to postmodern criticism on thinking in hierarchically valued opposites - he mentions, for example, high-low, white-black, modern-traditional, man-woman, autochthone-alletochthone, rich-poor, true-untrue - in his attempt to reconcile humanism and postmodernism he himself makes use of this model in a striking manner. With regard to humanism as well as with regard to postmodernism, he differentiates between a *good* and a *bad* variant. For example, against the bad, the humanism of the nineteenth and twentieth centuries linked with technological rationality and control, he sets the good, sixteenth century humanism of Montaigne, which its emphasis on corporality, contextuality and openness (68). With regard to postmodernism Kunneman differentiates the 'good' postmodernism of Lyotard and his associates, inspired by humanistic values, from the 'bad', which corresponds with "the present-day, thoroughly modern, late capitalistic consumption culture", which is characterized by "the new domination of the text by the

image, the novel by the video clip, the filing card by the data bank, an exchange of letters by the network, and by making industrial and post-industrial production processes both global and flexible" and "the creation of globe-spanning amusement and information networks with increasingly faster rotation times" (67).

Although I would not deny that there are interesting similarities between sixteenth-century humanism and certain motifs in postmodern thinking, and, moreover, subscribe to the fact that these motifs are relevant to the self-reflection and self-criticism of modern-day humanism, it is my opinion that Kunneman, because of the dichotomies he employs, does not do justice to the complex and ambivalent nature of (post)modern culture.[2] The caricatural image he sketches of 'bad' (because: hypermodern) postmodernism, leads him - without appreciable argument - to the conclusion that this form of postmodernism "appears to be much more nihilistic and much more threatening to central humanistic ideas, such as the rationality and autonomy of the subject, than the fundamental criticism postmodern philosophers put forward on these ideas" (67). Kunneman therefore lapses into the same idle rejection of unwelcome criticism for which he reproaches his fellow humanists, and in so doing he deprives himself and his readers of the opportunity to enter into a serious confrontation with, in my view, the no less radical criticism of humanism voiced by this 'bad' postmodernism.

This confrontation, therefore, is of the greatest importance for humanism because the capitalistic information society linked by Kunneman to 'bad' postmodernism is developing extremely quickly, and on a global scale, into the dominant form of society.[3] One way or another, humanists have to take up a position against this development. What makes this confrontation even more urgent is that these hypermoderns also claim to be the pre-eminent standard bearers of humanism. In their view the "*interweaving* of humanity and technological rationality" (70), loathed by Kunneman, has actually made an important contribution to the realization of humanistic ideals such as "fairness, equality, humanity and unrestricted self-realization" (65). The confrontation with 'bad' (hypermodern) postmodernism, finally, is of the greatest importance for humanism because the hypermoderns actually derive their motivation to rise above man and his limitations from the humanistic ideal of unrestricted self-realization.

It is not my intention in this article to once again reverse the hierarchical opposition between 'good' (anti-modern) and 'bad' (hypermodern) postmodernism and, in opposition to Kunneman, defend the latter. What I want to do is to illuminate the side of the confrontation between humanism and postmodernism neglected by Kunneman, and the questions which it raises. I shall do this by discussing the body of ideas of *transhumanism*, a movement which propagates the hypermodern program of 'bad' postmodernism in the most explicit and radical way. After an introduction of the program of this movement, which is concentrated on the work of Hans Moravec (§ 1), I will argue from an evolutionary-technological perspective that the scenario for the future propagated by the transhumanists is not without plausibility (§ 2). Finally, I shall discuss a few of the radical normative questions which the transhumanistic program presents to humanism (§ 3).

## *1. Transhumanism*

> Der Mensch ist Etwas, das überwunden werden soll. Was habt ihr gethan, ihn zu überwinden?
>
> *Friedrich Nietzsche*

The concept 'transhumanism', like the concept 'humanism', refer to a cluster of ideas and movements. Although the concept had already surfaced at the end of the forties in the work of writers and

scientists such as Aldous Huxley, Abraham Maslow and Robert Ettinger, the movement was largely inspired by FM-2030 (the pseudonym of F.M. Esfandiary), who developed the philosophy of transhumanism in his trilogy *Upwingers, Telespheres* and *Optimism One* (1970) and summarized it in *Are you a Transhuman?* (1989).[4] The lectures Esfandiary gave at UCLA (Berkeley) at the end of the seventies brought together a group of like-minded spirits which, since 1988, has published *Extropy Magazine*. In 1991, under the leadership of Max More, they formed the *Extropy World Institute*, which publishes newsletters, organizes conferences, and maintains a busy website on the Internet.[5] In Europe, too, the transhumanists have organized themselves - around Anders Sandberg's website in Sweden, for example.[6] The transhumanists are also active in the Dutch language region. In Belgium we encounter many transhumanistic themes in the research group *Principia Cybernetica*, led by Johan Heylighen, at the Free University of Brussels[7], while in the Netherlands *Transcendo: de Nederlandse Transhumanisten Vereniging* (Transcendo: the Dutch Transhumanists Association) was set up in 1997. An umbrella organization, the *World Transhumanist Association*, which publishes the electronic *Journal of Transhumanism*[8], came into being in 1998. At the moment the movement is still fairly small. It is estimated that the associations have not many more than a few thousand members worldwide, most of them from the fields of the natural sciences and information technology. Well-known sympathizers include the robot specialist Hans Moravec (Carnagy Mellon University), artificial intelligence researcher Marvin Minsky (Massachusetts Institute of Technology) and Erik Drexler, one of the founders of nanotechnology, a technique of synthesizing materials at a molecular level.

