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NEST-ethics in convergence

Testing NEST-ethics in the debate on converging technologies for
improving human performance

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1 Introduction

New and emerging science and technology are often accompanied by ethical challenges. This is because they upset established moral norms by bringing to surface issues which were not before open for discussion; the more radical the possibilities, the more intense the ethical deliberation. The train, the automobile, the computer, IVF, nuclear power, cloning and genetic engineering are only a set of technologies, which sparked ethical deliberation upon their emergence. However, it has been suggested (Swirstra&Rip, 2007) that the moral argumentation and the strategies used in such debates are not always as novel as the technology in question, that there are definitely certain arguments and patterns of moral argumentation reoccurring time and time again in ethical deliberations over new science and technology. For example, repeatedly the Promethean attitude is brought in support of a new technology, highlighting all the goods it can bring and the potential to improve our condition. It is many times answered with appeals to the Faustian bargain: The new technology may bring us certain benefits but at the end of the day we find ourselves in a lot messier situation. This in turn is answered with other arguments, remaining or not in the mythical register.

Although there may be specific arguments concerning specific aspects of a new technology and there are changes over time in argumentation, the hypothesis is that the core of most of the argumentation can be encountered in debates on many new technologies where they are concretized and elaborated having various degrees of convincingness. Such an x-ray of the ethics of new and emerging science and technology (NEST-ethics) has been attempted in the mentioned article of Swierstra and Rip. However, the hypotheses that most argumentation on emerging technologies can be found in NEST-ethics needs to be tested, the inventory of arguments can be extended and revised. Thus the main research question of this document is: Does NEST-ethics hold in face of testing it in a new debate over an emerging technological development? In other words, can we identify the same arguments and recurring argumentative patterns in a new ethical debate on an emerging technological development or are there variations that reveal inconsistencies in NEST-ethics and also interesting insights in the technology itself? The case study is represented by the debate over the convergence of technologies for improving human performance, which will also benefit from this analysis for its upcoming public exposure. Moreover, a NEST-ethics approach to this debate is likely to contribute to improving the democratic process, as it not only acts as a platform for various actors to express their positions and concerns but it also offers an inventory and articulation of arguments which can be later used in other instances of the debate.

The research question can be split into smaller ones based on the structure of NEST-ethics but also questioning this structure. A first set of sub questions of the research will go along NEST-ethics and test its claims in the new debate. Can the NEST-ethics inventory of arguments be encountered in the CT debate? How do the arguments that are being put up in the CT debate differ? Are there interesting variations in the arguments and argumentative patterns? Are there reasons for the absence/presence of certain

arguments? From these questions we will derive conclusions about NEST-ethics but also insights in the CT debate itself. From this analysis, the structure of NEST-ethics will be assessed. Are the categories of NEST-ethics helpful for analyzing debates on emerging technologies? Could there be a better taxonomy for ethical argumentation? Finally, the results of the analysis will be used to summarize the contribution NEST-ethics made to the CT debate as well as the contributions this document made to improve NEST-ethics.

Therefore the structure of this document is the following. First it will elaborate the NEST-ethics hypothesis and structure. Besides this it will explain its philosophical background in pragmatism and justify its normative stance anchored in the ideal of deliberative democracy. Next, it will outline the topic of the convergence of technologies for improving human performance. This will be done by outlining first the main technological issues and then the different visions on convergence that several policy reports and articles have articulated.

The next chapters of the document are built on the NEST-ethics structure using the converging technologies debate to verify and improve its hypotheses. This will be done by facing NEST-ethics with the arguments that have been put up in the CT debate so far in a set of key policy reports and subsequent reactions. The insights will be feed back into NEST-ethics along the way. Finally, the last part will summarize the findings and use them to derive conclusions about NEST-ethics structure.

2 NEST-ethics

Before testing and improving a theory on the debates over emerging technologies by analyzing the debate on converging technologies, NEST-ethics needs to be defined, its hypothesis detailed, its structure and philosophical background explained and its normative stance justified.

What is NEST-ethics?

NEST is an acronym standing for new and emerging science and technology and NEST-ethics refers to a hypothetical structure observed in ethical debates over novel science and technology. But can we speak of an ethics of new and emerging science and technology in general? And if there were such a thing, what would it contain?

Before going into its structure, a further elaborated example could illustrate the NEST-ethics thesis. A longstanding issue, which can be encountered at the beginning of many debates over technologies in their emerging phase, is technological determinism and more precisely the inevitability thesis: the issue whether we can control or not technological development. The holders of the inevitability thesis argue, either explicitly or by making implicit assumptions, that significant steering of technology by human agency is impossible and so having an ethical debate is largely pointless. Others stress that it is us who are making the technology so it should be possible in principle to determine its course. Therefore, there is a point in ethical deliberation and in putting in place processes where steering is done explicitly. This kind of exchange of arguments is to be found in various forms in many deliberations over technologies in their emerging phase. Moreover, such kinds of arguments provoke each other into existence creating a pattern. Once someone takes the inevitability stance, arguing with reference to international free markets that “if we don’t do it others will, so it will happen anyway”, is reminded that “there are national and international regulatory bodies which could declare bans, moratoriums and regulations when there’s pressure”. In turn it is exemplified that moratoriums only delayed technological development and yet again it is suggested that human agency still played a steering role at least in the very early stage (possibly in the laboratory or design office) when one technology was chosen for promotion among multiple choices.

The pattern continues but it should be clear by now that it does not depend on a specific technology, so a theory over emerging technologies debates could include such exchange of arguments over the inevitability thesis in its structure. Along with others that will be described in future sections, NEST-ethics was outlined as a radiography of ethical debates inventorying a repertoire of arguments, motives and patterns, available for use in concrete debates.

