ITAS - EPP
Elektronische Pre-Prints

Armin Grunwald

Ethical Inquiry Meets Future Projections. The Case of Human Enhancement

Pre-Print: 03.09.2007

Erschienen in: Ach, J. S.; Lüttenberg, B. (Hrsg.): Nanobiotechnology, nanomedicine and human enhancement. Berlin, Münster: LIT 2008, S. 133-153 (Münsteraner Bioethik-Studien, Bd. 7)

ITAS - Elektronische Pre-Prints

Allgemeine Hinweise

Wie mittlerweile viele wissenschaftliche Einrichtungen, bietet auch ITAS elektronische Pre-Prints an, die bereits zur Publikation akzeptierte wissenschaftliche Arbeiten von Mitarbeiterinnen und Mitarbeitern − in der Regel Buchbeiträge − darstellen.

Für die Autoren bietet dies den Vorteil einer früheren und besseren Sichtbarkeit ihrer Arbeiten; für die Herausgeber und Verlage die Möglichkeit einer zusätzlichen, werbewirksamen Bekanntmachung des jeweiligen Buchprojekts. Auf die in Aussicht stehende Veröffentlichung wird hingewiesen. Nach Erscheinen der Publikation werden der geänderte Status vermerkt und die bibliographischen Angaben vervollständigt.

Allgemeine Anregungen und Kommentare zu den ITAS Pre-Prints richten Sie bitte an Fritz Gloede (gloede@itas.fzk.de).

Empfohlene Zitierweise des vorliegenden Pre-Prints:

Grunwald, A.: Ethical Inquiry Meets Future Projections. The Case of Human Enhancement. Karlsruhe: ITAS Pre-Print: 03.09.2007;
http://www.itas.fzk.de/deu/lit/epp/grun07-pre02.pdf

Ethical Inquiry Meets Future Projections.
The Case of Human Enhancement

Abstract

In this paper, I will have a look at the interference of ethical reflection and the provisional and perhaps futuristic nature of its subject in such recent questions like human enhancement at the interface between society, technology, and ethics. This interface brings up more complex challenges to adequately dealing with normative and epistemic aspects of providing orientation. Taking the program of human enhancement as an example for the sake of illustration I will analyse some aspects of future communication which are relevant in this context. Especially the different functions which are simultaneously related with future communication and the resulting, partly severe, ambivalences of visionary communication give rise to be dealt with in ethical reflection. Concerning methodology I will outline two proposals for cooperation between ethics and future analysis approaches: an "ethical vision assessment" which comprises epistemological as well as normative aspects of gaining orientation, and an "ethically oriented technology foresight".

1. Introduction and Overview

The point of departure of this paper consists of the observation that the career of nanotechnology as a metaphor for revolutionary advance of science in general and as an important issue in societal debate is related with a specific role of long-term visions. Several visions and far-ranging expectations due to nano-technological advance regarding new potentials for improving human performance emerging from convergence of nanotechnology and other technology fields (NBIC convergence, Roco/Bainbridge 2002), but also dystopian views, have been put forward by visionary scientists, by science managers, by science writers and by philosophers. These positive and negative visions are an essential part of public debate and ELSI activities since some years (Schmid et al. 2006, chapters 5.4 and 6).

These visions include, on the one side, new occasions of choice, new possibilities for technical intervention and more independence from Nature and from the given, increasing considerably the contingency of the *conditio humana* (Grunwald 2006a). On the other side, this envisaged situation is related with novel challenges to create orientation how to deal with the new occasions of choice which are expected to emerge from nanotechnology and converging technologies. Ethical orientation is needed to a higher degree in order to offer criteria and procedures to deal adequately and responsibly with the normative aspects and implications of these new occasions of choice (Höffe 1993).

Communication on future prospects of improving human performance expressed by visions, roadmaps or scenarios contributes, at the one hand, directly to the increase of contingency. On the other, however, communication on future prospects also attempts at providing new orientation (Luhmann 1989; Grunwald 2006a; see part 3). Therefore, ethical analysis is more and more confronted with the necessity to deal with, in part far-ranging, future projections. Ethical inquiry in fields such as human enhancement takes elements of future communication like visions as its subject. Providing orientation then means to analyse, assess and judge those far-ranging future prospects on the basis of today's knowledge and seen from the today's moral point of view. Ethical investigation of topics like human enhancement – which is obviously a grand new challenge to ethics – does not consider technical capabilities of today but predicted or projected future capabilities with their specific uncertainties.

This situation leads to new methodical challenges for ethical inquiry. Especially the uncertainty of the knowledge standing behind the future prospects makes it difficult to assess whether a specific development at the human-machine interface or concerning the technical improvement

of the human body should be regarded as science fiction (SF), as technical potential in a far future, as a somewhat realistic scenario or as probably becoming part of reality in the near future. Ethical analysis has to take into account this uncertainty and has to be combined with an "epistemology" of future projections (see parts 4 and 5). There are expectations involved if ethical inquiry meets future projections:

(1) The epistemological analysis of future projection would provide ethics with necessary meta-knowledge about the "quality" of the future projections (which is a complex notion in itself, cp. Pereira et al. 2006), and
(2) The cooperation between an epistemological analysis of future projections and ethical inquiry would allow for better "constructions" of scenarios in specific areas which then could be used as basis of orientation and decision-making.

In this paper, I will have a look at the interference of ethical reflection and the provisional and perhaps futuristic nature of its subject in such recent questions like human enhancement at the interface between society, technology, and ethics. This interface brings up more complex challenges to adequately dealing with normative and epistemic aspects of providing orientation. Taking the program of human enhancement as an example for the sake of illustration (part 2) I will analyse some aspects of future communication which are relevant in this context. Especially the different functions which are simultaneously related with future communication and the resulting, partly severe, ambivalences of visionary communication give rise to be dealt with in ethical reflection (part 3). In the field of methodical steps I will outline two proposals for cooperation between ethics and future analysis approaches: an "ethical vision assessment" which comprises epistemological as well as normative aspects of gaining orientation, and an "ethically oriented technology foresight" (part 5).