Although the various groups do not agree on every point (the American extropists in general are more libertarian and market-oriented than the European transhumanists) there is, nonetheless, a fairly stable core of ideas. The press release which the founders of Transcendo sent round the world when the association was set up gives a concise summary of the movement's principles and its program: "Transhumanism (as the term suggests) is a sort of humanism plus. Transhumanists think they can better themselves socially, physically and mentally by making use of reason, science and technology. In addition, respect for the rights of the individual and a belief in the power of human ingenuity are important elements of Transhumanism. Transhumanists also repudiate belief in the existence of supernatural powers that guide us. These things together represent the core of our philosophy. The critical and rational approach which transhumanists support is at the service of the desire to improve humankind and humanity in all their facets".[9]

In broad terms the movement appears to share the anthropological and ontological postulates of modern humanism, as these are described in the Netherlands by Van Praag in his *Foundations of Humanism* [Grondslagen van het humanisme]. The transhumanists, too, assume the naturalness, solidarity, equality, freedom and reasonableness of humankind and regard the world as experiencable, existing, complete, contingent and dynamic.[10] The transhumanists share with humanists the view that humankind is part of nature and like all living creatures is subject to the forces of nature. They subscribe to the view that for their development people are dependent on each other, are equal, and free in the sense that they have a constant practical freedom of choice. It is also emphasized that man is rational and as such can, and should, take responsibility for himself and others. In the humanism of the English-speaking world the transhumanists' ideal of rationality is stronger than in continental humanism, oriented on the natural sciences, technology and in coherence. Their world view, therefore, is often more reductionist and in general they forthrightly reject religion.[11] With regard to the world, transhumanists agree with the humanists that the world is what it is and does not denote a transcendental reality. They also emphasize the contingency and dynamic of reality in the sense that it

is not the result of a preconceived (divine) plan, but of unremitting chance processes.

There is also an important difference, however. The 'plus' of transhumanism lies particularly in the radical manner in which it fleshes out the humanistic principle of human development: "Transhumanists distinguish themselves from 'ordinary' humanists because they do not gratuitously accept limitations such as the biological life span (now about 80 years) as 'natural' and therefore 'good'. They see many possibilities of improving the length and quality of the life of everybody if we utilize our intellectual and technical opportunities to the full. Transhumanists regard technological progress not as something threatening, but rather as a way of making the world a better place to live in, and of extending our boundaries. In genetic engineering, for example, they do not immediately think of the danger of creating terrible misshapen creatures, but of therapies which can be used to cure inherited diseases and which, eventually, will not only make people healthier, but also cleverer and more beautiful".[12]

Besides biotechnologies such as genetic engineering and cloning, the transhumanists pin their hopes on the earlier-mentioned nanotechnology, with the aid of which microscopically tiny machines could be made which could carry out curative activities throughout the body via the blood vessels, and on man-machine integration, for example by the implantation of artificial joints, organs and senses, or by the construction of (neural and electronic) interfaces between the brain and a computer. And transhumanists who are afraid that they will die before this miraculous world becomes a reality have pinned their hopes on cryogenic suspension. Encouraged by the successful application of this technique on baboons, transhumanists allow their brains or their entire bodies (depending on their financial resources) to be conserved at extremely low temperatures immediately after death in the hope that in the future their minds will be brought back to life again.[13]

Hans Moravec's book *Mind Children: The Future of Robot and Human Intelligence*, published in 1988, offers one of the most radical versions in this transhumanistic program. According to Moravec, man, in spite the intellectual grandeur he possesses in the midst of the other animals, is an extremely fragile creature. Such diverse things as accidents, toxic materials, radiation or an unbalanced diet easily damage our bodies. And even when the body functions at its optimum the achievements of our limbs, senses and minds are not particularly impressive. In comparison with many other animals we cannot run very fast, our physical strength is extremely limited and we quickly become exhausted. From time immemorial man has relied on tools and machines to compensate for this. And our mental capacities have relied just as much on external aids such as writing and computers to overcome our limitations in memory and mental capacity. Moreover, we age rapidly and although our average life span of around eighty years is longer than all the other primates it is nonetheless, certainly in the light of our historical awareness, rather limited. And although in the course of history the average life span in some parts of the world has almost quadrupled from twenty years to eighty, the maximum life span appears to have remained unchanged at one hundred and twenty years. Although we can replace defective parts of our bodies by implanting artificial body parts and could increase our resistance to a number of diseases by genetic engineering, according to Moravec we cannot really overcome the inherent limitations of biological material.

The solution Moravec suggests in *Mind Children* is the 'downloading' of the human mind into an artificial body that does not have the limitations of the organic body. Moravec suggests a procedure in which a brain surgery robot, equipped with billions of tiny nanoscopic electrical and chemical sensors, scans the brain layer by layer and then makes a computer simulation of all the physical and chemical processes in the brain tissue.[14] This computer program would then be copied in the mechanical 'brain' of the robot. In doing this Moravec postulates that the mind is a (by)product of the material (which arises as soon as a certain complexity is reached), and that the identity of the mind does not lie in the material of which the brain is made, but in the structure and the processes which

take place within it. Moravec sees an indication of this 'pattern-identity' in the fact that in the course of a human life all the atoms in the body are replaced, but the structure, and therefore the mind, remains preserved.[15]

According to Moravec, this transmigration of the human mind makes man potentially immortal. By creating 'back-ups' of the mind the destruction of our artificial body would not extinguish our consciousness. Because this would mean that the number of people living on earth would naturally increase even more rapidly than it is already, it will be necessary to continue life on other planets. That would not present a problem, however, because our non-organic bodies would be better suited to the living conditions on other planets than organic bodies and, furthermore, we would be able to transfer our mind extremely quickly via (wire-less) computer networks and download it into another body at the destination. We would also be able to make additional copies of ourselves. But just as in the case of biological cloning, these would quickly acquire a separate life history and therefore gradually grow into other persons.

However radical the downloading of the human mind appears to be, according to Moravec it would still only be the first step in a fundamental transformation of human life. The artificial body and the simulated mind within it would, indeed, still have many of the limitations of the human body and the human mind. The obvious thing, therefore, would be to 'upgrade' the body and mind - by improving the senses, for example (the eye might be provided with zoom lenses or made suitable for perceiving infra red light), or by increasing the speed and memory capacity of the brain. Undoubtedly there would also be a market for the implantation of extra language modules or reference books in diverse fields of study. In the virtual worlds, populated by artificial intelligences, disclosed by the computer networks, we shall, according to Moravec, eventually even perhaps be inclined to leave our material body completely behind and choose to live exclusively in a bodily simulation or merely as a mind (in the machine[16]). According to Moravec, it will also be possible to combine minds partially or fully, and these combinations need not necessarily be limited to the human species. We might also be able to add the experiences, skills and motivations of other species to our minds.