NEST-ethics structure

If there are certain recurring arguments and certain patterns that can be identified, how can such common issues in debates be theorized? How would its structure look like? The approach adopted in NEST-ethics was to classify arguments according to the major moral theory underlying them explicitly or implicitly: utilitarianism (and more broadly consequentialism), duties and rights (deontology), virtue ethics (issues of the good life and good society). An additional category of arguments could be classified according to the just distribution of costs and benefits (theories of justice). Moreover, there are considerations pertaining to developmental control and the relation between morality and technology, what one may call meta-ethical issues. However, these categorizations do not mean that patterns in argumentation do not cross boundaries. For example, in some debates utilitarian arguments that stress the positive consequences are many times answered with arguments with appeal to the good society that might be jeopardized when the technology would spread beyond intended positive consequences. These arguments in turn, could be black boxed as unquantifiable and the pattern witnesses a return to more precise consequentialist arguments. In the following we will outline the structure of these categories as well as outlining their content with a few examples.

Meta-ethical issues

Considerations at the meta-level in NEST debates deal with how actors involved in the new technology relate to the control of its development, the relation between technology and society, the relation between technology and morality. These considerations are tightly coupled to the novel and emerging character of the technology and so are prominent especially in this development stage, when it is not yet clear what concrete ethical issues will be raised.

The example given above with the pattern surrounding the debates over technological determinism represents such a meta-ethical issue. Another related meta-ethical issue regards the relation between technology and society, perceived by different actors. For example, some technology promoters might present technology as promising as such, independently of the efforts the actors must make, so giving it agency. The critics also could view technology as an independent force but hostile to social order. Such a view of technology as coming in society from outside goes against the findings of science and technology studies, which stress that exogenous technology is a myth.

A general pattern of meta-ethical argumentation comes from the different ways the past is mobilized either to support or call for caution about the technology. The pattern may take many forms in argumentation, from appeals to myths to trickle down reasoning: “The technology will trickle down in time to the poor people, just as they did in past cases”. Arguments pleading for cautiousness stress the cases when technologies came with unintended, unwanted side effects or show that technologies contributed to make the rich richer and the poor poorer.

The pattern continues. In the beginning the novelty of the technology is highlighted by proponents to announce all sorts of benefits. In response to the critics who also stress novelty but in relation to past cases, which brought disasters, the promoters many times choose the strategy of downplaying the novelty, presenting the technology as nothing unusual. The initial announcement of a revolution is now presented as a continuation of previous technological developments. This strategic movement is meant to ease the worries triggered by the announced novelty and to rally the moral intuitions developed in relation to previous technologies: If we accepted a previous technology, we should accept this one as well since it's only doing things better and faster. However, this kind of appeal to moral intuitions is sometimes used as an argument from *consequent*, which delegitimizes the past in light of criteria regarding a potential future: If we agree that such a new technology is unacceptable, then we should be consistent and question our present technologies, which basically do the same. Throughout the debate, the dichotomous approaches to a new technology usually create polarizations turning even the innocent inquirer into an opponent.

A third pattern of meta-ethical argumentation is related to the relation between morality and technology, namely the possibility of the emerging technology to change morality itself. The arguments in this category portray this change either as inevitable or as a threat. What one may call the habituation argument basically suggests that even if the new technology may currently be at odds with established moral norms, in time there will be a reconsideration of the norms once people become accustomed with the technology. Precedents are called when fright concerning a new technology was overcome. The second argument of moral corruption comes in two forms, the slippery slope and the colonization argument.

The slippery slope argument suggests that the new technology, although currently appearing innocent, is highly probable, given current cultural orientations and socio-political context, to be a deadly embrace, entailing further technological steps that lead to definitely undesirable situations. The solution, the argument goes, is to stop going on this technological path now before it's too late. The spatial version of the moral corruption argument leads to the same conclusion. Better stop now before it's too late. The new technology might indeed address the legitimate needs of a minority, but once developed it is impossible to stop others from making less legitimate use of it.

Consequentialist argumentation

In practice, debates are started by consequentialist arguments. The technology is deemed desirable because its consequences are desirable. In the emerging phase of the technology, when developments are not yet clear, the consequences take the form of promises and dreams. The basic form of argumentation behind these promises looks like this: If we invest in this science or technology it will increase our knowledge and our scope in manipulating the natural world, which will result in increased general happiness when applications of these knowledge and manipulations lead to positive effects.

The consequentialist pattern of contestation follows three axes. The first line of contestation appeals to plausibility. Because promises are based on assumptions and projections about the future, facts must be gathered before taking them seriously and invest, in order not to create false expectations and disappointments. The second line of consequentialist contestation refers to the cost-benefit ratio. Do the first outweigh the former? Do we have the cognitive capacity to rightly answer this question? Usually this line of thought appeals to the sorcerer's apprentice story where perceived initial benefits were turned out to be the seeds of future disaster and leads to calls for preliminary risk assessments before going into development. The third line of consequentialist contestation questions whether the promised benefits are really benefits. This will shift the discussion on another level since it will no longer deal with facts but with normative aspects. This line of thought is triggered because promises and benefits imply views and criteria about what is good, even if they are not always explicit. For example, benefits such as reducing hunger may be viewed as unproblematic but when this means uprooting traditional (agri) culture by intensive use of modified plants the benefit might not be perceived as maximizing overall happiness. The announcement of the promise as a benefit shows in some cases the inadequacy of utilitarian criteria of maximizing happiness because happiness gets redefined depending on the culture assessing it.

This last remark leads to some considerations on the ethical theory underlying consequentialist argumentation, utilitarianism with its moral drive to maximize happiness and reduce pain. In modern application of utilitarian thought, reducing pain gets priority over maximizing happiness. The idea behind this prioritization is that people tend to agree more on what constitutes pain than on what constitutes maximal happiness. This is why most of the promises of emerging technologies are framed as reducing hunger and disease.

A final set of three recurring rhetorical tropes. It begins with an argument suggesting that the new technology will help in solving the causes of problems instead of patching symptoms. Why struggle messing with a multitude of secondary problems when we can fix the root cause with this new technology. Such rhetoric can be encountered for example in biomedical technologies. It usually triggers a second trope to be found at skeptics. They acknowledge that the technology might deliver some of its promises but stress the "technological fix" character of the solution. The pejorative connotation of the expression "technological fix" suggests superficiality and that a proper solving of the problems is deeper and lies outside the technological realm. "Are you really over your problems by switching on the "happiness electrode" in your brain?" The assumption here is that complex problems require comprehensive approaches, which if not pursued lead to disaster on the long run. In response, it is argued that the technological solution might be more realistic than the non-technological one and clinging to the letter denotes a dogmatic approach. "What is so wrong if this electrode makes him feel better and happier while still functioning efficiently in society?" The third trope is precaution and the precautionary approach. The basic tenet is that measures can be taken to ensure the highest level of protection but they must be backed by reasonable grounds for concern for possible adverse effects and based on broad cost-benefit analysis. This attitude can be encountered in bureaucratic institutions.

