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S T O A

A European approach to Human Enhancement

Background document for the STOA Workshop
"A European approach to Human Enhancement"
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12:45 - 14:15: working lunch (room ASP 5G1)
14:45 - 16:30: debate (room ASP 5G2)

The workshop is a part of the project
"Human Enhancement" commissioned by STOA and
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Background paper for a workshop in the European Parliament

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Human enhancement, the use of technology to improve bodily functions, is a rising trend. New human enhancement technologies offer opportunities for individuals and for society. They also pose new risks, however, and could put social solidarity and healthcare systems under pressure. Human enhancement issues are not just academic: the technologies involved can have both beneficial and adverse effects in all kinds of political domains, such as healthcare and the economy. Apart from interventions by nation states, EU policies will also have to address these issues.

In this paper, we present the reasons why the EU should address human enhancement and discuss the form EU involvement could take. The policy options presented in this paper will be discussed in detail in a workshop held in the European Parliament in Brussels on 24 February 2009.

This paper forms part of a STOA project on the influence of human enhancement on the European Union and policy options that the EU could take towards human enhancement. The project started in February 2008 with an inventory of existing human enhancement technologies, those under development and those that have been envisioned, together with an assessment of the human enhancement debate. Two expert meetings were then held, one in September and one in October 2008. The first focused on the way concepts (such as “treatment”) and boundaries (that between “enhancement” and “treatment”, for example) would change as a result of human enhancement. The second dealt with the regulation of human enhancement. The outcome of all these activities formed the basis for the present background paper, which will be discussed in the upcoming workshop.

The final report of this project, planned for completion by the end of March 2009, will include the results of the workshop to be held on 24 February.

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Introduction

Three seemingly unrelated news topics have received intensive media coverage during the past few years. The first concerned the illicit use of Ritalin by students and scientists wishing to improve their concentration. Ritalin, a drug prescribed to treat attention-deficit hyperactivity disorder (ADHD), has been found to be able to promote concentration in both ADHD patients and in others. It has been labelled a “universal performance enhancer”, because enhanced concentration is known to benefit any cognitive task.

Secondly, the issue of “designer babies” and other interventions in human genetic make-up is often aired in the mass media. More and more couples, for example, are using pre-implantation genetic diagnosis (PGD) to prevent their child from inheriting a gene that might give rise to a fatal disease in 30, 40, or 50 years’ time. PGD can be used in combination with in vitro fertilisation (IVF) in a procedure which is permitted in some EU member states and not in others. After the egg has been fertilised and the embryo is a couple of days old, one or two of its cells are tested for a certain genetic marker (in general, one associated with a deleterious effect). Only embryos that pass this test (and do not thus have the harmful genes in question) are subsequently used in the IVF procedure.

Finally, it is widely known that many people are using various anti-depressants to improve their mood. Around 3-5% of males and 8-10% of females are diagnosed with depression every year in North America, and one in eight adult Americans takes mood-brightening agents, even when not suffering from severe long-term depression. It is not clear how much of this trend is due to a rise in the incidence of depression and how much to increased readiness to use medication.

These three themes all have one thing in common: the use of existing *human enhancement technologies* (HET). Other examples are cosmetic plastic surgery, treatments claimed to be "anti-aging" and the illicit use of performance-enhancing drugs in sports (colloquially known as “doping”). Taken together, these technologies are referred to as *human enhancement* (HE).

Several social and economic drivers lie behind these trends, such as the growing commercialisation of medicine, the medicalisation of more and more aspects of life and the high degree of competiveness at work and in private life. All these examples lead to the development of what may be called a performance-enhancing society.

As with any social trend, it evokes a variety of different reactions. Of recent years, a small group of important players in science and technology such as the U.S. National Science Foundation, the journal *Nature* and big corporations in the IT and biotech industries have embraced more or less radical visions of human enhancement or even *transhumanism*. Transhumanism is the idea that humankind can (and should) be perfected beyond its present limits by the use of appropriate technologies. These views are countered by a small but vocal group of conservatively minded opponents of human enhancement. In between these two extreme positions, a wide range of more nuanced views are expressed.