Somewhere in the course of this transformation we shall without doubt cease to be human. But that is exactly what the transhumanists eventually have in mind - the creation of a post-human life form. In this sense transhumanism does not only surpass humanism, it also surpasses the human. "Our speculation ends in a supercivilisation, the synthesis of all solarsystem life, constantly improving and extending itself, spreading outward from the sun, converting nonlife into mind. Just possibly there other such bubbles expanding from elsewhere. What happens if we meet one? A negotiated merger is a possibility, requiring only a translation scheme between the memory representations. This process, possibly occurring elsewhere, might convert the entire universe into an extended thinking entity, a prelude to even greater things".[17] At first sight the notions of the transhumanists appear to possess a large measure of science fiction. Moravec's work, in particular, sometimes gives the impression of being a hypermodernistic orgy of fantasies of makeability and control. But perhaps the roots are a little deeper and what we are concerned with here is a secularized, but nonetheless no less unrealistic, version of the old religious hope of immortality and a projection of the omnipresence, omnipotence and omniscience previously ascribed to the gods. All this makes it tempting not to take the transhumanists too seriously. But although transhumanism in indeed a curious mixture of *science* and *fiction*, such an attitude would not be prudent. Many of the technologies on which transhumanists have pinned their hopes are, indeed, already reality (genetic engineering, cloning, the implantation of pacemakers and artificial joints, heart valves, insulin pumps and electronic senses), partially successful (artificial intelligence, e.g. chess programs), or at least successfully tested in a laboratory setting (linking of an information transfer between nerve cells and electronic processors, the nanotechnological rearrangement of atoms, successful cryogenic suspension of baboons). In their

book *Beyond Humanity, CyberEvolution and Future Minds* (1996), the evolutionary biologist Gregory S. Paul and the artificial intelligence expert Earl D. Cox predict that should science and technology continue to develop at the same rate, an important part of the transhumanistic program could be realized in the first half of the twenty-first century.[18]

And even if certain transhumanistic presuppositions (for example, concerning the 'pattern identity' of the mind) should turn out to be completely or partially false, or the predictions greatly exaggerated (as were predictions in the field of artificial intelligence and robotics in the fifties and sixties), it is still sensible to take the transhumanistic program seriously. In its uncompromising radicality this program clarifies a tendency that is characteristic in the development of human culture and which appears to be grounded in the evolution of life on which it is based.

## *2. Evolutionary chance, acceleration and technology*

> We have become, by the power of a glorious evolutionary accident called intelligence, the stewards of life's continuity on earth. We did not ask for this role, but we cannot abjure it. We may not be suited for it, but here we are.
>
> *Stephen Jay Gould*

The (trans)humanistic postulate that man is part of continually developing nature and subject to its laws is in a large measure inspired by Darwin's theory of evolution. Other than Copernicus, probably no other scientist has made such an important contribution to the bringing about of the modern, humanist world view and the accompanying break away from the religious world view which was predominant in Europe in the preceding centuries.[19] The transhumanistic program extends the interpretation of the past of the theory of evolution through to the future.

According to current insights into the theory of evolution, all life on earth stems from common 'ancestors', primitive microorganisms originated in the oceans approximately four billion years ago. Darwin's central thesis is that the development of life took place through a process of natural selection. This process is based on the phenomenon that in the reproduction of organisms a particular variation always occurs in the offspring and that in the struggle for scarce sources of life the individuals that are best adapted to their ever-changing environment have the best chance of successfully reproducing.[20] Particularly when organisms develop independently in different environments can they evolve into different species over the course of time. In this process of diversification, in the course of these millions of years of development, tens of millions of different species originated (of which some four million have been described), which with other related species are part of the biological chain of species, genera, families, orders, classes, phyla and kingdoms. Measured by evolutionary criteria man only appeared only recently. *Homo sapiens*, modern man, is no more than a few hundred thousand years old. If we imagine the evolution of life as a single day, man only appeared on the stage one and a half minutes before midnight and prehistory ended only one second before twelve.

A fundamental insight of (neo)Darwinisn, which corresponds to (and has undoubtedly influenced) the development of (trans)humanistic postulates, is that evolution did not follow a predetermined plan, but that in more than one respect was the result of blind chance. The variation in the descendent crucial for development is dependent on chance mutations which appear in the genetic material (which happens a few dozen times per million copies and in some of these actually lead to deviations

which are relevant to the struggle for existence), on chance fluctuations in the frequencies of genes from one generation to another (genetic drift), from the chance recombination of genetic features in the case of sexual reproduction, and from chance changes in the milieu of the organism (climate, continental drift, meteor strikes, etc.) Chance, moreover, is not only active at the genetic level, but plays its role everywhere where natural selection occurs - also, therefore, in the association between individual organisms, biological species, cultures and ideas ('memes').[21]

Another insight, expressed by Stephen Jay Gould, which has gained ground in the last decades is the theory that evolution in not a gradual process, but one which proceeds in leaps and in fits and starts.[22] When a species reaches a certain equilibrium, often it does not change any further for a long time. In the light of the fundamental role of chance the pattern of evolution can no longer be regarded as a simple 'cone of increasing diversity' but, on the contrary, must be regarded as a process of diversification and decimation. During evolution repeated periods of mass extinction have occurred, after which an explosion of often radically different new life forms took place, life forms which in a relatively short time occupied all the available ecological niches, but the majority of which subsequently diasappeared as a result of natural selection and only a small number of which developed further. An example of this is the mass extinction at the end of the Precambrian (approximately 570 million years ago) which was followed by the 'Cambrian explosion' - a concentrated diversification of multicellular animals in which dozens of new phyla (fundamentally different basic forms of build) originated.[23] In this case, too, diversification was followed by decimation. The remaining life forms subsequently developed into a multitude of classes, orders, families, genera and species. If the decimation in the Cambrian period - determined by chance - had turned out differently, and the *Pikaia* (the predecessor of the phylum of vertebrates to which Homo sapiens also belongs) had failed the natural selection process, life on earth would now be completely different and Homo sapiens in its entirity would not have been created. Seeing that the course of evolution produces increasingly complex life forms, it is perfectly possible that other intelligent creatures might have been created, but the chance that they would have resembled human beings in appearance and intelligence is extremely small.