Consequentialist patterns of argumentation do manage to settle many issues but not all can be dealt with utilitarian ethical theory and the debate calls for different kinds of arguments. The following sections outline deontological arguments, justice and good life arguments.

Deontological arguments

Deontological arguments (arguments anchored in rights and duties) are usually brought up when deeply held beliefs are touched by the new technology and the consequentialist argumentation seems not to consider them. Technology may promise to maximize overall happiness but at the expense of moral convictions, duties and rights. Examples include technologies that involve experimentation on vulnerable groups or entities, technologies that disregard minorities, individual rights; for example, medical experiments that involve cruelty and disregard for animal rights even if they might benefit overall public health. But deontological arguments are not only brought up to counter optimistic promises but also in support of the technology: the duty to further human progress, the duty to diminish suffering, the duty to acquire knowledge but also the right to choose whether to use or not a technology.

Contestation of deontological arguments comes along three axes. One way is by invoking a principle with higher authority. For example, the duty to further human knowledge could be invoked in support for a technology but this basis could be contested if developing the technology implies disrespect, for example, for human rights. A second way to contest deontological argumentation is by showing that the invoked principle does not apply to the technology in case. For example, we should work out to diminish human suffering but you can hardly categorize the unpleasantness produced by cutting onions as human suffering so genetically modifying the onion in this sense could hardly be argued as diminishing human suffering. A third way to counter deontological argumentation is by interpreting and applying the principle differently. We may all agree to the principle of furthering human progress but in practice, a particular technological progress undermines the flourishing of this particular culture and thus undermines its social progress.

Good life arguments

The promises concerning some technologies could call arguments that go beyond utility, rights and duties, which are perhaps better quantifiable but do not grasp overall phenomena concerning the impact of the technology on the good life and the good society. Good life arguments, with appeal to mythological motives or culturally shaped identities, have a particular force in drawing utopian pictures or dystopian scenarios, which transgress current conceptions on the good life.

The promoters of the new technology typically identify with the Promethean attitude of offering humanity otherwise inaccessible goods. Appeals to the Garden of Eden are also to be found in visions of technological progress that promise to bring about a mythical

state of bliss. Skeptics remember the Faustian bargain applying it to technology. The myth of Icarus received various interpretations and transformations. His figure is sometimes invoked to remind about the unconscious fascination with technology and the disregard of warnings. The Greek term hubris is also used to denote careless pride and arrogance usually resulting in fatal retribution.

Good life arguments can be found also in discourses on limits. A recurring motif to be found in some new technology debates is that humans should not play God. The underlying assumption of the argument probably comes from the conception of God as all knowing and all-powerful and therefore, humans pretending to know things beyond their cognitive capacities could mess up the given.

Further limits are derived from what is deemed to be natural. The arguments are based on a perceived moral order in nature and transgressing it will create monsters. References to the monster of Victor Frankenstein feature here. Another idea that is invoked in discourses on limits and orientation of the aims of control is that humans cannot flourish in completely controlled environments. The novel *Brave New World* of Aldous Huxley is invoked in this context with appeals to the aspects of it that refer to a completely controlled world, plying itself obediently to human desire.

Technology promoters offer different interpretations of the myths and scenarios. For example, it is argued that God wants us to play Him and a view of man as co-creator with God is suggested. Concerning myths that suggest catastrophes, it is suggested that even if humans have a bad track record in using their powers there is also learning. Finally, even if technology may replace nature as our living environment, it is every inch as capricious and surprising as nature is.

Justice

Arguments of distributive justice do not feature too detailed in NEST debates given the speculative nature of the impacts on the distribution of goods. However, the paradigmatic issues many times brought up is the technological divide, the gap between the haves and the have-nots which takes many forms: the gap between rich and poor countries, the gap between rich and poor strata of the population. The basic tenet giving orientation with respect to distribution of goods seems to be the maximin rule: the technology will advance justice only if it will benefit those who are worse off. Therefore, supporters of the development of a new technology, probably expensive and available only to the rich, must include arguments that it will trickle down to the poor. For example, that the new technology will create more goods thus in absolute terms everyone will have more of the expanded cake.

The pattern continues with arguments acknowledging that the technology might make the majority better off in absolute terms but the divide between those reaping the most benefits and those picking up the crumbs still widens. The conclusion is most often a plea for developing the technology in directions that specifically address the needs of the poor.

It is unfair, the argument goes, to have so many problems with people lacking basic needs and to divert resources to technologies that do not address this in any way.

Government and governance

The theme of explicit steering of technological development or controlling technology is addressed as well in NEST-ethics. Two models of decision-making are outlined: governance and government. The initial NEST-ethics article only gives examples of the two paradigms of governing without theorizing them. However, they could be defined as follows.

Governance is the mode of governing which is usually associated with decentralized, bottom-up established processes, cultures, policies and relationships between free-equals that decide to regulate their behavior and relations. Sometimes, people appoint governments as governing authority of a certain domain of activity. Governments are usually associated with centralized, top-down apparatus exercising authority and having monopoly of exercising force. NEST-ethics gives examples of actions taken in the two modes of governing. For example, voluntary moratoriums are usually done in a governance mode by researchers as a way of self-containment. Molecular biologists have resorted to this in 1974 and 1975. Bans are usually government issued and rely on a widespread consensus. As an example, the ban on human cloning is given.