The advocates of these different points of view have engaged in an energetic debate on the pros and cons of human enhancement. The time when the EU will have to take a stance on this issue would seem to be fast approaching. So far, EU involvement has been largely restricted to the commissioning of experts in (medical) ethics and the funding of pertinent ethical research (including some initiatives for the stimulation of public dialogue on this question)[1].

Against this background, we will explain in the present paper what *human enhancement* is, give some examples of current and expected human enhancement technologies, argue why the EU should address this topic, and present some possible ways in which it could intervene in this field. This paper is a result of an ongoing research project on human enhancement. The main policy options involved will be discussed in greater depth at an expert meeting to be held in Brussels on Tuesday 24 February 2009.

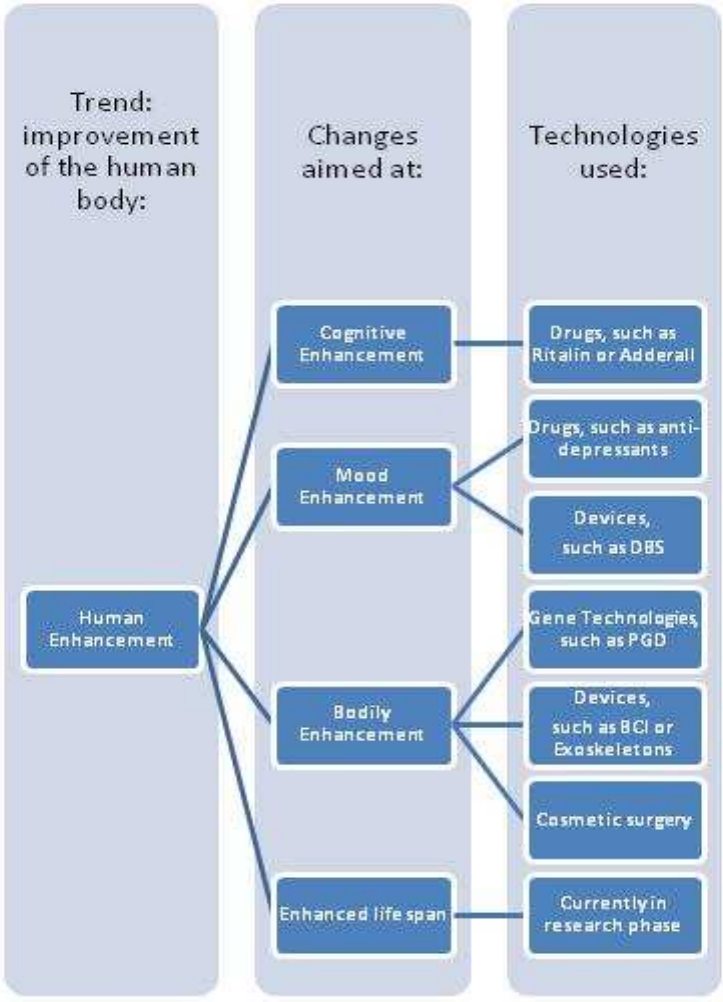
What is human enhancement?

Human enhancement is a phenomenon linking a range of at first sight very different technologies. We define it as any "modification aimed at improvement of individual human performance and brought about by science-based or technology-based interventions in the human body". The effects of human enhancement technologies can be either long-term or even permanent (as in the case of genetic enhancements), or temporary (such as the improved concentration brought about by use of Ritalin). The aim may be to improve our natural abilities (for example by making us stronger or happier) or to give us characteristics or abilities that no human being has ever had before, such as night vision.

The term "human enhancement" can refer both to any *individual technology* aimed at improving human mood or performance and to the *phenomenon* encompassing all the different technologies and practices in this field (see Figure 1). As a result, both the opportunities offered by human enhancement technologies and the concerns felt about the possible consequences of its use are manifested both at the level of the individual practice and at the aggregate level. In the next section, we will present some individual human enhancement technologies and explain the benefits they offer. This will be followed by a discussion of the various concerns expressed about the individual technologies and the phenomenon of human enhancement as a whole.

[1] There is one exeption to this; the *Commission Recommendation of 07/02/2008 on a code of conduct for responsible nanosciences and nanotechnologies research* (Brussels, 07/02/2008, C(2008) 424 final) exacts, under the heading "Prohibition, restrictions or limitations" (p. 9), that nanoscience and nanotechnology "research organisations should not undertake research aiming for non-therapeutic enhancement of human beings leading to addiction or solely for the illicit enhancement of the performance of the human body."