The process of accelaration which is characteristic of evolution is also linked to the increasing complexity of life. After the creation of the first simple single-celled organisms (prokaryotes) between 4 and 3.5 billion years ago, it was almost 2 billion years before these had evolved into more complex single-celled organisms with a nucleus of genetic material (eukaryotes). More than 1.4 billion years then passed before (580 million years ago) the first multicellular organisms appeared on the scene. Not long after the 'Cambrian explosion' the first vertebrates appeared in the sea and from 400 million years ago on some life passed from the sea to the land and the first plants, insects and amphibians developed. Around 350 million years ago the first reptiles appeared and these developed into the giant dinosaurs which ruled the earth between 200 and 65 million years ago. After their sudden extinction (a second example of mass extinction, which according to a popular hypothesis was cause by a meteorite striking the earth), mammals and birds developed - extremely quickly measured by evolutionary criteria. The development of the order of primates happened rapidly about 5 million years ago when man's ancestor split away from the ancestor we have in common with anthropoids. This *Australopithicus* subsequently developed via *Homo habilis* (2.4 to 1.8 million years ago), *Homo erectus* (1.8 million to 300,000 years ago) and the archaic hominoids (c. 300,000 to 50,000 years ago) to modern man, *Homo sapiens sapiens* (c. 50,000 years ago). Although man has not developed further anatomically since then, the biological evolution was followed by a cultural and technical (r)evolution, which must be measured in terms of tens of thousands, and subsequently in thousands, then hundreds of years, and now, in the age of information technology, perhaps even in decades.

This acceleration is the consequence of the increasing complexity of organisms and the increase in genetic variation associated with it. There is a directly proportional correlation between the degree of genetic variation and the speed of evolution. When variation increases (for example, at the moment the eukaryotic cell with a nucleus of pairs of chromosomes, which makes sexual reproduction - and therefore a continuous recombination of genetic material - possible, is created), then there is greater choice for natural selection and evolution moves up into a higher gear. The continual increase in complexity and heterogeneity of organisms and their environments has led to evolution of life being characterized by an exponential acceleration which has continued to the present day.[24]

This acceleration does not alter the fact that evolutionary developments are subject to blind chance - at least until the moment a (sub)family is created within the hominoids which, thanks to its intelligence, can to some extent mould chance, and therefore acquires the ability to intercede itself in the further evolution of life. In the hominoids, cultural 'mutations', such as the discovery of fire, the conservation of food and the use of increasingly advanced tools, became increasingly important factors in the process of evolution.[25] Cultural 'mutations', unlike mutations in biological evolution, are not exclusively dependent on chance, but are often brought about consciously.[26] Culture can be regarded as an attempt to control and domesticate blind chance. Modern science and technology, in particular, have put powerful instruments into the hands of man, tools with which he can mould the chance which natural selection requires. This is also reflected in biological evolution, which is subject to non-natural selection. Through cultivation the coincidence of genetic recombination becomes subject to human design and with the aid of genetic engineering even genetic mutations become subject to technological control. Because of this man has finally acquired control over his own evolution.[27] Man has therefore become the first creature able to create his own evolutionary successors.[28] And that does not necessarily mean life forms based on carbon and water, which we know on earth to the present day. We can also think of artificial life based on silicon (AL), and of artificial intelligence (AI) or of cyborgs, half-organic, half-mechanical intermediate forms.

In this framework the development of information technology and the informational sciences is of crucial importance.[29] Sciences based on information technology, such as artificial physics and artificial life, in contrast to the classic mechanical sciences, are not so much driven by the question of what reality *is*, but how it *could be*. These 'modal sciences' are no longer primarily directed at imitating nature, but rather at the creation of new nature.[30] With the aid of a computer simulation of evolution, not only can countless alternative evolutions be made into virtual reality, but - if we wish to - we can realize these alternatives in physical nature with the aid of genetic engineering.[31] Reciprocally, insights from evolution theory can also be applied to the development of artificial life forms. One of the reasons the classic AI research failed was because attempts were made to program artificial intelligence *top down*. Because the number of possible mutual interactions between the instructions in a software program increases exponentially as the number of lines of code increases linearly, the program is quickly confronted with an unmanageable complexity.[32] For this reason the *bottom up* approach has gained popularity in AI and AL research in recent years. In this approach AI and AL programs are constructed in such a way (by making use of genetic or evolutionary algorithms) that they can develop themselves further in a process of (un)natural selection. Moreover this approach, suggests Moravec in his subsequent publications to *Mind Children*, has, unlike the download procedure, the advantage that it is not weighed down by the burden of the evolutionary baggage of the human body.[33]

In the light of the previous evolution of life on earth it is not unthinkable that, thanks to information technology, this will again result in an explosion of radically different life forms, based on different

basic forms of build (phyla), which together will form a new kingdom (or perhaps even a variety of kingdoms) in the taxonomy of life, beside the existing kingdoms of the Animalia, Plantae and Fungi, Protista (single-celled organisms with one complex cell) and Monera (simple unicellular organisms). And if evolutionary history repeats itself, after a short period in which this multiplicity of various new life forms has occupied all the niches in the natural, cultural (and especially virtual) world, we can expect another decimation, after which a small number of them will carry the torch of evolution further.

In the previous section I observed that many of the techniques required for the realization of the three outlined alternatives (genetic engineering of the human organism, the construction of cyborgs and the development of artificial life and artificial intelligence) are already reality - or at least in the process of development. Furthermore, if we take the exponential acceleration of evolution seriously, then neither can we comfort ourselves with the thought that this will take ages. Even the failure of artificial intelligence research, with its unrealistic expectations, gives no reason for complacency. A characteristic of exponential acceleration is that we tend to overestimate its effects in the short term, while often grossly underestimating its effects in the somewhat longer term.

Also some of the fundamental criticism from various quarters - here I have in mind philosophers such as Searle, Dreyfus and Lyotard[34] - which is put forward against the presuppositions of the transhumanist program, in my opinion gives little reason to dismiss this program as implausible. An important element of this criticism is falsely based on the anthropocentric presupposition that man is the measure for every form of artificial intelligence and artificial life. If, for example, it is argued that computers will never be really intelligent, never possess consciousness or have real experiences, then it is all too easily assumed (completely setting aside the question as to whether this criticism holds water) that the form of intelligence (situated in organic bodies) which has developed in *Homo sapiens sapiens* is the measure of intelligence überhaupt. This 'carbon chauvinism' is rather shortsighted. Like birds, aeroplanes can fly, but they do not owe this ability to a literal imitation of a bird's wings. Neither do artificial life and artificial intelligence need to be a literal replica of organic life and organic intelligence in order to share its essential characteristics (such as the ability to reproduce, creativity, and the ability to learn). Computer viruses, for example, despite the fact that the reproductive material differs from that of natural viruses, share a number of important characteristics with them. Even if artificial life forms, based on silicon, should never reach the level of (human) consciousness, it is still conceivable that they will be more successful in evolutionary survival than man.