2. Human enhancement and the need for orientation

Human enhancement is an old theme. Mankind's dissatisfaction with itself is known from ancient times – discontent with mankind's physical endowments, its physical and intellectual capabilities, with its vulnerability to exogenic eventualities such as disease, with the inevitability of aging and, finally, of death, dissatisfaction with its moral capacities, or – and this will probably be particularly frequent – with one's physical appearance.

The idea of a "technical" enhancement of human performance, however, in combination expectations of being able to realize it in an overseeable time scale (Roco/Bainbridge 2002), seems to be a novelty in human history. The precondition of enhancement is that it would be possible to rebuild parts of the human body by technical means which would provide, as a first step, identical functions (for example, in order to substitute damaged organs by technical ones) compared to the natural organs. The second step then could be – and this would be a step deeply inherent to engineer's thinking – to "improve" the functionality of those artificial organs and to enable humans to control those enhanced organs and to harvest the new possibilities. Human enhancement, therefore, is closely related with the human-machine-interface.

In this chapter, I will first introduce some of the ideas concerning the "technical" enhancement of humans (2.1). Obviously, this field is closely connected with more general developments concerning the human-machine-interface, especially via the current debate on implants and neuroimplants. Secondly, I will interpret these prospects against the background of the increase of contingency emerging from these new possibilities and the need for orientation (2.2).

2.1 Converging Technologies for improving human performance

The recent discussion of human enhancement was initiated by the report of an American research group to the National Science Foundation (NSF), which has considerable influence on the agenda for the sciences (Roco/Bainbridge 2002). The title of this report conveys its program: "Converging Technologies for Improving Human Performance". Nanotechnology and the Converging Technologies offer, according to this report, far-reaching perspectives for perceiving even the human body and mind as formable, to improve them through precisely targeted technical measures, and, in this manner, also to increase their societal performance. A special, practically as well as ethically particularly interesting sub-area, is bridging the gap between

technology and the human nervous system. An interesting field of development are nanoelectronic neuroimplants (neurobionics), which compensate damage to sensory organs or to the nervous system, resp., improve the capabilities of these organs, and broaden the spectrum of human perception. There are three key fields of human enhancement:

- *extension of human sensory faculties*: the capabilities of the human eye can be augmented, for example, with respect to visual acuity ("Eagle Eye"), or with regard to a night vision capability by broadening the electromagnetic spectrum visible in the direction of infrared; other sensory organs, such as the ear, could likewise be improved, or completely new sensory capabilities, such as, for instance, the radar sense of bats, could be made accessible to human beings.
- *neuro-implants* to improve cognitive and mental capabilities, for example expanding brain memory through technical aids like implementing a chip into the brain and connecting it adequately to the brain functions. In view of our forgetfulness, this could be an attractive idea for many people.
- *retardation of aging*: The inevitability of aging and, finally, of death belongs to the great driving forces of visions in order to overcome this inevitability. According to our present knowledge, aging can, roughly speaking, be interpreted as a form of degradation on the cellular level. If it could succeed to discover and to repair immediately all forms of such degradation, aging could be greatly delayed or even abolished.

These examples indicate the direction of the New Thinking: it is a matter of broadening human capabilities in comparison with those we traditionally ascribe to a healthy human being. It is obvious that an entire series of ethical or anthropological questions are associated with these visionary expectations (or even just possibilities), which increase the contingency of the *conditio humana*. These questions pertain to the moral *permissibility* or *forbiddenness* of enhancement, to a possible *duty* to enhancement (if such a duty were possible, Siep 2005), to the consequences of enhancement with regard to equity – who can afford to have himself or herself enhanced? –, to the *consequences* for our *concept of mankind* and for the *society of the future*, to the question of the possible limits of technical enhancement, and to the question of identifying criteria for drawing boundary lines.

2.2 Occasions of choice and need for orientation

Influencing the faculties of the "healthy" human body in the form of an improvement can be shown to be the *logically consistent continuation of* scientific and technical progress (Grunwald 2006a). Fully in the tradition of technical progress, which at all times has transformed conditions and eventualities which, until then, had been held to be given, as immutable fate, into influenceable, manipulatable, and formable conditions and circumstances, the human body and its psyche are increasingly being drawn into the dimension of the Designable. With this development, a further increase of contingency in the *conditio humana* takes place: an increase of what is determinable and a reduction of that which, out of tradition or due to nature, had to be accepted without question. This increase in contingency is, on the one hand, emancipatory, liberation from constraints, as the European Enlightenment has emphatically demanded it. On the other hand, it questions traditional certitudes. With regard to human enhancement, new choices will possibly exist, about which "society" not only *may*, but *has to* form an opinion. To this end, society, in the modified *conditio humana* with further increased contingency, needs further elaborated methods of dealing with this contingency constructively.

A somewhat closer look on approaches to human enhancement shall make this general statement more specific. Up to now the physic capabilities of healthy humans have to be taken as given, as a heritage of the evolution of life. The sensoric capabilities of the eye or the ear, for example, cannot be extended (except by technical means outside of the human body like microscopes). It would be an act of emancipation from Nature to be able to influence these capabilities intentionally by technical means. New occasions of choice would appear: in which directions would an enhancement be sensible, which additional functions of the human body should be realised etc. Also more individuality could be the result if decisions on specific enhancements could be made at the individual level. In this way, human enhancement seems to contribute to further realising grand normative ideas of the Era of Enlightenment.

However, there is also another side of the coin. Legitimate interventions into the human body and mind are at present carried out with the aims of healing or preventing disease or deficiencies. *Improving* human beings is, as yet, not a legitimate aim of medicine. Though the borderline between healing and enhancing interventions can hardly be drawn unambiguously (Habermas 2001), and though the terms "health" and "illness" are not well-clarified (Gethmann 2004), there is obviously a categorical difference between the intentional enhancement of human beings and healing disorders. Healing orients itself of necessity conceptually on a condition of health held to be ideal. This can either be explicitly defined or merely implicitly understood – in both cases, healing means closing the gap between the actual condition and the assumed ideal condition.