Figure 1



Some examples of human enhancement technologies

The field of human enhancement is appreciably wider than that sketched in the Introduction. There are already a number of drugs apart from the above-mentioned Ritalin that appear to have the potential to promote wakefulness (e.g. Modafinil, developed to treat narcolepsy) or concentration (such as Adderall, another anti-ADHD medicine). They offer us the promise of allowing us to study, work and "party" much longer than usual, and possibly even be more productive. Then there is the wide field

of doping in sports where (illicit) performance enhancement is already a widespread practice.

So-called “mood enhancement” can in the future perhaps be pursued not only by pills but also with the aid of devices. A brain implant technique called deep brain stimulation is already used to treat the symptoms of Parkinson’s disease and has been used experimentally to alleviate severe depression, but it could conceivably improve the mood of healthy people as well. It has already been presented as a spectacular case of “push-button happiness” in the mass media. Other, non-invasive devices such as transcranial magnetic stimulation that are currently being studied as treatment for depression and other psychiatric disorders might have beneficial effects on the mood of normal individuals too.

Other new technologies targeting the brain can be found in the field of brain-computer interfaces (BCIs). Some of the research into BCIs is funded by the EU. BCI devices are being tested in various applications, such as those intended to enable paraplegic patients to control computers. Other BCI technologies undergoing trials for use in computer games might lead to enhanced human abilities to interact with “virtual” surroundings of different kinds. In the USA, the developments in this field have led to far-reaching visions of pilots controlling their machines “by thought alone”. A number of different emerging brain-computer interfaces seem to offer real promise of merging “virtual worlds” and “real life” in the not too distant future.

Gene technologies can lead to genetic enhancement. Scientists have already succeeded in creating a genetically modified, super-strong mouse. Limb prostheses and exoskeletons already under development offer the potential of improving human functioning beyond the species-typical. Lifting heavy objects will become much easier if we can improve our musculature or use an exoskeleton to help us. Some prostheses already give their users a performance (e.g. in mountaineering) which is impossible with ordinary human bodies (such as extending their legs to cross wide crevasses). And one need only think of athletes with new sporting prostheses, such as Oscar Pistorius who tried to qualify for the Olympic Games of 2008 with two lower leg prostheses, to realise that, now or in the very near future, the use of prostheses will no longer be restricted to the physically disabled.

Many different aspects of the human body can be profoundly altered by new or emerging human enhancement technologies; the list given above is by no means exhaustive. While evidence that these drugs and technologies really can enhance human performance is still scarce, there are many who think that this situation will change in the near future, and some of them argue for a major change in the relevant policy fields.

Is human enhancement technology a blessing or a curse?

Human enhancement is the subject of impassioned debate. Some people claim that specific technologies will yield untold benefits, while others utter dire threats about their possible consequences; and similar discussions rage about the field of human enhancement as a whole. Some of the arguments for and against human enhancement will be presented below.

Drug use to enhance concentration could be seen as a great way to improve production, for example, but also raise questions like: Will students or intellectual workers be able to keep up with their peers if they do not use the drugs? What does ongoing research tell us about the addictive potential of these substances? And what do we really know about their possible long-term side-effects? Genetic enhancements might make people stronger or improve endurance, but will it become the new doping and embroil the sports world in a new storm of controversy? Mood enhancement might make people feel better, but is it not sometimes good to feel sad, bored, or unhappy? Some regard these emotions as a valuable and necessary part of human life. Finally, while it may be a worthwhile objective to ensure that children will not be born with genes that carry dreaded diseases, does this mean that only healthy, disability-free children are good enough? And is life not worth living if you have a relatively high risk of becoming severely ill in four or five decades?

Similar questions relating to the entire field of human enhancement can be identified. Many of these questions concern one of the driving forces of human enhancement, the tendency towards the medicalisation of life as a whole. Many enhancers are introduced as “therapies” for conditions that were not traditionally seen as illnesses. The newly developed “treatments” also put pressure on healthcare systems, for everyone who wishes to “cure” his or her condition will want to claim reimbursement of the costs of the “medication” used. The distinction between “treatment” and “enhancement” is often discussed in the human enhancement debate.