From the end of the Old Stone Age (*Paleolithicum*) until the New Stone Age (*Neolithicum*) man developed as we now know him (*Homo sapiens sapiens*). During this development a form of intelligence came into being which deviated in essential points from previous forms of organic intelligence and which gave the evolution of life on earth a new twist. Perhaps we are standing at the threshold of the *Newest* Stone Age in which intelligent life on earth will acquire a new form and direction unrecognizable to man. And who knows whether man will then share the fate of the innumerable species left to him as (living) fossils in life's Odyssey through time and space.

### *3. Difficult questions for humanists*

> No popular ethical system yet, be it humanist or religion-based, has shown itself able to face the challenges that already confront us. How many people should occupy the earth? What sort of people should they be? How should we share the available space? Clearly we must change our ideas about making additional children. Individuals are now conceived by chance. Someday, instead, they could be "composed" in accord with

> considered desires and designs. ... What kind of things should our "mind-children" know? How many of them should we produce, and who should decide their attributes?
>
> *Marvin Minsky*

It scarcely needs to be argued that the transhumanistic project, which is articulated explicitly and radically in Moravec's work, but in fact (intentionally or not) dictates an important element of the agenda of the new information sciences, means a fundamental challenge for humanism. 'Bad' postmodernism proclaims the *end of mankind* in a much more literal and radical manner than 'good' postmodernism has ever done. This is no longer exclusively about criticism of an anthropocentric way of thinking; the continued existence of humankind *itself* is at stake. What must sound ominous to humanists is that this shall occur in the name of humanistic values such as rationality, autonomy, self-determination and self-realization. Transhumanism radicalizes the humanist struggle "to raise life to its highest possible level"[35] into a call for *self-transformation* of the biological type of man.

Transhumanists refer not only to the theory of evolution, in which it is argued that this process of self-transformation is inherent in life, but also to Nietzsche's philosophy of life.[36] In Nietzsche's philosophy, too, self-transformation is regarded as an essential characteristic of life: "All great things fail at its own instigation, through a deed of self-elevation: the law of life compels them to this, the law of *necessary* 'self-overcoming' is the essence of life".[37] "And life itself has spoken this secret to me: 'See, so it spoke, I am that which *that must always overcome itself*'".[38] Humankind is no exception to this. It is, in Nietzsche's famous words in *Also Sprach Zarathustra*, "a rope, fastened between animal and superman - a rope over an abyss",[39] The transhumanistic project is directed at the technological realization of the *Übermensch* or, as the extropist Max More puts it: *the being existing in us as potential, waiting to be actualized*".[40]

Supposing that life is indeed characterized by self-transformation, then we cannot take for granted that we *must* strive for this self-transformation. But as has already been remarked, the defence of self-transformation is supported by humanistic ideals: The Enlightenment and the humanist perspective assure us that progress is possible, that life is a grand adventure, and that reason, science, and good will can free us from the confines of the past... Aging and death victimizes all humans. To transhumanists, in the words of Alan Harrington, "death is an imposition on the human race and no longer acceptable".[41] If we allow - and even acclaim - the fact that medical science and technology have previously combated deadly diseases successfully, what objections can we put forward against striving to improve life by adapting the body and the mind? And what reasons could we advance against striving to transform humankind into a superior, post-human life form? These questions seem to me to be literally a matter of life and death at the beginning of the twenty-first century. All the more so because thanks to evolutionary chance, which has gifted us with intelligence and imagination our future, is by no means fixed, but is partly dependent on the choices that we make.

To be sure - and this is the prudent lesson of 'good' postmodernism that we must not forget - our freedom of choice is limited in many ways. Our fundamental finitude means that our insight and knowledge are always historically and culturally limited and we can only choose from a limited number of alternatives, the consequences of which, moreover, can never be completely calculated. As our culture becomes more complex and we intervene in nature in a more fundamental way, the number of unforeseen and unforeseeable consequences of our actions increases strongly. Partly because of this, our cultural and technological creations achieve their own equilibrium and dynamic, which means that in the long term we cannot fully control them. In combination with the late capitalistic market economy, technology even gives the impression of being an autonomous,

unstoppable system. With the evolutionist *bottom up* approach to the creation of artificial life and artificial intelligence, moreover, we appear to be taking a conscious distance to what is given us to control. But perhaps it is also anthropocentric arrogance to think that we are able to and have to control this development. Is it not more obvious that at some point in time our *mind children* will (must) take over responsibility for their development? Should we not accept that seen from the perspective of humankind this development - to quote the title of a book by Kelly - become more and more *Out of Control*?[42]

But at the very least there is scope for human intervention - however limited it might be, and however much more limited it might possibly be in the future. Certainly when we consider that evolution is a chaotic process which is characterized by a 'sensitive dependency on the initial situation' in which the most minute variations at the outset can have enormous consequences for the further development of the ecological system. Because at the moment we are standing at the threshold of a development, what little scope we have brings great responsibility with it.[43] This prompts a fundamental consideration of the question as to if, and if so, how far and in what way, we should actively promote our own self-transformation.

In answering these questions humanists cannot rely on a number of traditional strategies, seeing that in the light of the humanistic postulates (see § 1) these have lost their validity. This applies, for example, to the rejection of the transhumanist program on the grounds that it would breach the given natural order. Within the humanist world view, however, this order is not immutable (whether created by God or not), but a dynamic process, driven by a multitude of chance factors. Neither can the artificiality of the intended transhuman and posthuman life be a reason to reject it. Hominoids, in fact, have always been cyborgs - at least from the moment that *Homo habilis* manufactured the first stone tools. Certainly the 'artificial by nature'[44] *Homo sapiens sapiens* was from the outset complete and already dependent on cultural artefacts to compensate for his physical and mental shortcomings.[45] In this sense the transhumanist program is only an extension of the course which has characterized evolution from the very beginning. As has already been observed, it goes without saying that no normative arguments can be employed for the promotion of the transhuman and the posthuman, but neither can we can employ any normative arguments *against* it.