The issue of governing technological development springs debates that cover the question of technological determinism or social shaping of technologies. On one hand there are those who do not believe that significant impact of human agency is possible and appeal to free market mechanisms, the logic of international competition and the internal logic of technologies to argue that discussion about explicitly steering technological development is useless because these forces lack explicit human agency and they are the ones effectively guiding technological development. On the other, there are those who believe in the social shaping of technologies and who argue by exposing the social mechanisms that influence the shape of technologies and therefore pleading towards explicit (more democratic) control, which would increase responsibility and accountability and require transparency. Among those rejecting technological determinism, there are those acknowledging that shaping of technologies can happen undemocratically by governmental agencies or corporate control. However, there are others who argue that technological steering needn't remain undemocratic if mechanisms are put in place to take into account input from other relevant stakeholders. For example, government driven developments subjected to public consultations, which are then effectively taken into account and built into the technology.

Philosophical background of the approach

Until now we have presented the NEST-ethics framework with its hypothesis and structure. In this section we explain its philosophical background in pragmatism, its normative stance in the ideal of deliberative democracy, outlining also the set of necessary conditions for valid public debates that might make use of NEST-ethics.

As we have seen, innovative science and technology brings novelties in society and the society responds in various ways. The responses to novelty can vary from warm welcoming as towards a hero bringing a long-awaited salvation to skepticism and prudence as towards a stranger with unknown intentions or rejection as towards a lawless villain who does whatever it wants. As the new technology opens certain issues for debate, it challenges existing moral routines setting up a process of re-alignment where resistance to change is a possible societal reaction. In the process, existing moral routines can be reinforced, reformed or abolished.

In the pragmatics of every day life, morals exist as routines considered self-evident by people who are hardly aware of their existence. But at some point, they started as conscious decisions of conflicting interests/rights or answers to the question what is a good life. New technologies set in motion such processes of conscious ethical deliberation with unknown end. In the NEST-ethics approach, ethics is considered to be this practice of reflexive deliberation set in motion when moral routines are no longer self-evident, rather than designating what is good and should be done, as many actors using the term do.

This deliberative practice benefits both from an exhaustive consideration of various arguments as well as from an environment in which all voices can be heard, all interests measured and where the exchange of arguments between actors can take place in a climate of mutual respect.

The environment can be achieved by positing deliberative democracy as an ideal type of democratic steering of technology. Although an ideal, it may be a necessary and productive one, as actors participating in the arena of technological development need to seek legitimacy for their standpoints in what can be characterized as functioning democracies. As a model of a democratic steering of technology, deliberative practices need certain conditions to be thought valid. Amongst others, participants should compose a broad sample of the affected population. The process should be conducted in an independent, unbiased way and all relevant actors should be invited as early on as possible and should be able to bring up relevant topics and be heard by all relevant parties (Hamlett 2003, 9).

If deliberative democracy is concerned to have all the representative actors having their voices heard, NEST-ethics comes to improve the deliberative process, helping to raise its quality by offering an input of arguments and argumentative patterns. This document offers such an input contribution for the debate on converging technologies for improving human performance, enriching it by articulating all kinds of public concerns and positions.

In the same time, this document extends NEST-ethics, contributing towards making it a framework useful in improving the deliberative process for other new technologies to come. This is not say that this document will exhaust polishing and extending NEST-ethics as this is likely to be an ongoing endeavor benefiting from future NEST debates.

The context in which this analysis takes place is one in which there have been calls for public debates on the topic of converging technologies for improving human performance. Many actors, each for different reasons, advocate a broad and early engagement of the large public in converging technologies debates. Proponents are interested in gaining public acceptance, learning from past experiences when the public boycotted new technologies, an example being the GMOs. Others see a more active role for public debates hoping that an informed judgment of the public will also contribute to shaping emerging technologies (Grunwald 2007). The following chapter introduces the topic of converging technologies for improving human performance and circumscribes a set of key texts that will be further analyzed.

3 Defining the convergence of technologies

This chapter introduces the topic of converging technologies for improving human performance through an exploration of the policy reports and scientific articles in which it is articulated. In this way, the chapter circumscribes the texts, which will be further used for analysis. Besides the major reports on converging technologies for improving human performance, this document considers other positions as well. Most of them belong to the members of the report's expert groups, who published their positions also outside the frameworks of the reports. Besides them, other authors are considered on the rationale of writing explicitly on the subject. However, a note should be made. This selection does not exhaust the positions on issues related to the topic. One reason is that the topic exposes similarities with other debates like the one on human enhancement on which many other positions have been expressed. Another reason is that even on the subject concentrating on the technologies themselves, there are similarities with other debates like the one on nanotechnology. Once these notes being made, this chapter goes on to summarize the reports and the articles by the members of the expert groups. The points of the other authors will be made throughout the text as they are brought up throughout the NEST-ethics analysis. This separation of the texts is done because not all positions concerning converging technologies are aiming to define the subject, as are the reports and the ones closely related to the reports.

The Converging Technologies for improving human performance report

The concept of converging technologies (CT), in the sense used throughout this document, got its first articulation in a widely cited policy report (Roco& Bainbridge, 2002). The report's role was to articulate visions that could be achieved if fostering the convergence of multiple areas of science and technology. The key identified areas of convergence are Nanotechnology, Biotechnology including genetic engineering, Information technology and Cognitive science (hence the NBIC abbreviation). It is argued that cutting edge developments in each area are progressing at a rapid rate and if properly nourished and actively integrated, this process of convergence will witness exponential growth in the first decades of the 21-century.

Converging technologies were conceived in this report to be tightly coupled with the explicit goal of improving human performance. This is made manifest by the integration of cognitive science, including cognitive neuroscience in the core set of domains of convergence. Thus, NBIC convergence advocates an accelerated cross-fertilization of these four areas of science and technology at the nano-scale and towards the explicit goal of improving human performance.

The report is the result of a workshop sponsored by the US National Science Foundation and consists of articles by multiple American scientists, engineers and politicians. Although various issues are conceived differently throughout the articles of the report, in this document the report will be considered unitary. This is done for two reasons: First, it

is this report that initiated the subject of converging technologies in this NBIC version which is common for all the authors and, second, the report was conceived and presented as an official report and thus it invites itself a unitary reference to it.