What is to be understood under the ideal condition of a healthy human being has certainly been defined culturally in different manners in the course of history. In each individual case, however, this is, at least in context, pragmatically obvious enough. The ophthalmologist who subjects his/her patient to an eye-test has a conception of what the human eye should be able to do. He/she will propose technical measures (e. g., a pair of glasses) only for deviations from this conception, and only from a certain degree of deviation on. The purpose of such measures is restoring the normal state, which may more or less well succeed. Traditional medical practice is probably unimaginable without the manner of thinking that a normal or ideal state serves in the background as a normative criterion for defining deviation. Medical treatment doesn't extend beyond this normal or ideal state. Just this – for medical practice, essential – way of thinking would probably become meaningless in some future in case of realisations of technical improvement capabilities of human beings.

This diagnosis poses the question, how far humans *may, should, want* to go in the (re-)construction of the human body with the aim of improving it (Habermas 2001; Siep 2005). And precisely at this point, it turns out that increasing humankind's occasions of choice and its emancipation from the given-ness of its biological and intellectual constitution also bring about uncertainties, a loss of securities which have been unquestioned up to now, and the need for new orientation to answering the above-mentioned general questions, as well as other, more specific questions, for example concerning neuro-implants.

It is a characteristic trait of modern societies that they draw the orientation needed for opinion formation and decision-making increasingly from debates about future developments, and less and less from existing traditions and values (Beck 1992, Luhmann 1989). Modern secular and scienticized society generally orients itself, instead of on the past, more on wishes and hopes, but also on fears with regard to the future. The notion of a "risk society" (Beck 1992) and the global movement towards Sustainable Development (Grunwald/Kopfmüller 2006) are examples of this approach. Ethical reflection, therefore, has to be related with communication about those future prospects. The necessity of providing orientation in questions such as human enhancement leads to the methodical challenge of applying the "moral point of view" on non-existing but projected ideas with their own uncertainties and ambiguities. This situation gives rise to analyse the role of communication about future occasions of choice assumed to be brought up by scientific and technological advance in some more detail (Sec. 3) before addressing the role of ethics more specifically (Sec. 4).

3. Characteristics of future prospects concerning the need for orientation

In the last years a considerable increase of communication about technically-induced "new futures" could be observed, especially in the fields of nanotechnology and the converging technologies (Nordmann 2005, Selin 2006). This increase of visionary communication can be interpreted as indication of new occasions as well as attempt for regaining orientation (Grunwald 2006a). Because consequently – if my diagnosis applies to the current situation – ethical reflection will or shall be more closely related with future prospects like visions, scenarios, or roadmaps, it seems to be appropriate to spend some effort to investigate the role of visionary communication in the field of human enhancement by converging technologies in order to arrive at a better understanding of the problems and challenges involved. At a rather general level, I will first consider the functions of communications of the future against the background of increasing contingency by scientific advance (3.1) and then concentrate more specifically on the radical nature of the respective orientation problem due to fundamental ambivalences of future visions (3.2).

3.1 Functions of communication of the future

Futuristic and far-sighted communication can be interpreted to serve certain functions in the context of increasing contingency (following Grunwald 2006a):

(1) *Catalyst Function:* First of all, communication of the future (like expectations concerning human enhancement) is in itself a *catalyst* and a *pacemaker* for increasing contingency. Previously unquestioned certitudes (for example, the abilities or capabilities of a healthy human eye and its limits) are already dissipated by the fact that future technical possibilities for improvement are discussed throughout society. Independent of the question, whether and when these possibilities could be realized possible alternatives and, with them, the options come into view through the visionary communication on the future *itself*. Traditional certitudes are eliminated, and new occasions of choice (together with need for orientation) are created without their technical preconditions already having been established.

(2) *Indicator Function*: The augmentation of communication of the future with visions such as human enhancement points out the current erosion of traditional certitudes. In such communication, the disintegration of these certitudes and the appearance of new questions, as, for instance, of the naturalness or designability of the human body and mind, show themselves clearly. Communication of the future is an *indicator* of increasing contingency, and could, therefore, be investigated empirically in order to get some more insights into the spreading of ideas included over society and into the respective changes of attitudes of people.

(3) *Orientational Function*: Communication on the future can be seen, however, always also as an *attempt to regain orientation* facing new occasions of choice and the corresponding uncertainty. If it would succeed, by means of a societal agreement on future scenarios planned, desirable, or those to be prevented, to bring about orientation in decisions on the agenda, then the situation of increased contingency would be mastered constructively. This, however, is a normative expectation concerning the role of communications of the future (Luhmann 1989) which will succeed, as a rule, seldom without problems (see 3.2).

In the medium of communication of the future *loss* of existing orientation as well as attempts of a *renewal* of orientation take place simultaneously, using the same means of language. Obviously, the three functions mentioned above are different due to their pragmatic status. The catalyst and the indicator functions are – in principle – empirically observable: by means of social sciences the impacts and consequences of communications of the future could be investigated empirically. There should be some observable evidence of these functions. The orientational function, however, is a normative expectation derived from considerations provided by the theory of modern societies (Beck 1992, Luhmann 1989). Whether it really would be possible to regain orientation by debates on possible future scenarios seems to be not self-evident because the plurality of modern societies in normative respect directly will affect the judgment of future developments and prevent easy consensus. The societal conflicts with which we are familiar with will also enter the field of future considerations and assessments. Attempts at bringing about orientation through communication of the future frequently cause new orientation problems instead of giving solutions. This observation will be the point of departure for further reflection. The most severe situation in this respect is, concerning the human enhancement issue, the extreme discrepancy between fears of catastrophes and anticipations of salvation (3.2).