A pragmatic argument which at first sight appears to hold more water concerns the enormous risks involved in genetic engineering and the development of artificial life and intelligence. For this reason, following the bio-ethicus Hans Jonas, there is an argument for the 'heuristics of fear'.[46] According to this strategy on the basis of *possible* future horrors we should decide to temporarily break off, slow down or even stop completely, certain technological developments. In any event, we must proceed in such a way that we can at all times rectify the consequences of our technological interventions.

In the light of what has been said about the fundamental limitations on human desire to control, it is patently obvious that enormous risks are attached to the transhumanistic program. The question, however, is whether Jonas' heuristics of fear is actually a realistic option. The notion that it is possible to oversee and, if desired, to rectify, all the consequences of our technical interventions appears, in the light of unforeseen (and in the case of chaotic complexity fundamentally unforeseeable) side-effects of informationistic interventions in nature, to be an unrealistic point of departure, and one which clings, in a negative way, to the modernistic ideal of the makeability of reality. And the idea that to actually call a halt to technological developments will lie within the capacity of human beings living in a technotope would also appear to be somewhat unrealistic. We are not in a position to halt the Odyssey of life. We should rather direct our efforts towards steering its course. Furthermore, we might ask ourselves whether the wilful curbing - or halting - of creativity and a yearning to experiment would not also rob humanity of its grandeur. Nietzsche's definition of man as "the great

experimenter with himself"[47] is more than a description, it also expresses esteem. When we are weighed down by the risks associated with the human yearning to experiment it might be a comfort to consider that the experiment of evolution in humankind was exclusively guided by blind chance.

Taking the above considerations into account, the normative question as to whether we should promote the transhuman and posthuman is, of course, still not answered. If we wish to answer this question we must first ask ourselves if the presupposition of the transhumanistic program - that it will promote our happiness - is correct. Moreover, we should bear in mind that here we are not only speaking of the happiness of humanity, but equally of that of the transhuman and posthuman life forms we are striving for. Transhumanistic ethics can be no other than a radicalized *Ferne-Ethik* (Ethics of distance) which - within the earlier-mentioned bounds of human responsibility - not only bears responsibility for future generations of humankind, but also for life forms created by humankind. As far as humankind is concerned we can ask ourselves if suppressing chance and - in the most radical scenario - the mortality of human life in all its aspects is an ideal worth striving for. I have argued elsewhere that , chance, contingency and fate not only forms a threat to human happiness but, paradoxically, is also one of the principle sources which determines this fragile happiness. The elimination of chance conjours up the terrible image of dystopias such as Aldous Huxley's *Brave New World* in which under the motto "Community, Identity, Stability", and with the aid of chemical and psychological manipulation, man is transformed into a fully interchangeable 'hedonistic machine', who is no longer capable of experiencing real feelings. If this is the consequence (or even the ideal[48]) of the transhumanistic project, then the result is less the creation of the *Übermensch* as Nietzsche (who affirmed chance in the extreme from the standpoint of his *amor fati*) had in mind, than that of the nihilistic 'last man' at which Nietzsche actually directed his criticism.[49] Would the endless stretching of life's duration towards immortality not lead to a lapse into an Eternal Recurrence of the Same , to bottomless boredom? Or is the terrible image of community, identity and stability the result of an outdated modernistic illusion that it is possible to completely control befalling chance? Or is it not the case that an increase in command and control will actually lead to new, perhaps much more radical, forms of chance, contingency and fate, which will turn our lives into a much greater and more varied adventure than it already is?[50] If that should be the case, then the humanistic ideal of self-realization would not be so badly damaged by the transhumanistic program, but would rather receive an unprecedented new stimulus.

It would be intellectually over-confident to think that we could formulate conclusive answers to these and associated questions.[51] All the more so if we consider that in judging of the desirablility of transhuman and posthuman life forms it would be difficult for us to resist the tendency to judge these from an anthropocentric perspective. But just as the ape cannot form an adequate picture of the human life form, so it is not given to us to visualize the nature or attractiveness of these new life forms. And that makes our responsibility in the creation of these life forms extremely perilous.

The most radical and difficult-to-answer question that the transhumanistic program poses to humanism is closely related to this. It is the question of what value the human life form has compared with potential transhuman and posthuman life forms. Does human life have a unique intrinsic value that justifies it defending itself against these new life forms? Or must we fall back on the argument that prompts us to protect the panda and defend human life in the name of bio-diversity? And if we are faced with the choice will we then apply the same criteria, which leads us to sacrifice the lives of animals for the welfare of humankind? Will the superiority of transhuman or posthuman life (in the quantity of information it carries or in its abilities) ever force us to eliminate ourselves? Will our relationship with our *mind children* be comparable with that of parents who, driven by a desire that is stronger than any moral reasoning, sacrifice themselves for their children? Or, if we are concerned with artificial, other types of children, will this sacrifice surpass our moral capacities and will we only

be able to fall back on the egoism of our own species?

In the coming decades these and related difficult questions will repeatedly startle us out of the anthropocentric slumber in which we usually exist. In the end all these questions are variations on the most difficult of the difficult questions posed by the German writer Max Frisch: "Are you certain that when you and everyone you know are no longer here, the continued existence of the human race really interests you?"[52]

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[1] H. Kunneman, "Humanisme en postmodernisme." In: Paul Cliteur and Douwe van Houten (ed.), *Humanisme. Theorie en praktijk*, 65-77. Utrecht 1996, 65. The numbers between brackets in the rest of this chapter refer to this article.

[2] See J. de Mul, *Romantic Desire in (Post)Modern Art and Philosophy*. New York: State University of New York Press, 1999.

[3] For a penetrating analysis of this development see M. Castells, *The Information Age: Economy, Society and Culture Volume I: The Rise of the Network Society; Volume II: The Power of Identity; Volume III: End of Millenium.* Oxford:

Blackwell, 1996-1998.

[4]For a brief history of transhumanism see N. Vita More, *Create/Recreate. Transhuman Beginnings and Extropic Creativity,* Z.p., 1997.