Throughout the report, converging technologies are referred in various ways. They are presented in terms of visionary applications, as benefits they would bring to multiple areas of society, in relation to the steps that need to be taken to foster their advance and with respect to ethical issues. Visionary applications include understanding and technologically improving the capacities of the human brain including brain-to-brain interaction, brain-machine interfaces; enhancing personal sensory, communicative and cognitive capacities through nanotechnology-enabled implants; producing regenerative bio-systems as replacements for human organs and ameliorating the physical and cognitive decline. Generally, the report envisions a human body that will be “more durable, healthier, more energetic, easier to repair, and more resistant to many kinds of stress, biological threats, and aging processes” (Roco& Bainbridge 2002, 19).

Under these general lines, many projects were envisioned and nourished. For example, brain-machine interfaces (BMIs) were conceived to allow subjects to interact seamlessly with a variety of actuators and sensors through the expression of their voluntary brain activity. The outcomes desired from such projects include the capacity of the subject to directly operate actuators within workspaces that are either too small or too big (e.g. at the nanoscale or space robots) than the normal reach by the use of voluntary brain activity. Or to perform tasks that require extremely delicate movements or ones that require much more rapid reactions than the normal human reaction like “responding in hand-to-hand combat at a rate far exceeding that of an opponent” (Roco& Bainbridge 2002, 268)

One important area where converging technologies would see flourishing and support is the military where converging technologies are applied to enhance humans but not only. The report identifies seven opportunities to strengthen this field with CT through “threat anticipation, uninhabited combat vehicles, war fighter education and training; responses to chemical, biological, radiological and explosive threats; war fighter systems; non-drug treatments to enhance human performance; and applications of human-machine interfaces”(Roco& Bainbridge 2002, 11).

Other areas actively seeking to benefit from converging technologies are the enhancement of group and societal outcomes by alleviating physical disabilities, crossing language differences, geographic distance and variations in knowledge, improving work efficiency, communication and education, aeronautics and space flight, food and farming, sustainable and intelligent environments. Converging technologies are said to bring “security from natural and human generated disaster, steering human evolution, including individual and cultural evolution” or to “increase significantly our level of understanding” of each other (Roco& Bainbridge 2002, 18).

Because CT is viewed throughout the report as “essential to the future of humanity”(Roco& Bainbridge 2002, 13), bringing a “new renaissance”(Roco&

Bainbridge 2002, 16) and “transformation of civilization”(Roco& Bainbridge 2002, 12) the report announces that, if CT is properly advanced it will foster “human convergence” and towards the end of the twenty first century we could witness “world peace, universal prosperity, and evolution to a higher level of compassion and accomplishment”(Roco& Bainbridge 2002, 20).

Ethics in the NBIC report on convergence

The US NBIC report highlights mainly the technological potential of converging technologies for improving human performance. However, it does acknowledge on a couple of occasions that there may be ethical issues to be addressed. It refers to ethics in several ways throughout the report. From the beginning it mentions that ethical issues will need proper attention (Roco& Bainbridge 2002, 9) but it does not analyze them. Widespread ethical consensus will be built along the way in the process of convergence (Roco& Bainbridge 2002, 19). However, it states that the possibilities for progress elaborated in all contributions to the report are “based on full awareness of ethical and scientific principles” (Roco& Bainbridge 2002, 16). It can be said that throughout the report the references to ethics and ethical are made at this level of mentioning they may exist and calling for their further research. For example, the media is recommended to inform the public on the convergence of technologies such that the public can participate wisely in debates (Roco& Bainbridge 2002, 39). The government should facilitate an arena where such ethical debates could take place (Roco& Bainbridge 2002, 44) and new mechanisms will have to be developed to take into account public interests (Roco& Bainbridge 2002, 23). Only on few occasions, the report mentions concrete ethical issues such as “unexpected effects on social equality, transforming human nature” (Roco& Bainbridge 2002, 39) but without analyzing them. The report does anticipate however that issues such as having “computers inside” and “tinkering with our genetic code” will generate anxiety as these are “shocking and frightening stuff to contemplate”(Roco& Bainbridge 2002, 125).

Although not an official US policy report, the document was conceived as one and managed to spark vivid reactions as well as official responses in various countries. Similar visions were projected for example in a Canadian report (Canada 2003). There were also reports pleading for caution. For one, there was the US President’s council on bioethics, issuing regular reports on biotechnologies, and which dedicated a report on non-therapeutic applications (Beyond therapy, 2003), which reacted to the NBIC convergence of technologies. European Commission issues also regular reports on technological trends, so the convergence of technologies got a separate report elaborated by a High Level Expert Group (HLEG 2004) reacting also to the US NBIC visions. In the following these two reactions will be detailed as a counter part to NBIC conception of converging technologies.

Beyond therapy

The President’s council on bioethics (PCBE) report is not a science policy report but deals more in depth with ethical issues raised by novel biotechnologies. The *Beyond*

Therapy report refers explicitly to the NBIC report when acknowledging that there are scientists and biotechnologists who do not “shy about prophesying a better-than-currently human world to come, available with the aid of genetic engineering, nanotechnologies, and psychotropic drugs”¹. Generally, the report adopts a skeptical attitude towards the visions outlined in the previous section. It views such developments as humans trying to remake Eden and playing God, warning that such developments could lead to a humanly diminished world similar to the one described by Aldous Huxley in its 1932 novel *Brave New World*.

Split across enhancement themes like improvement of children, superior human performance, prolonging lifespan, improving mental states, the report identifies and explores various concerns meant to curb the enthusiasm displayed by the NBIC report. Identified problems include genetic engineering of desirable traits and the fear of eugenics and designing children, mind-altering drugs and behavior steering (of children), the impact of (muscle) enhancement on sporting competitions, the implications of prolonging life indefinitely, the meaning of happiness and mood alteration drugs.

The report acknowledges the potential of such technologies to alleviate mental illnesses, overcoming blindness and deafness and more generally to intervene into the workings of our bodies and minds and to alter them by rational design and bring about healthier bodies, decrease pain and suffering and bring about peace of mind and longer lives (President's Council on Bioethics 2003, 5).