3.2 Between expectations of salvation and fear of catastrophes

The idea of "human enhancement" by converging technologies has been propagated as expectation of salvation and anticipation of paradise: “Rapid advances in convergent technologies have the potential to enhance both human performance and the nation’s productivity. Examples of payoff will include improving work efficiency and learning, enhancing individual sensory and cognitive capacities, revolutionary changes in healthcare, improving both, individual and group efficiency, highly effective communication techniques including brain to brain interaction, perfecting human-machine interfaces including neuromorphic engineering for industrial and per-

sonal use, enhancing human capabilities for defence purposes, reaching sustainable development using NBIC tools, and ameliorating the physical and cognitive decline that is common to the aging mind" (Roco/Bainbridge 2002, p. 1). In part, these expectations extend far beyond the anticipated solution of humanity's problems and merge into transhumanistic lines of thought, in which mankind is supposed to improve itself into a technical civilization (cf. Coenen 2006).

These expectations, which stand in Drexler's (1986) technology-optimistic tradition, contrast radically with fears expressed in the technology-sceptical tradition of Joy's (2000) line of argumentation. The uncertainty of knowledge about converging technologies and possibly catastrophic effects related to them have been taken by Dupuy/Grinbaum (2004) and Dupuy (2005) as an occasion for judging even the precautionary principle as insufficient for handling these far-reaching future questions. Instead, Dupuy's view of society's future with converging technologies based on nanotechnologies leaves open solely the *existential renunciation* of nanotechnology as the only chance of preventing the ultimate catastrophe. Just that is the purpose of his argumentation:

- nobody can know anything about the future of nanotechnologies – except that it's the utter catastrophe (his argument uses the self-organisation characteristics included in many prospects of nanobiotechnology and the "running-out-of-control" fear similar to Joy 2000);
- if everyone can be convinced that nanotechnology will lead unambiguously into *the* catastrophe, there could be a general renunciation of nanotechnology, so that finally,
- the catastrophe could still be avoided.

This argumentation is paradoxical: if everyone would follow the assertion that nanotechnology is simply "the catastrophe", and then would "renounce nanotechnology", then the catastrophe wouldn't happen, even if it is at present claimed to be certain that the catastrophe will happen. To put it concisely: the catastrophe won't happen because everybody's convinced that it's certain that it will happen. The assumption of the inevitability of the catastrophe, therefore, serves to motivate a "renunciation". Dupuy's concern is exactly this "renunciation". He goes beyond even Hans Jonas' "Heuristics of Fear" (1984), inasmuch as he formulates a "duty to expect the catastrophe" in order to prevent the catastrophe. Future prospects on converging technology, therefore, show the maximally imaginable disorientation: they oscillate between expectations of paradise and of catastrophe.

There is an additional element of disorientation: the promoters of human enhancement also warn against catastrophes, but in the opposite sense: "If we fail to chart the direction of change boldly, we may become the victims of unpredictable catastrophe" (Roco/Bainbridge 2002, p. 3). Rhetorically, this line of argumentation – the threat of drastic punishment in the case of a refusal to accept certain advice – recalls some prophecies included in the Old Testament. If, however, the ultimate catastrophe is cited in both directions as a threat, this leads to an arbitrariness of the conclusions.

There is a systematic reason behind this arbitrariness which is related to the issue of uncertainty. Far-ranging, highly positive expectations frequently can easily be changed into dark, dystopian scenarios: "Tremendous transformative potential comes with tremendous anxieties" (Nordmann 2004, p. 4). The most recent example of this reversal of positive expectations into sinister fears is provided "Bill-Joy-Debate" on nanotechnology. Since the now-famous contribution "Why the Future Doesn't Need Us" (Joy 2000), self-reproducing nanorobots are no longer simply a vision which is supposed to contribute to the solution of humanity's gravest problems (Drexler 1986), but are communicated in public partially as a nightmare. This reversal with respect to highly speculative developments then gave the occasion for a specific risk debate on nanotechnology and converging technologies (Schmid et al. 2006, chap. 5.4).

On the basis of this short description the following can be learned for the purpose of this contribution: first of all, the loss of orientation concerning converging technologies for improving human performance seems to be maximal – everything seems to be possible between paradise and catastrophe. Secondly, when the debate runs into this sort of aporia, which can only be interpreted as arbitrariness, then visionary communication of the future would seem to worsen the lack of orientation instead of enabling society to gain new orientation.

Out of this ambivalent situation with regard to far-sighted visions of the future – the more radical the innovation, the greater its potential for catastrophes –, and due to the fact that, because of their speculative character, there are hardly any arguments for deciding "rationally" for one or the other variant, a serious problem arises here for the "orientational function" of communication of the future. The purpose of providing orientation and contingency reduction by means of communication of the future just doesn't succeed in this manner. On the contrary: if it turns out that a negative utopia stands against a positive one, even just the opposite can be the case, and the uncertainty and confusion could even be increased. But if, on the one hand, realization of the orientational function of communication of the future is indispensable for preventing blockades of societal action, fundamentalism, or destructive ideological trench warfare, and on the other hand, this orientational function as described doesn't become effective by itself, then we have to ask for supporting activities or new perspectives in order to remedy the situation. In the following chapter, the role of ethics in this field will be considered.

4. Ethical inquiry and far-sighted visions: methodical challenges

In order to make constructive use of the orientational potential which should, according to normative arguments (see above), be provided by communication on the future, new instruments for the rational pervasion of such projections into the future are needed. Otherwise, as has been seen in the previous chapter, disorientation would be the consequence. There are several resulting methodical challenges:

(1) *Make future prospects as rational as possible*: in order to distinguish between mere and arbitrary assumptions, potential developments with some probability (even if this probability could not be given quantitatively), scenarios as possible futures resulting from a foresight process, and developments which could be expected to come into reality for good reasons it is necessary to establish an "epistemology of future knowledge" (Pereira et al. 2006). Such an epistemology would uncover and analyse the premises and presuppositions of the various types of inputs which constitute the resulting statement about future developments in order to allow for criticism of those inputs with respect to their validity as well as with respect to their composition. In this way, more transparency could be brought into the debates around such future prospects vacillating between paradise and catastrophe (see above)

(2) *Separate between epistemic and ethical aspects:* in futuristic visions as in the case of human enhancement, there are normative elements (like the desire to overcome illness and death) and epistemic elements (like assumptions about what scientific knowledge will be available within a certain time frame) are intermixed. Because both types of assumptions require different kinds of reasoning some effort should be made in order to separate them analytically as far as possible.