Another group of questions relates to what it means to be human and the nature of a desirable future society. What is normal, and from whose point of view? What are the consequences for disabled people? Will they be seen as inferior, or will a time come when they or their parents are blamed for burdening society with a disease or disability? And will we all be caught up in a rat race for enhancement? What would it mean if we were to live our lives in a restless search for maximum happiness, never content with our current state of mind? And if we continually seek to maximise happiness, health, physical strength, beauty and the like, are we not losing sight of some important element of human life? (Not to mention the fact that human enhancement technologies, like any other form of treatment, may lead to harmful side-effects.) Will we really still want to pursue all the great promises of individual human enhancement once we have seen the big picture?

This leads to the important issue of autonomy. Will peer or other pressures lead to a world in which everyone will have to get enhanced? Will we still have a choice as to whether we want to be enhanced, and by which means? Again, which valuable aspects of human life will be lost in such a world?

Very different stances can be taken towards human enhancement. There are conservative ethicists, scientists, and political philosophers who argue that we should refrain from changing human nature, emphasising the problems involved and perceiving human enhancement as extremely dangerous. On the other hand, some ethicists, visionary scientists and transhumanist activists welcome the ability to radically change human nature. Others emphasise that both the traditional notions of human nature and the perfectionist, technology-driven dreams of the transhumanists are misleading. As, in their view, there is no fixed human nature at all, they argue that

the interrelations between technology and human agency need to be understood in a much more nuanced way.

One of the ethical and political objections to human enhancement is its association in the minds of some people with the eugenics debate that took place around the time of World War II. Concerns have been raised about the possible social stigmatisation of people who lack certain qualities, the arbitrary and questionable character of the criteria for the realisation of human enhancement and the limits to be placed on individual requests for improvement (especially when this leads to an extra burden on healthcare systems). The danger that growing "biologised" inequality between humans could lead to conflicts or even pave the way for a new totalitarianism has also been mentioned, while some scientists and engineers (among others) have pointed out the risk that a focus on the often highly speculative visions of human enhancement might distract from real innovations and other more important potential advances in R&D and trigger a strongly irrational societal debate about science and technology.

In any case, real trends towards an enhancement society are already discernable, and in our view these trends will increasingly impact on various policy fields. There is a need not only for regulatory discussions with regard to certain human enhancement technologies but also for increased awareness of the overarching trend towards human enhancement in general. It might be appropriate to use the notion of enhancement more often as a regulatory concept, but this would require further clarification of the concept – for example, by making a clearer distinction between therapeutic and non-therapeutic enhancement.

Why should the EU address the topic of human enhancement technologies?

Both the above-mentioned broad ethical and societal issues and the problems in specific fields of R&D (such as brain-computer interfaces or nanomedicine) require a political response and some form of political action, both at EU level and in the individual member states. Particular political challenges arise in this context, at least in the three domains discussed below.

Healthcare systems

The main political challenge at present comes from the fact that healthcare systems are still regulated by the member states, without any overall direction imposed by the EU. Given the free movement of people and the freedom to provide services across the European Internal Market and the new directive on cross-border healthcare that is in preparation, this means that national healthcare systems will be put under pressure to allow what is allowed elsewhere, as otherwise people will travel abroad to get the enhancement they cannot get at home. This will force up the overall costs of the healthcare systems. Strains will also be placed on solidarity if such enhancement is only available to the rich. It has already been recognised that the EU needs a healthcare framework that respects common values and shared principles, as reflected in the Council of Europe's request that the European Commission should ensure the development of such a framework (2006/C 146/01). We believe that special attention should be paid to the consequences of human enhancement for (cross-border) healthcare in this context.

Research and development

The issue of human enhancement is also relevant to the EU in the field of R&D and the technology market. Human enhancement technologies are already funded, developed or used in the EU, and some of them could have a profound impact on society, for better or worse. On the one hand, the economy and the citizens of the EU could benefit from human enhancement, the economy by developing and selling the individual technologies and the individuals by using them to attain a higher quality of life and/or to boost their productivity. It should not be forgotten, however, that some of these technologies could have undesired consequences including an adverse impact on social cohesion.