However, it refers to the enhancement goal, which is central to the NBIC report, as being “problematic” even as a term because it is difficult to prioritize enhancements, it is not clear if they are not bringing secondary effects which could make things worse (e.g. modifying towards diminishing aggression could undermine ambition) and generally, there are no guides of where to go and where to stop modifying human abilities (President’s Council on Bioethics 2003, 3).

Besides unintended consequences, the report expresses concerns that the same technologies offer great powers, which could easily be intentionally diverted towards undesired uses. Genetically engineered pathogens could be used as agents of social control (e.g. tranquilizers for the unruly). The concerns are about what some people could do to the majority and more specifically what governments can do to populations (President’s Council on Bioethics 2003, 29). Moreover, the report expresses concerns that such technologies could have implications that go as deep as altering self-understanding. For example, the report mentions a worry that knowledge of brain functioning and behavior, once individually available, could alter notions of free will and moral responsibility (President’s Council on Bioethics 2003, 28).

Besides these concerns the report downplays the need for investing in the visions with which the convergence of technologies is being advertised, as there are more pressing

¹ President's Council on Bioethics, 2003: “*Beyond Therapy: Biotechnology and the Pursuit of Happiness*”, p. 6

concerns in a world where millions die of AIDS, malaria and malnutrition and these only require existing technologies besides will and funds.

However, the report welcomes further debates on the issues of improving human performance as some of them are not any more an issue of speculation but are close enough and even present. Examples enumerated are: cosmetic surgery, performance enhancing drugs, steroids, weight loss, hair growth or selecting sex of offspring. Contemplating the much more powerful technologies advanced in the NBIC visions could actualize ancient philosophical issues of what is a good life, what is a good society?

A summary of concerns derived in the report from such questions warns that in pursuing the goal of human enhancement and “acting as if we are already super-humans or divine, we risk despising what we are and neglecting what we have”. In seeking to become better by these means we risk having identity problems and thus perfections might turn out to be at best illusions or “at worst a Faustian bargain that could cost us our full and flourishing humanity”. In seeking brighter outlooks “we risk flattening our souls, lowering our aspirations, and weakening our loves and attachments”. By accepting satisfactions that technologies can readily produce “we risk turning a blind eye to natural loves and longings the pursuit of which might be the truer road to more genuine happiness”(President’s Council on Bioethics 2003, 300).

Converging Technologies for European Knowledge Societies

On various lines, the European report (HLEG, 2004), a governmental initiative, adopts also a critical attitude towards the US report proposing a specific European approach to CT. If the credo of the US initiative report seems to be “we need technological acceleration to realize human potential”, the credo of the European report is “we need social innovations to realize technological potential”. Consequently, it distances itself from the explicit goal of enhancing human performance, capturing the stance through a paradigmatic phrase: Instead of engineering the body and mind, the report speaks of “engineering *for* the body and *for* the mind”. Instead of “enhancement of human performance” it hopes to divert considerations towards multiple programs and problems (e.g. Converging technologies for treating obesity, converging technologies for natural language processing, converging technologies for environmental remediation) and where converging technologies are not limited to NBIC.

The report is also critical of the militaristic flavor of the NBIC report explicitly drawing a line between military ambitions for CT and their developments in Europe. To highlight the different stance, the European report contrasts two CT projects: one militaristic and another therapeutic. This first, developed at the MIT institute for soldier nanotechnology, aims at making soldiers less vulnerable to enemy and environmental threats with an exoskeleton battle suit combining bioengineering, robotics and nanotechnology. The other, developed at Lund University in Sweden, aims at developing brain-controlled hand prostheses with electrical signals generated from multiple muscles electrodes implanted in the peripheral or nervous system.

Regarding the shaping of CT, the European report, subscribing to the precautionary principle, is much more explicit in the encouragement of deliberation in an environment open to social and political shaping and proposes even consultations with the citizens of Europe when risks and their nature are unknown. Consequently, it withdraws from advancing a specific agenda but places the emphasis instead on the agenda setting itself. Therefore, the report does not limit the areas of convergence to NBIC and includes among others, social sciences, philosophy, and evolutionary anthropology in the project of convergence. This orientation takes the form of an explicit recommendation to “recognize and support the contributions of the social sciences and humanities in relation to CTs, with commitments especially to evolutionary anthropology, the economics of technological research and development, foresight methodologies and philosophy”(HLEG 2004, 57).

NBIC revisited

The US NBIC workshops continued with yearly reports and new one on converging technologies for improving human performance was produced, taking into account, explicitly and implicitly, the reactions so far (Roco& Bainbridge, 2005). The main visions of converging technologies for improving human performance remained the same. However, there were major changes in approach as compared to the initial report. First, there are signs that convergence will include more than NBIC. For example, the report acknowledges that the cognitive science component could integrate “perceptual psychology, linguistics, cultural anthropology” (Roco& Bainbridge 2006, 11) besides neuroscience and artificial intelligence. In other parts of the report, there is talk about “nano-agro” (Roco& Bainbridge 2006, 61) convergence to refer to agricultural innovations, etc.

Secondly, the report places much more emphasis on “ethical and societal aspects”. For example, it answers the considerations of the *Beyond therapy* report concerning the pursuit of happiness and mood-altering drugs but arguing against a hierarchy of values and pleading for maintaining the decision of what is a good memory in the private sphere to each individual because “it does not make sense to appeal to one (Aristotelian) valuation of what qualifies as good memory or good happiness” (Roco& Bainbridge 2006, 168).

But perhaps the most striking change in the approach towards converging technologies is the shift in the discourse about the contribution of converging technologies to society. If in the first report they would bring about universal prosperity and world peace by the end of the century, now they are the only choice to avoid civilization disaster. The convergence of technologies is portrayed as the way to avoid conflicts such as those of the 20th century whose cause is claimed to have been over scarce resources. Only by moving to a new technological level will the peoples of the earth achieve prosperity without depleting resources (Roco& Bainbridge 2006, 2). However, it acknowledges that NBIC converging technologies are not a silver bullet solution to bridge the gap between haves and have-nots (Roco& Bainbridge 2006, 52).