[5]http://www.extropy.com/~exi/

[6]http://www.aleph.se/Trans/

[7]http://pespmc1.vub.ac.be/MANIFESTO.html

[8]http://www.transhumanism.com/

[9] Http://www.stack.nl/tcedo/transhum.htm. According to the definition of the World Transhumanist Association: "Transhumanism is the philosophy which advocates the use of technology to overcome our biological limitations and transform the human condition. The accelerating pace of technological development opens up such revolutionary prospects as superhuman artificial intelligence and molecular nanotechnology. The consequences of these developments may include: the biochemical enrichment or redesign of our pleasure-centres so we enjoy a richer diversity of emotions, life-long happiness and exhilarating peak experiences every day; the elimination of ageing; the abolition of disease; and perhaps the gradual replacement of human bodies with synthetic enhancements and computers." (http://www.transhumanism.com/). Max More's short definition in the introduction to *The Extropian Principles 2.6.* (1993-1995) is along the same lines: "Extropianism is a *transhumanist* philosophy: Like humanism, transhumanism values reason and humanity and sees no grounds for belief in unknowable, supernatural forces externally controlling our destiny, but goes further in urging us to push beyond the merely human stage of evolution" (http://www.extropy.com/~exi/extprn26.htm).

[10]See J.P.v. Praag, *Grondslagen van humanisme*. Amsterdam/Meppel: Boom, 1978, 88-103.

[11]Cf. P.B. Cliteur, Twintigse-eeuws humanisme in de Engelstalige wereld. In: Paul Cliteur and Wim van Dooren, *Geschiedenis van het humanisme. Hoofdfiguren uit de humanistische traditie*, 191-249. Amsterdam: Boom, 1991.

[12]http://www.stack.nl/~hkl/tcedo/transhum.htm

[13]In the United States a number of companies offer this service. At the moment about 70 deceased people have been frozen and worldwide approximately one thousand have made arrangements to be frozen when they die.

[14]H.Moravec, *Mind Children: The Future of Robot and Human Intelligence*. Cambridge: Cambridge University Press, 1998, 109-110.

[15]H. Moravec, op.cit., 116v.

[16]With this the cartesian dualism of body and mind, which has been less of a (problematic) ontological postulate than a scientific program, would find provisional fulfilment.

[17]Moravec, op.cit., 116

[18]Paul, Gregory S., and Earl D. Cox. *Beyond Humanity: Cyber Evolution and Future Minds*. Rockland, Massachusetts: Charles River Media, 1996.

[19]This is probably also the reason why fundamentalist movements in the United States devote so much energy to attempting to ban the teaching of the theory of evolution or, when unsuccessful, to trying to ensure it is complemented by creationist theories. In the Netherlands, too, there is still resistance to the inclusion of evolutionary theory in the

central written pre-university examinations.

[20] Notwithstanding this almost warlike metaphor, the 'struggle for existence' is not solely about the right of the strongest individual. Peaceful co-operation between individuals and symbiotic relationships between species often play a crucial role in the survival of individuals and species.

[21] Stephen Jay Gould, "'What is life?' as a problem in history." In: Michael P. Murphy and Luke A.J. O'Neill (ed.), *What is Life? The Next Fifty Years. Speculations on the future of biology*, ed. M.P. 25-40. Cambridge: Cambridge University Press, 1995.

[22] See Stephen Jay Gould, *Wonderlijk leven. Over toeval en evolutie.* Amsterdam: Contact, 1991. [22]

[23] A detailed description of this Cambrian explosion can be found in Gould's book mentioned in the previous note.

[24] Gregory S. Gregory and Earl D. Cox, op.cit., 33-87. See in particular the graphs on pp. 68-71.

[25] L. and F. Cavelli-Sforza, *Wie zijn wij? Het verhaal van het menselijk verschil.* Antwerp/Amsterdam: Contact, 1994, 118. Biological and cultural factors are also closely interwoven. It could be argued, for example, that with the development of the use of external symbols (from cave paintings to alphabetic writing) humankind's biological brain was extended to include an external memory store. Although humankind has not developed anatomically since the emergence of modern *Homo sapiens sapiens,* the development of the cognitive equipment has continued since then. Seen from a cognitive-evolutionary perspective, Homo sapiens sapiens, man equipped with an external memory store, has been a cyborg - half organism, half apparatus, from the very beginning. In this context see Merlin Donald, *Origins of the Modern Mind: Three Stages in the Evolution of Culture and Cognition.* Cambridge: Harvard University Press, 1991.

[26] In addition it should be noted that chance in the form of serendipity also continues to play an important role.

[27] Moravec also pointed this out: "In the metaphor of Richard Dawkins, we are the handiwork of a blind watchmaker. But we have now acquired partial sight and can, if we choose, use our vision to guide the watchmaker's hand". H. Moravec, *Mind Children*, op.cit., 159.

[28] "Our uniqueness will lie in the ability to create our own successors". S. Levy, *Artifical Life: The Quest for a New Creation*. London: Penguin, 1992, 9.

[29] For a more extensive analysis of the characteristics which distinguish the information sciences from the mechanical see J. de Mul. 'The informatization of the Worldview' (forthcoming).

[30] See Claus Emmeche. *The Garden in the Machine: The Emerging science of Artificial Life.* Princeton: Princeton University Press, 1991, 161. In these sciences the traditional distinction between *science* and *fiction* becomes blurred: "Science becomes the art of the possible because the interesting questions are no longer how the world is, but how it could be, and how we can most effectively create other universes - given this or that set of computational resources".

[31] Genetic engineering differs from the classical cultivation of plants and animals because here it is not a question of controlling the recombination of *existing* genetic material, but the creation of *new* genetic material.

[32] An IBM study into the cost of eradicating inevitable faults from a program (*debugging*) concluded that it would increase exponentially with the scale of the program. While debugging a program of 6000 lines would cost §100 per fault and §100,000 in total, a program of 1 million lines would cost §1000 per line and 1 billion dollars in total. According to this calculation, debugging a *top down* programd simulation of the human brain, which would contain many hundreds of millions, if not billions of lines, would cost at least tens of thousands of dollars per line and cost

billions ($10^{12}$) or even trillions ($10^{18}$) of dollars. Derived from Paul and Cox, op.cit., 94.