(3) *Relate ethical analysis with the future prospects and uncertainties:* following the first two mentioned steps there would be a necessity to integrate the results from the different perspectives and analyses in order to allow for a reflected ethical assessment of the visions which have been the subject of inquiry. This step has to take into account the epistemological issues, like uncertainties involved, as well as the ethical judgments.

(4) *Create interfaces with public and political communication:* The solution of challenges like making decisions about human enhancement issues goes far beyond the mandate of experts and ethicists but rather democratic procedures are needed. Ethics and epistemology should aim at contributing to public debate and at advising policymakers in order to fully exploit the chances for reflected well-informed, epistemologically reflected and ethically oriented future debates. Technology Assessment has developed a lot of conceptual and methodical tools for purposes like this (Decker/Ladikas 2004).

Ethical reflection in cases like human enhancement, therefore, needs cooperation with epistemology as well as with Technology Assessment. In the following chapter, some methodical proposals for dealing with the situation which has been structurally described in Sec. 3 will be proposed briefly.

5. The subject of ethical analysis: from futuristic visions to scenarios

Far-ranging visions have been put forward in the context of “converging technologies”, considering the vision of “enhancing human performance” (see sec. 2). A new paradise has been announced: “People will possess entirely new capabilities for relations with each other, with machines, and with the institutions of civilisation. … Perhaps wholly new ethical principles will govern in areas of radical technological advance, such as the routine acceptance of brain implants, political rights for robots, and the ambiguity of death in an era when people upload aspects of their personalities to the Solar System Wide Web” (Roco/Bainbridge 2002, p. 19).

It might seem that such speculations should not or could not be subject to ethical inquiry at all. Ethical analysis in this case could be regarded as not possible, not purposive, or even as waste of time facing more urgent or less speculative challenges.

In this chapter, I will argue that in spite of the "futuristic" and speculative nature of those visions (see Grunwald 2004 for the notion of "futuristic visions"; and Grunwald 2006b for first steps toward an epistemological analysis of future knowledge) an early ethical dealing with visions of the type of "human enhancement" would be an important and highly relevant task in order to allow more transparent debate, especially about science's agenda (5.1). However, there is need to make those visions more specific and to extract their epistemic and normative key assumptions and ideas. This could be done in the framework of an "ethical vision assessment" (5.2). In the last consequence, it would be necessary to transform the future prospects of those visionarists like Roco/Bainbridge (2002) into more negotiatable and communicatable, transparent scenarios of the future. This could be realised by using the toolbox of (technology) foresight (5.3).

5.1 The need for an early vision assessment

The factual importance of futuristic visions in ongoing debates – in the debate on the chances of scientific-technological advance as well as in the ongoing risk debate on nanotechnology – is the main argument for postulating an early vision assessment in order to allow for more rationality, reflexivity, and transparency in these debates (Grunwald 2004). This importance emphasises also the need for an early assessment of such visions *in ethical regard*, in order to allow for more transparent discussions about the premises involved, about the normative content (Kushf 2004) and its justification background, as well as about potentials for moral conflict.

Occupation with futuristic visions, speculations and risks is not only sensible, but necessary. While their content often is near to fictions and might be rather far away from facts it is a fact that visions can have real impact on scientific and public discussions. We have to distinguish between the degree of facticity of the *content* of the visions and the fact that they are used in real communication processes *with their own dynamics*. Even a vision without any facticity at all might cause real impact on debates, on opinion-forming, on acceptance, and even on decision-making. Futuristic visions are able to change the perception of the World and to increase the contingency of the *conditio humana* (Grunwald 2006a).

Futuristic visions, for example, can be instrumentalized to create public acceptance and political support (Paschen et al. 2004). Negative visions, however, could be used to mobilise resistance against specific technologies. The factual impact of visions on public and political debate is the strongest argument in favour of stating a need for vision assessment, including ethically relevant aspects. Futuristic visions are of high relevance for technology assessment, ethical discussion and risk communication because (Grunwald 2004):

- they have great impact on the way in which the political and the public debates on future technologies are currently conducted, and they will probably also have a great impact on the results of those debates – and they will, therefore, considerably influence the pathways to the future;
- the societal and public debate about chances and risks of new technologies will be structured around those visions to a considerable extent (as is currently the case in the field of nanotechnology, cp. Schmid et al. 2006, ch. 5);

- they motivate and enable public debate because the impact of those visions on everyday life and on the future of social areas like military, work or health care is obvious;
- facts and values are mixed up in futuristic visions which forms an obstacle to a transparent discussion and which needs enlightenment;
- futuristic visions might be easily instrumentalised in public debate for propagating interest-biased views;
- they provide some insights into the ways scientists and engineers are thinking about their products, developments, and perspectives,
- especially, they have a high influence on the scientific agenda (Nordmann 2004) which, as a consequence, partly determines which knowledge will be available and applicable in some time.

Therefore, new methodical approaches are needed to analyse and assess such futuristic visions, especially, their reliability, their degree of reality and expectability, their normative aspects and their impact on public and political debate (Grunwald 2004, Schmid et al. 2006). Some experiences from the field of Technology Assessment (Grunwald 2002) can be used. On the one side, the Leitbild Assessment (Dierkes et al. 1992) already shed some light on the use of visions in technology development. However, these "guiding visions" (Grin/Grunwald 2000) are connected with technology development at the workbench more closely and did not reach the scope of visions like "human enhancement". Therefore, a "vision assessment" (5.2) has to provide some new capabilities. On the other side, the field of Technology Foresight has been developing out of Technology Assessment in the last years. Dealing with far-ranged future prospects has been practised there. Accordingly, I will briefly outline a proposal for applying foresight methodology to visions like "human enhancement" (5.3).