Other reactions

The initial report on converging technologies triggered other reactions as well, some supportive while others critical. In face of the critics of the visions advanced, Bainbridge, one of the main editors of the NBIC reports defends the initiative (Bainbridge 2007). In his article explores in more depth the ideas that he introduced in the last report. CTs are the only way to avoid civilization collapse. He criticizes the European precautionary stance arguing that Western culture and ethic are based on outmoded religious beliefs constantly undermined by progress in sciences and technology. He sees two possible futures regarding converging technologies: one in which a religiously fragmented world halts scientific progress and enslaves technology to the ruling elites and one in which a radical transcendence of the human condition made possible by the convergence of technologies establishes a new creed to replace religion, making possible space exploration as well as transformation of the human nature (Bainbridge 2007, 3). For Bainbridge, the current period is a dangerous transition towards either abyss or a new renaissance where convergence becomes a new science based vision of the world enabling the transcendence he hopes for. He acknowledges that many would find these ideas strange and he proposes the compromise of leaving planet Earth as the cradle of traditional humanity and having other planets for those who want to transform themselves with converging technologies (Bainbridge 2007, 17).

Interesting to note that Bainbridge tempered his visions in this article as compared to one from just a year before (Bainbridge 2006), published soon after the new NBIC report. Besides arguing for a different homeland (possibly in outer space) for those pursuing the visions outlined for converging technologies, he also suggests and sympathizes with the idea that “convergenists”, seeking cyber-immortality (i.e. “the possibility that converging technologies will offer humans extended lives within information systems, robots, or genetically engineered biological organisms”, Bainbridge 2006, 1), could form a “covert network of radical cells”, which with the help of their considerable technical expertise, would “destroy the technologically dependent civilization that seeks to annihilate them”(Bainbridge 2006, 5).

On the other hand, Dupuy (2007), a member of the European commission expert group, withdraws from engaging in space travel dreams but he does acknowledge the importance of the “dreams of reason”. He makes the point that “men often dream science before doing it and that these dreams, which can take the form of science fiction, have a causal effect on the world and transform the human condition”. In this view, even wild imagination is no less important when it comes to shaping scientific imagination about technologies that do not yet exist in material form but which are already present in the form of dreams.

However, concerning the aim of project of converging technologies for improving human performance as laid out by the NBIC reports and other defenders of the initiative, he sees in them the ambition to capture the capacities of living organisms in order to harness them to human ends (when considering synthetic biology or genetic modification of organisms), a climax of the rebellion against human existence as it has been given (when

he contemplates dreams of technologically achieved immortality), a man's attempt to remake the world and himself anew, a Promethean project where man is turned both into a demiurge, as an engineer of evolutionary processes, but in the same time into an engineered artifact himself (when considering reproductive cloning, human genetic engineering or the naturalization of the mind by cognitive science).

He warns though that man, once artificialized by mechanizing the mind, would lose orientation and the grounds on which to exercise power over himself: "But in the name of what, or of whom, will man, thus artificialized, exercise his increased power over himself? In the name of this very blind mechanism with which he is identified? In the name of a meaning that he claims is mere appearance or phenomenon? His will and capacity for choice are now left dangling over the abyss"(Dupuy 2007, 20).

Nordmann (2007a), the European rapporteur of the European expert group, adopts a critical attitude towards discourses that engage in incredible scenarios, be they dystopian or utopian. They are distracting the scarce resource of ethical concern by construing possibly emerging issues as if they are already presenting themselves. He is skeptical of discourses about transcending mental capacities with brain-machine and brain-to-brain interfaces, dreams of immortality as being on the verge of possibility and different from temporary, non-transcending technical enhancements like binoculars, cosmetic surgery, or Viagra. Such discourses are many times crude extrapolations that should not be taken seriously as residing mainly on credulity and not on sound scientific grounds. As an example he gives the logarithmic plots presenting the history of technology that many historians of technology would find crudely simplistic.

In another article, Nordmann (2007b) refers to premature claims of unity of science and convergence of technologies as "mythical entities" that would not be amenable to rational debate or political choice. Such a myth around convergence needs thus to be demystified. In this way he argues that mystical conceptions are destroyed and developments could be opened to public scrutiny. He anchors this perspective in scientific traditions, which speak truth to power. Therefore, a skeptical attitude towards convergence is encouraged. Instead of engaging in unlimited speculations on possible futures, questions should be asked on how to establish agendas such that they are amenable to political choice. Instead of anchoring the drive of convergence in dreams promoted by specific agendas, the attention should be shifted towards agenda setting itself where the public would learn to formulate specific and rationally explicit demands to technologies.

4 Meta-ethical issues

The previous chapter reviewed in rough chronological way the arguments that have been made so far around converging technologies for improving human performance by major science and technology policy makers and commentators. Of course, there have been other authors commenting the subject as well but the selection gives the analysis enough ground to assess some of the hypothesis of NEST-ethics. This chapter analyzes meta-ethical issues including arguments concerning the steering of technological development. The debate so far exposes certain patterns that can be identified but it also presents interesting specificities.

Novelty

It has been argued in NEST-ethics that debates on emerging technologies start with a strong emphasis on novelty. The debate on converging technologies certainly exposes this pattern in a variety of respects. The discourse of the initial NBIC report itself puts great emphasis on novelty, which is manifest throughout the report; the word “new”, for example, can be encountered 886 times. Besides such a metric there are many ways in which novelty features in the report with respect to many aspects of converging technologies. For one, there are the visionary applications, some representing innovation by all means. Then, the opportunities and benefits that converging technologies could bring for multiple sectors of society are presented as tremendous quantitative increases as well as qualitative breakthroughs. Novelty is the key word also in the steps needed to control convergence, in that new ways are considered to be necessary for taking public interests into consideration (p. 23) and ethical deliberation is invited to take place from the beginning of the developments (p. 12).