Research that might lead to the development of human enhancement technologies should therefore not be uncritically funded. Further discussion is needed on policy guidelines and funding criteria for human enhancement. We need to make absolutely sure that proposed research really will serve socially desirable goals.

Competitiveness of European economies

The European economies will have to become more competitive if the goal set in the Lisbon Treaty – the transformation of the EU into a single dynamic, knowledge-based economy – is to be achieved. The necessary impetus could come from traditional means of stimulating the economy, such as encouraging people to pursue further education or the funding of innovative research. However, human enhancement technologies might assist in this process in a number of different ways - in particular, through the emergence of a market for enhancement technologies and, if the promises of the transhumanists are to be believed, by the creation of a more focused, happier and/or more productive workforce. From this perspective, it may be asked whether the EU will be able to compete in future with other regions of the world that may opt to follow a more liberal approach towards the use and development of human enhancement. Such a global imbalance could have other consequences apart from harming the EU's economic competitiveness, such as a trend towards illicit use of uncontrolled, untested and possibly unsafe enhancement techniques within the EU.

It could be argued on the other hand that focusing on individual enhancement and on visions of creating "bionic" men might impede attainment of the Lisbon agenda by distracting from more relevant issues. While it is true that new and emerging technologies can help to strengthen the competitiveness of the European economies and to update our ageing knowledge societies, it is far from clear that human enhancement technologies should be the technology of choice in this respect.

Proposals for a European approach to human enhancement

In our opinion, the impact of human enhancement in the above-mentioned three domains demands a political response from the EU and the member states that reflects European values. As the experts we consulted confirmed, this must be based on Europe-wide reflection on the fundamental normative and societal aspects of human enhancement and how it can be regulated. At present, we do not even have a clear picture of European opinion at grass-roots level on these topics. The outlines of a possible European approach to human enhancement are sketched below.

There is currently no platform for the discussion of specific human enhancement technologies or the issue of human enhancement as a whole. We believe that such a platform should be created, on the basis of a critical vision of the phenomenon of human enhancement.

In our opinion, this demands the appointment of an appropriate body to inventory and analyse the trend towards human enhancement, assess its moral and social consequences for the EU and provide broadly based normative information and advice.

Such a body could be set up by the European Commission in the form of an expert working group comprising or having access to social, ethical, technological, scientific, medical and policy expertise. The composition of the group should also reflect European cultural diversity by including representatives from different member states. This body would thus not only function as an intermediary agent between science and technology and the European Union, but also be a place where the developing technologies can be discussed in the light of European values.

However, involvement of the European Parliament in the reflection on ethical and broader societal issues and the policy preparation would also be highly desirable to strengthen the intermediate and public role of the working group. This could be achieved by including a number of MEPs as members of the working group.

If the European Parliament prefers to take a stronger lead and to send out a message that the issue of human enhancement is of major strategic importance for the regulation of science and technology at a European level, it could set up a Temporary Committee on Human Enhancement.

This working group or committee would collect, analyse and discuss data and existing policy documents concerning specific human enhancement technologies and the overall field of human enhancement, and formulate a normative framework for human enhancement which would help to:

- define the limits within which each country can regulate human enhancement within its own boundaries;
- prevent undesirable (side-)effects of human enhancement technologies within member states and the EU as a whole;
- prevent inequalities in healthcare between member states; and
- prepare the ground for a policy on the funding of human enhancement research.

Strategic options for a European approach to human enhancement

The following five possible strategies for the regulation of human enhancement may be broadly speaking distinguished:

- a total ban on any technology that alters “human nature”;
- a laissez-faire approach;
- a reasoned pro-enhancement approach;
- a reasoned restrictive approach; and
- a systematic case-by-case approach.

The arguments for and against these five strategies will now be briefly explained and discussed.

A total ban or laissez-faire?

A *total ban* on any technology that alters "human nature" is the most restrictive option. To implement such a total ban, one would need to define "human nature" and explain which alterations are acceptable and which are not; this might be an impossible task. This option would also involve banning all human enhancement technologies already in use, would have to take the fine line between medically indicated treatment and enhancement into account, and would need a lot of maintenance.