5.2 Vision Assessment with respect to ethical issues

Vision assessment can be analytically divided in several steps which are not sharply separated and not linearly ordered but which serve different sub-objectives and involve different methods (cp. Grin et al. 2000; Grunwald 2004). These steps are vision *analysis* which itself separates into a *substantial* part (what is the content of the respective vision?) and a pragmatic part (in which way is it used in concrete communication?), the vision *evaluation* (in which way could the content of the vision be evaluated and judged?) and the vision *management* (in which way should the persons and groups affected deal with the visions?). In the following paragraphs, the general approach to vision assessment as a new proposed element of the TA (technology assessment) toolbox is chosen (Grunwald 2004). Vision assessment with regard to ethical questions will follow this general scheme but will focus on specific steps.

(1) With respect to analysis *(Vision Analysis)*, it would be a question of disclosing the *cognitive and normative* contents of the visions and of judging epistemologically the extent of their reality and practicability, self-evidently on the basis of current knowledge. Then, an important aspect, the prerequisites for the visions' realizability and the time-spans involved, would have to be investigated. In both analytical steps, observing the language used on the one hand and the question of the antecedents of the predictive statements play a special role: " … the nanoethics researcher must be attentive to the twists and turns of language which can be symptoms bringing light to the most hidden layers of the scientific or technological imagination" (Dupuy 2005). Further, the visions' *normative* contents have to be reconstructed analytically: the visions of a future society, or of the development of human beings, as well as possible diagnoses of current problems, to the solution of which the visionary innovations are supposed to contribute. For a "rational" discussion, the transparent disclosure of the stocks of knowledge, uncertainties and values involved is necessary, above all, with regard to the relationship of fact to fiction (Schmidt 2003). The contribution of such reflective analyses could consist in this respect in the "clarification" of the pertinent communication: the partners in communication should know explicitly what they are talking about as a prerequisite for more rational communication. It is a matter of society's "self-enlightenment" and of supporting the appropriate learning processes.

(2) Vision Assessment would, further, include evaluative elements *(Vision Evaluation)*. These are questions of how the cognitive aspects are to be categorized, how they can be judged according to the degree of realization or realizability, according to plausibility and evidence, and which status the normative aspects have, e. g., relative to established systems of values, or to ethical standards. The purpose is the transparent disclosure of the relationship between knowledge and values, between knowledge and the lack of it, and the evaluation of these relation-

ships and their implications. On the one hand, one can draw upon the established evaluation methods of technology assessment, which often include a participative component (Decker/Ladikas 2004; Grunwald 2002). On the other, in the field of human enhancement there are some far-reaching questions in normative respect which stand to discussion and which require ethical and philosophical reflection (cf., for instance, Habermas 2001 for the pertinent analyses and judgements of the debates on the future of nature and of mankind).

(3) Finally, it is a matter of deciding and acting (*Vision Management)*. The question is how the public, the media, politics, and science can be advised with regard to a "rational" use of visions. First, the question of alternatives, either already existing or to be developed, to the visions already in circulation, stands here in the centre of interest, in accordance with the basic position of technology assessment, of always thinking in terms of alternatives and options. In this manner, visions based on technology can be compared with one another or with non-technological visions. Finally, it is a question of strengthening reflectiveness. Communication on the cognitive and normative backgrounds of visions is also part of "responsible" communication making use of visions, in order to make a transparent discussion possible.

In particular, it would be the assignment of Vision Assessment in ethical regard to confront the various and, in part, completely divergent normative aspects of the visions of the future directly with one another (cf. Chap. 3.2). This can, on the one hand, be done by ethical analysis and desk research; on the other, however, the representatives of the various positions should discuss their differing judgments in workshops directly with and against one another, in order to lay open their respective premises and assumptions.

5.3 Ethical reflection and foresight processes

According to the above-mentioned ideas and challenges ethical reflection of far-ranging future visions should be combined with research and procedures of making the various future prospects more transparent. A close relation between an epistemology of future knowledge (Pereira 2006) and ethical deliberation emerges. This situation motivates to have a brief look into the field of "technology foresight" which has been developed in the last ten years, especially at the European level. It seems to be possible to benefit from experiences which have been made there in dealing with different kinds of future knowledge and assessments concerning the agenda-setting processes. In particular, it adds to the previously mentioned dimensions of epistemology and ethics possibilities for public debate and involving other actors than researchers and philosophers.

Foresight is the process to look systematically into the longer-term future of science, technology, the economy and society with the aim of identifying the areas of strategic research (agenda-setting) and the emerging generic technologies likely to yield the greatest economic and social benefits at low risks. As the term implies, these approaches involve thinking about emerging opportunities and challenges, trends and breaks from trends, future risks and ways of dealing with them, etc. Foresight involves bringing together key actors of change and sources of knowledge, in order to develop *strategic visions* and to establish networks of knowledgeable actors who can respond better to policy challenges in awareness of each others' knowledge resources, values, interests and strategic orientations. The contexts in which foresight can be employed are equally wide-ranging: much work to date has focused on national competitiveness and especially the prioritisation and development of strategic goals for areas of research in science and technology. Foresight involves five essential elements (FOREN 2001):

- structured *anticipation* and *projections* of long-term social, economic and technological developments and needs
- *interactive* and *participative methods* of exploratory debate, analysis, assessment and study, involving a wide variety of stakeholders
- forging new social *networks*
- elaboration of a guiding *strategic vision*, to which there can be a shared sense of commitment among the actors involved
- explicit recognition and explication of the implications of that vision for *present day decisions and actions*

Foresight thus occupies the space in which planning, futures studies, technology assessment, strategic deliberation, and policy development overlap. It is not a matter of academic or consultancy-based forecasts of the future (though it has to take these into account as necessary knowledge grounds).

As can easily be seen there are some similarities to the situation described above: far-ranging visions and expectations, uncertainty of knowledge, diverse positions of different actors, and the aim at influencing agenda-setting. Obviously, there are also differences: usually, in foresight processes ethical reflection is not part of the game while regional cooperation, creating of new networks, mobilisation, and contributing to economic welfare by exploiting chances of new technologies and of regional resources are major issues. The reason for bringing the more philosophical issue of assessing and reflecting future visions with respect to epistemological and ethical questions concerning human enhancement together with established foresight methodologies lies in the common challenge of being confronted with the necessity to deal "rationally" with highly uncertain future knowledge and the inseparably interweaved normative elements of expectations, desires, and fears often involved. Giving advice to the scientific agenda, for example via contributing to the processes of defining issues and priorities of the public funding of science and technology, following an open and democratic debate, is, therefore, difficult to achieve.