[33]"I think the idea of extending an existing human being, both in life-span and intelligence, is probably not the effective way to have a better grasp of the universe, because I think we have too much evolutionary baggage from our past. Probably the best way is to make a clean break, and to design successors to ourselves who are more adapted to the way things are than we are... Now I think it is better to build children than to preserve an existing mind, at least an existing biological mind, which has too many limitations and is just built wrong for the future". Interview with Moriyama, http://

[34]See, among others, John Searle, *The Rediscovery of the Mind*. Cambridge: The MIT Press, 1992; Hubert L. Dreyfus. *What Computers Still Can't Do*. 2nd ed. Cambridge: The MIT Press, 1993; Jean-François Lyotard. *L'inhumain; Causeries sur le temps*. Paris: Editions Galilée, 1988.

[35]H.J. Pos, Personalisme en humanisme. In: *Het Keerpunt*, September 1947, 472-483, 479.

[36]The writings of the extropist Max More, in particular, are peppered with quotations from Nietzsche. See, among others, Max More, *On Becoming Posthuman*. http://www.primenet.com/~maxmore/becoming.htm (1994), More, Max. *The Extropian Principles 2.6*. http://www.extropy.com/~exi/extprn26.htm (1995) and *Technological Self-Transformation Expanding Personal Extropy*. http://www.extropy.com/selftrn2.htm (1997). It should also be noted that the term 'transhumanism' is also used in the context of the so-called anti-humanism debate in connection with Nietzsche. Here, however, the 'trans' is linked to a particular (humanistic) explanation of humankind, and not so much to human beings themselves.

[37]F. Nietzsche, *Sämtliche Werke. Kritische Studienausgabe*. Berlin 1980, Band 5, 410. From this perspective the dividing line between living nature and dead is, according to Nietzsche, difficult to draw. In the context of his analysis of interpretation, which according to him, is inherent in the desire to the self-conquest of life, Nietzsche observes that chemical processes in inorganic nature can also be included. Volume 7, 437. In connection with this see my Nietzsche interpretation in: Jos de Mul, *The Tragedy of Finitude. Dilthey's Hermeneutics of Life*. New Haven/London: Yale University Press.

[38]Idem. Volume 4, 148. With regard to this aspect of Nietzsche's American working history, Stanley Kubrick's film *2001: A Space Odyssey* (1968) plays a marginal, but not unimportant, role. This film - pithily derscribed in the program as " an epic tale of man's ascent, from ape to space traveller and beyond" (2001: A Space Odyssey. Special Collector's Edition. MGM/UA HomeVideo, 1997) deals with the role of technology in the transformation from animal to humankind and from humankind to *Übermensch*. One of the stars of the film is HAL, an exceptionally advanced artificial intelligence, which in many respects is superior to man. The crucial transformation scenes in the film were accompanied by Richard Strauss' symphonic poem based on Nietzsche's *Also sprach Zarathustra*. Marvin Minsky, mentioned earlier, was one of the scientists brought in by Kubrick to advise him on the film. For the great influence this film exercised on his generation see the interview with Minsky in: D.G. Stork (ed,), *Hal's legacy: 2001's Computer as Dream and Reality,* Cambridge: MIT, 1997, 15-31.

[39]Op. cit., 16

[40]M. More, Technological Self-Transformation. Expanding Personal Extropy. op.cit., In this context More speaks out explicitly against the fascist interpretation of Nietzsche's *Übermensch* doctrine: "Self-discipline and the conscious self-guidance of our lives will allow us to achieve even higher goals, as we raise our sights with each triumph. Effective self rule will free us of the desire to control others. Contrary to popular interpretation, the *Übermensch* is *not* the Blond Beast, the conqueror and plunderer. They are those who neither rule others nor tolerate other's attempts to rule them".

[41]M. More, On Becoming Posthuman, op. cit.

[42]In so far as this is recognized by transhumanists as an inevitable consequence of their objectives, in any event no unbridled urge to control can be pinned on them.

[43]The history of the development of new technologies always shows a turning point. After a period in which human choices have a great influence on this development, the technology itself takes on its own impulse and seems to assume its own dynamic and controls humankind as an autonomous power. See T.P. Hughes, Technological Momentum. In: M.R. Smith and Leo Marx (ed.), *Does Technology Drive History? The Dilemma of Technological Determinism*, 101-113. Cambridge MIT, 1966.

[44]H. Plessner, *Die Stufen des Organischen und der Mensch.* In: Gesammelte Schriften, Frankfurt part IV, 1981, 385.

[45]See note 26.

[46]Hans Jona, *Das Prinzip Hoffnung. Versuch einer Ethik fur die technologische Zivilisation.* Frankfurt a/M: Suhrkap, 1984, 392; cf. Hans Achterhuis, ed. "Hans Jonas: Ethiek en techniek." In: Hans Achterhuis (ed.), *De maat van de techniek. Zes filosofen over techniek: Gunter Anders, Jacques Ellul, Arnold Gehlen, Martin Heidegger, Hans Jonas en Lewis Mumford*. Baarn: Ambo, 1992, 139.

[47]Op. cit., Volume 5, 367.

[48]David Pearce's *The Hedonistic Imperitive* (s.a.) offers an exhaustively argued defence of this, http://www.hedweb.com/hedab.htm.

[49]Nietzsche's description of the 'last human' is fully applicable to the soma-anaesthetized inhabitants of Huxley's Brave New World: "A little poison now and then: that brings sweet dreams. And, at the last, much poison, to die gently. Men still work, for work is pleasure. But it is ensured that the pleasure does not take over... 'We have discovered happiness' - say the last people, and wink" (Nietzsche, *Sämtliche Werke. Kritische Studienausgabe*, Band 4, 19).

[50]In his study cited in note 49 Pierce puts forward a number of good arguments against the presupposition that 'dopamine-overdrive' inevitably leads to emotional numbness and lethargy.

[51]Obviously we must also consider the social consequences of the transhumanistic program. Should this program lead not so much to uniformity, but to a radical differentiation in human life, this would also have far-reaching consequences - for example, in balances of power. Therefore we can think again about *Brave New World* with its division into biotechnologically constructed social classes. See also Minsky's questions in the introduction to this chapter.

[52]Max Frisch, *Lastige Vragen*. Amsterdam: Meulenhoff, 1992, 5.