The *laissez-faire* approach would encounter serious problems too. If all the member states were to establish different regulations and fund different practices, this would lead to inequalities between the member states and most probably to an increase of medical or human enhancement tourism, the former already being a European problem. All these problems would have to be addressed by the EU. Besides, some human enhancement technologies such as those for military applications would seem to be problematic in themselves and hence in need of regulation. Moreover, social cohesion and individual rights to physical integrity and protection against discrimination might be adversely affected in a performance-oriented society in which the competitive pressure would extend to the use of performance-enhancing drugs and technologies.

In our view, and this was confirmed by the participants in the expert meetings held during the project, these two strategies are therefore neither desirable nor realistic. Several human enhancement technologies are already in the process of development or being used, and a total ban appears to be neither feasible nor, even if based on a strict definition of human enhancement, wholly desirable. The laissez-faire approach will only postpone the need for regulation, and leave the positive as well as negative societal consequences that some of the technologies could have to unfold. A laissez-faire approach would also mean that there are no criteria for EU-funded research into human enhancement technologies; this could have undesirable consequences, ranging from a lack of ethical awareness about these technologies to illegitimate funding of specific enhancement technologies.

Three remaining options

In our view, it therefore needs to be decided whether human enhancement technologies should be regulated in the EU by a reasoned pro-enhancement approach, a reasoned restrictive approach or a systematic case-by-case approach. Since actual and potential human enhancement technologies – as well as the very idea of "human enhancement" in general – challenge beliefs widely held in some European countries and are in line with those in others, the whole spectrum of European cultural diversity has to be taken into account in any deliberation on this issue. With reference to any of the three strategies, the deliberations could be supported by state-of-the-art public participation tools, rigorous examination of the ethical, social and cultural aspects of human enhancement and a series of surveys carried out to learn more about European public opinion on the various facets of the issue. These final three strategies will be illustrated and discussed in the rest of this section.

A reasoned pro-enhancement approach

In a *reasoned pro-enhancement approach,* EU policy would explicitly fund R&D on (non-therapeutic) human enhancement technologies, while preserving all applicable elements of existing ethical frameworks and, as a matter of course, respecting fundamental European values. In such a strategy, EU policy would try to stimulate a societal dialogue about how risk-averse we really should be, and how open to innovations which might run counter to traditional value systems. Initiatives to stimulate discussion of deregulation in such areas as drug and doping policies or reproductive technologies could be elements of this strategy.

This pro-enhancement approach will acknowledge and address existing tendencies such as that towards medicalisation of society and the widespread desire for almost unlimited self-determination. This approach will furthermore be able to keep EU institutions and its citizens up to date with new technologies. On the other hand, this approach might be problematic from a broader normative point of view and even for practical reasons, for example because it may not be easy to square human enhancement technologies with fundamental European values. It also remains to be decided whether the line between acceptable and unacceptable human enhancement technologies should be drawn in principle ahead of time, or should be determined post facto. Furthermore, human enhancement could have undesirable side-effects that are only discovered in the long term. Finally, it is far from clear whether the technologies and trends that are most intensively discussed in the human enhancement debate really would facilitate achievement of such goals as the creation of a competitive, dynamic European knowledge society or the improvement of European innovation systems.

A reasoned restrictive approach

In line with the last-mentioned argument, a *reasoned restrictive approach* would always have to be based on consideration of whether proposed human enhancement solutions to social and individual problems really do have added value when compared with non-technological or other technological solutions, and whether funding priorities need to be changed accordingly. Moreover, the precautionary principle would have to be applied as systematically and comprehensively as possible in this approach, since – in this view – individual enhancements should never be allowed to threaten the social fabric and fundamental cultural values. The ideologies and social prejudices underlying the recent trend towards human enhancement would have to be subject to further scrutiny and critical examination. Some kinds of R&D or interventions, such as human enhancement technologies for military purposes, might be banned altogether.

The benefit of this approach is that it includes built-in control over human enhancement and its consequences. This strategy might protect EU citizens from unwanted consequences of human enhancement, while still allowing them to benefit from a few, carefully researched technologies. It is moreover compatible with a continued focus on the question of how economically competitive knowledge societies can be created without an undue shift of attention to individual technologies. On the other hand, a more liberal approach to human enhancement might facilitate a competitive response of the European community to an increase in individual

demands for enhancement technologies or a shift to a pro-enhancement policy in other parts of the world. Furthermore, the reasoned restrictive approach requires an explicit framework or set of criteria to test each individual human enhancement technology for admissibility.