In various foresight exercises it has been a common experience that in order to arrive at a workable view on the future in the respective field (e.g. concerning the development of a region) depends on a clear thematic focus of the exercise (FOREN 2001). This focus allows for identifying stakeholders, people affected or concerned, policymakers etc which should be involved in the foresight process. Then there is a chance to transform rather diffuse imaginations about future developments into more concrete scenarios which then could be used to orientate action and decision-making.

Compared to this experience it seems impossible to apply a foresight exercise to such a broad and grand topic like human enhancement. In contrary, more specific subtopics should be addressed. In the field of human enhancement, respectively concerning some more specific subtopics like specific kinds of implants, it is imaginable to set up a foresight process which would

- include research and reflection parts as the vision assessment activities described above but which also would
- involve other societal groups (stakeholders, patients, policymakers etc) by means of applying foresight methodologies, and which
- take care about permanent exchange between these two layers of reflection and assessment so that the foresight process would
- provide a balanced and ethically as well as epistemologically reflected view on the respective part of the human enhancement field which then could be used as a valuable input for debates about science's agenda in this field.

The task of such a foresight exercise would consist, at first, of a "rationalisation" of diffuse future prospects in a double manner: rationalisation concerning the epistemic contents as well as concerning the normative aspects involved. Secondly, the resulting images of the future should be communicated to and debated with a broader audience in society. In this way, there could be a success in transforming the rather diffuse visionary prospects of human enhancement into more specific scenarios in specific areas of the human-machine interface. For example, the field of neuro-implants might be an suitable field of investigation by applying this methodology.

6. Conclusions: ethical inquiry and time relations

Since the very beginning of ethical reflection in science and technology there is an ongoing discussion about the adequate relation in time between the scientific-technological advance and ethics. Ethics often seems to pant helplessly behind technical progress and to fall short of the occasionally great expectations. The rapid pace of innovation in technicization has the effect that ethical deliberations often come too late: when all of the relevant decisions have already been made, when it is long since too late for planning technology. Technological and scientific progress sets facts which, normatively, can no longer be revised (Habermas 2001): „It is a famil-

iar cliché that ethics does not keep pace with technology" (Moor/Weckert 2003). This "ethics last" model means that first there have to be concrete technological developments, products and systems which then could be reflected by ethics. Ethics in this perspective, could, at best, act as a repair service for problems which are already on the table (Mittelstraß 2000).

In contrary, the "ethics first" model postulates comprehensive ethical reflection on possible impacts already *in advance* to technological developments. Ethics actually can provide orientation in the early phases of innovation, e. g., because future projections and visions emerging on the ground of scientific and technical advance may be subject to ethical inquiry (as is the case in human enhancement, cp. Habermas 2001, Siep 2005). Because there are early ideas available about the scientific and technical knowledge and capabilities as well as about their societal impacts – risks as well as chances – long before market entry, it is possible to reflect and discuss their normative implications. Obviously, ethical reflection in this model has to deal with the situation that the knowledge about technology and its consequences is uncertain and preliminary.

This doesn't necessarily mean that ethical deliberations have to be made for absolutely every scientific or technical idea. The problems of a timely occupation with new technologies appear most vividly in the diverse questions raised by the visions of salvation and horror as regards nanotechnology and human enhancement. What sense is there in concerning oneself hypothetically with the ethical aspects of an extreme lengthening of the human life-span, or with self-replicating nanorobots (Moor/Weckert 2003)? Most scientists are of the opinion that these are speculations which stem much rather from the realm of science fiction than from problem analysis which is to be taken seriously: „If discussions about the ethics and dangers of nanotechnology become fixated on a worry that exists only on science fiction, we have a serious problem" (Ball 2003). We shouldn't forget that ethical reflection binds resources, and there should therefore be a certain evidence for the realizability of these visions, if resources are to be invested in them which could then be lacking elsewhere.

Therefore, methods of assessing visions of human enhancement are required which allow for an epistemological investigation of the visions under consideration. In this respect, ethical analysis needs its own "vision assessment" (see above), and has to be related with foresight exercises. If orientation shall be achieved by applying ethical reflection to future prospects then the visionary nature of the future prospects has to made more specific and transparent in its premises, presuppositions, expectations, fears and desires. There is a lot of conceptual and methodical work concerning ethical futures analysis and technology assessment in front of us.

If at first only rather abstract considerations on lines of technological development in the field of human enhancement are possible, valuable advice for the further path of development can nonetheless already be given. Further, ethical judgement makes orientation for shaping the *process* of scientific advance and technological development possible (for example, with regard to questions of equity, or with respect to ethical issues of neuro-implants). In the course of the continuing concretization of the possibilities for application of converging technologies (for example implants or substitutes of different organs), it is then possible, continuously to concretize the – at first abstract – estimations and orientations on the basis of newly acquired knowledge, and finally, to carry out an ethically reflected technology assessment.

Due to nanotechnology's and the converging technologies' early stage of development we have here a rare case of an advantageous opportunity: there is the chance and also the time for concomitant reflection, as well as the opportunity to integrate the results of reflection into scientific agenda and technology design, and thereby to contribute to the further development of science and technology (Moor and Weckert 2003). In view of the visionary nature of the prospects for a technical enhancement of human beings, and of long and longer spans of time within which the realization of certain milestones can be expected, there is, in all probability, enough time to analyze the questions posed. In general, it applies in this case that this reflective discussion should take place already in the early phases of development, because then the greatest possibilities for influencing the process of scientific development are given. The chances are good that, in the case of human enhancement, ethical reflection and the societal discussion don't come too late, but can accompany scientific-technical progress critically and can, in particular, help influencing science's agenda by ethically reflected advice.

References

Ball P (2003) Nanoethics and the purpose of new technologies. Lecture at the Royal Society for Arts, London, March 2003, http://www.whitebottom.com/philipball/docs/Nanoethics.doc

Beck, U. (1992): Risk Society, Towards a New Modernity. London: Sage Publications [originally: Beck, U. (1986): Risikogesellschaft. Frankfurt: Suhrkamp

Coenen, C. (2006): Der posthumanistische Technikfuturismus in den Debatten über Nanotechnologie und Converging Technologies. In: A. Nordmann, J. Schummer, A. Schwarz (Hg.): Nanotechnologien im Kontext. Akademische Verlagsgesellschaft, S. 195-222

Decker, M.; Ladikas, M. (2004, Hg.): Bridges between Science, Society and Policy. Technology Assessment – Methods and Impacts. Berlin: Springer

Dierkes, M., Hoffmann, U., Marz, L. (1992): Leitbild und Technik. Zur Entstehung und Steuerung technischer Innovationen. Berlin. Campus Verlag, Frankfurt/New York

Drexler, K.E. (1986): Engines of Creation – The Coming Era of Nanotechnology. Oxford: University Press

Dupuy, J.-P. (2005): The philosophical foundations of Nanoethics. Arguments for a Method. Lecture at the Nanoethics Conference, University of South Carolina, March 2-5, 2005

Dupuy, J.-P.; Grinbaum, A. (2004): Living with Uncertainty: Toward the ongoing Normative Assessment of Nanotechnology. Techné 8, S. 4-25

Fleischer T (2002) Technikfolgenabschätzungen zur Nanotechnologie - Inhaltliche und konzeptionelle Überlegungen. Technikfolgenabschätzung – Theorie und Praxis 11:111-122

FOREN (2001): A practical guide to Regional Foresight (http://foren.jrc.es)

Fukuyama F (2002) Our Posthuman Future: Consequences of the Biotechnology Revolution. Farrar, Strauss, and Giraux.

Gethmann, C.F. (2004): Zur Amphibolie des Krankheitsbegriffs. In: A. Gethmann-Siefert/K. Gahl (Hg.): Wissen und Verantwortung. Bd. 2: Studien zur medizinischen Ethik, Freiburg: Alber.

Grin, J., Grunwald, A. (2000, eds.): Vision Assessment: Shaping Technology in 21st Century Society. Heidelberg: Springer 2000, 193 S.

Grunwald, A. (2002): Technikfolgenabschätzung – eine Einführung. Berlin: Edition Sigma

Grunwald, A. (2004): Vision Assessment as a new element of the Technology Futures Analysis Toolbox. In: Proceedings of the EU-US Scientific Seminar: New Technology Foresight, Forecasting & Assessment Methods, Seville, May 13-14 2004'; http://www.jrc.es/projects/fta/index.htm [2.6.2005]

Grunwald, A. (2006a): Converging Technologies: visions, increased contingencies of the conditio humana, and search for orientation. Futures (forthcoming)

Grunwald, A. (2006b): Nanotechnologie als Chiffre der Zukunft. In: A. Nordmann, J. Schummer, A. Schwarz (Hg.): Nanotechnologien im Kontext. Akademische Verlagsgesellschaft, S. 49-80

Grunwald, A., Kopfmüller, J. (2006): Nachhaltigkeit. Frankfurt/New York, Campus

Habermas, J. (2001): Die Zukunft der menschlichen Natur. Frankfurt: Suhrkamp

Höffe, O. (1993): Moral als Preis der Moderne. Frankfurt: Suhrkamp

Jonas, H. (1984): The Imperative of Responsibility. Original: Das Prinzip Verantwortung. Frankfurt: Suhrkamp 1979

Joy, B. (2000): Why the Future Does not Need Us. Wired Magazine, April 2000, p. 238 - 263

Khushf G (2004a) The Ethics of Nanotechnology – Visions and Values for a New Generation of Science and Engineering. National Academy of Engineering: Emerging Technologies and Ethical Issues in Engineering. Washington, pp 29-55

Luhmann, N. (1989): Paradigm lost. Frankfurt: Suhrkamp

Moor, J., Weckert, J. (2003): Nanoethics: Assessing the Nanoscale from an ethical point of view. Lecture at TU Darmstadt, October 10, 2003

Nordmann, A. (2004): Converging Technologies – Shaping the Future of European Societies. Brüssel: European Commission

Nordmann, A. (2005): Wohin die Reise geht – Zeit und Raum der Nanotechnologie. In: G. Gamm, A. Hetzel (Hg.): Unbestimmtheitssignaturen der Technik: Eine neue Deutung der technisierten Welt. Bielefeld: transcript, S. 103-123.

Paschen, H., Coenen, C., Fleischer, T., Grünwald, R., Oertel, D. und Revermann, C. (2004): Nanotechnologie. Forschung und Anwendungen. Berlin et al.: Springer

Pereira, A.G., von Schomberg, R., Funtowicz, S. (2006): Foresight Knowledge Assessment. International Journal of Foresight and Innovation Policy (in press)

Roco, M.C. und Bainbridge, W.S. (Hg.) (2002): Converging Technologies for Improving Human Performance. Arlington, Virginia: National Science Foundation

Schmid, G., Brune, H., H. Ernst, W. Grünwald, A. Grunwald, H. Hofmann, H. Krug, P. Janich, M. Mayor, W. Rathgeber, U. Simon, V. Vogel, D. Wyrwa (Hg.) (2006): Nanotechnology. Assessment and Perspectives. Berlin, Heidelberg: Springer 2006

Schmidt, J. (2003): Zwischen Fakten und Fiktionen: NanoTechnoScience als Anfrage an prospektive Wissenschaftsbewertung und Technikfolgenabschätzung. In: Bender, W.; Schmidt., J. (Hg.): Zukunftsorientierte Wissenschaft. Münster: agenda-Verlag, S. 207-220

Selin, C. (2006): Expectations and the Emergence of Nanotechnology. Science, Technology and Human Values, forthcoming.

Siep, L. (2005): Die biotechnische Neuerfindung des Menschen. Vortrag auf dem XX. Deutschen Kongress für Philosophie am 28.9.2005 in Berlin