A systematic case-by-case approach

In a *systematic case-by-case approach*, a normative perspective on human enhancement would be taken into account whenever a technology- or science-based intervention aimed at improvement of individual human performance is proposed. Any decision on whether to allow such an intervention or to fund relevant R&D would be based on a process involving consultation of all groups directly affected by such interventions and their duly appointed organisations and expertise from all relevant fields and disciplines (selected to reflect the cultural diversity of Europe).

This approach does not demand a single large regulatory system: instead, specific regulations tailored to fit within a general framework would be drawn up as new technologies appeared on the scene. This overall framework would allow existing human enhancement trends to be systematically taken into account and deliberated on in due course, with input from those most closely affected. Since no regulations have to be drafted for technologies that do not exist yet, it will be possible to spread the burden of work over time. On the debit side, the EU will have to maintain a regulatory mechanism for human enhancement in the long term, and will have to abstain from adopting a clear position on the issue of human enhancement in general in order to permit such a flexible and highly deliberative approach.

Regulatory instruments for human enhancement

In our opinion, the EU should consider regulation of two aspects of human enhancement: R&D for individual technologies and the actual use of interventions aimed at human enhancement. Before implementing any human enhancement policy co-decided by the European Parliament, the EU would first have to perform a thorough inventory of existing regulations to determine which regulations need to be altered or even replaced and where entirely new regulations need to be drafted. While many individual human enhancement technologies are new phenomena, they fall into familiar policy-making domains such as healthcare systems, equal access to resources, solidarity or the freedom to provide services across national boundaries, which will facilitate the task of the EU.

For some of the domains (such as research policy or the internal market) where regulations need to be adjusted to take the use of human enhancement technologies into account, it is clear that the EU is the primary policy-maker. It may however not be immediately clear where the EU stands with regard to problems human enhancement might cause for healthcare systems. Although such systems are mainly a national affair, the EU can intervene in certain cases, as in the action taken by the EC to harmonise the market for in vitro diagnostic devices throughout Europe (Directive 98/79/EC). The EU could use directives in a similar way to influence national regulation of human enhancement practices. Alternatively, it could help professionals to establish their own standards such as codes of conduct and government-backed disciplinary regulation. Any successful human enhancement policy will also have to

include ways of monitoring and evaluating the effects of technologies once implemented.

In our opinion, the EU has a further regulatory task, in respect of research funding. Here again, all existing regulations should be reviewed and adjusted to suit the chosen strategy. In other words, the social and technological goals for which the research is funded and the criteria to be met by applicants for funding should be clearly defined. The research funded should also be monitored and evaluated. Special attention should be paid here to dual-use technologies, that is technologies designed for another goal which can also be used for the purposes of human enhancement.

We would like to emphasise that in the case of all the three possible strategies discussed above:

- all policies should include monitoring, maintenance, and evaluation based on the chosen normative framework;
- the working group or temporary committee set up to deal with this strategy should design a normative framework to serve as a guide to the drafting of specific, responsive and enforceable regulations;
- the public should be consulted during the development of the normative framework and during the subsequent regulatory process;
- private R&D inside Europe and R&D carried out outside Europe should be monitored, to detect innovative technologies that may require regulation;
- the EU working group or European parliamentary committee should identify specific new problems (e.g. the role of informed consent in trials of new technologies) at the level of individual human enhancement technologies or human enhancement as a whole which require regulation and follow-up.

Concluding remarks

This paper presents our view of the nature of human enhancement, and the reasons why this important new trend requires a political and policy response from the EU. The first step we propose is to ensure the development of a normative framework that can serve as a guide in choosing an approach to human enhancement and the formulation of EU policies in this field. Human enhancement is already an established societal trend and a political and ethical issue, and more and more technologies are being viewed from this perspective and developed accordingly. The sooner policy-makers react to this trend, the better are the chances of successfully controlling the relevant developments in science and technology and of developing a European approach to it. The EU should not hesitate to take this first step, and all steps that may follow from it. The EU needs to deal with human enhancement technologies now, for they are here to stay.