Inevitability thesis

And it is perhaps from this last aspect that a first deviation from identified patterns can be seen: the low presence in the debate of technological determinism and the inevitability thesis. It has been argued that NEST debates start with a prima facie meta-ethical issue: the question whether technological development is inevitable or not in order to assess if talking about steering its course makes sense. So far, most actors seem to acknowledge that the convergence of technologies needs concentrated effort in order to happen and all invite debates right from the beginning. Promoters acknowledge the significant effort that will be needed to realize convergence while critics put significant effort in presenting alternatives or showing the initiative as risky. However, some forms of determinism may be embedded in rhetoric but they are not explicitly defended. For example, the verbs chosen to describe the visions are at present continuous, “converging”, suggesting a process happening already, therefore a development upon which there is no question about it being started or not. Moreover, the verbs used to describe its potential applications lack any conditional forms being at future simple: sensors *will* enhance,

computers *will* transform, robots *will* be useful for human beings, the human body “*will* be more durable, healthier, more energetic, easier to repair” (Roco& Bainbridge 2002, 19).

This being said, this analysis found that the inevitability thesis is lacking its prominent role in the CT debate as compared to other debates over new technologies. The NBIC report advocates explicitly an aggressive advancement of the agenda because it is “a timely opportunity” and because progress will not “happen automatically, without the necessity for vigorous action” (p. 17). From critics, this acknowledgement that steering is possible can be deduced from the effort invested in criticizing the visions or exposing them as utopian and dangerous. Moreover, the quasi-unanimous invitation to ethical deliberation rests on the presupposition that such debates can have a real impact in steering the development and shaping the visions.

Three observations can be made from this inconsistency. A first (but superficial) remark about NEST-ethics would suggest that it was a hasty conclusion to consider the inevitability discussion as a *prima facie* meta-ethical issue in NEST debates. However, this would be indeed a superficial conclusion as countless debates on new technologies record this pattern and this observation is by no means hasty. Technological determinism has been historically a major issue of contention over technological development and many authors have adopted even a fatalist stance on technological development (e.g. Jacques Ellul).

The low presence of technological determinism ideas so far in the debates on converging technologies could point towards two other explanations. On one hand it could be the case that the discussion has not taken place yet but it is only postponed. On the other, there might be something qualitatively different about converging technologies, which increases uncertainty about the future, giving room for more choices and thus vanishing or inhibiting the discussion over inevitability.

The first thesis among the two is related to the actual path that converging technologies will take. If further development of converging technologies goes on a track that can be viewed by some actors as resembling scenarios described in (ancient) prophecies, the argument that human agency was powerless in influencing it anyway might gain weight again thus reigniting the inevitability discussion, for example, if converging technologies get to be viewed by some as fulfilling a destiny, a heideggerian *geshick*. Converging technologies might not be viewed by some as the result of human doing, which would trigger the reaction of those arguing that any prophecy should be seen at most as a warning or heuristic but not as predetermination.

The third conclusion derived from the observation would hint towards a possible qualitative difference in technological development concerning converging technologies. In general technological progress decreases dependency on the given but it might be the case that the visions accompanying CT are so radical that they amount to a drastic increase of contingency concerning the human condition. This might also explain the absence of the inevitability thesis discussion as increase in freedom of choice is related

with a decrease in the belief of a predetermined path. Grunwald (2007) sees the signs of this increase of contingency of the human condition brought about by converging technologies in the very fact that the discussion over technologically modifying the human body and mind takes place. Converging technologies might mark the entering in an age in which not only there is increased freedom of choice but also in which there is a need for orientation, which could be seen in the increase in the number of visions and scenarios about the future. Still, not only the character of this technological development could justify this attitude towards technological development in the debate on converging technologies but also social learning. It could be the case that the level of awareness has raised about the role of social forces in the shaping of technological development. Finally, it could be the case that the debate so far has been one between experts and their insights in the mechanisms shaping technological developments prevents them from adopting a determinist stance.

Mobilizing the past

Besides visions of the future, seeking orientation is done by appeals to the past as well. Such a pattern of argumentation can be seen as well in the CT debates however, with some modifications. NEST-ethics argues that previous technologies can be mobilized either to support the new technological development because technologies have helped in the past or to cast suspicion because similar previous technologies have brought unintended and unwanted side effects. In the converging technologies debate, this pattern can be seen for example in the references to the successes achieved by the individual domains. For example, the revolution in information technology is praised for helping to “efficiently gather, store, transmit, and process information”(p. 82).

Mobilizing the past is also done by mythological invocations. The CT debate certainly exposes a rich set of mythological invocations but not without deviations from what NEST-ethics has identified. For example, NEST-ethics argues that Prometheus is usually invoked as a protector of the promoters of technology that boldly reach for goods that could improve human condition. However, the myth has more variants and interpretations and we find it invoked by skeptics as well. Dupuy likens the “NBIC convergence with a “Promethean project” (p. 15), while his entire assessment of the initiative is a highly skeptical one. Why would he derive skepticism about the US NBIC visions of convergence while in the same time describe it as promethean? It may be the case that promoters and critics refer to different interpretations of the myth. In some variants, Prometheus features as a benefactor of humanity tricking Zeus, viewed as a tyrant, and giving fire to human kind and improving their condition. Dupuy seems to refer to another interpretation of the myth, possibly of Hesiodic origin, in which Prometheus is portrayed as a subversive character, chained for transgressing the moral order.

Multiple other myths are invoked also in the converging technologies debate some identified in the NEST-ethics framework but some not. There are no surprises concerning the invocation of Faustian bargain. The President’s council on bioethics refers to the story of Faust making a pact with the devil in return of knowledge viewing it as a risk “that

could cost us our full and flourishing humanity”². However, orientation by appeals to archetypes also varies. Therefore not all identified tropes can be found in the converging technologies debate and also the debate exposes ones that have not been inventoried.

As examples of the first category, King Midas invoked inversely about the civilization that turns everything it touches into means of destruction, is not invoked as such by participants in the CT debate but it is invoked directly. The PCBE refers to the Midas problem with reference to the perceived benefits that CT may bring but which might turn out not to be what was needed (p. 183). The myth of the ancient Greek King wanting to turn everything it touched into gold only to realize he is starving to death, is about wrong desires, getting something and realizing it is not what was wanted. The PCBE gives examples of improved human performance but which is uncoordinated. That is CT may increase lifespan but not increase all capacities in the same time. This could result in longer lifespan, strong muscles but weak joints, ardent desire but weak potency. Given these possibilities, the plea is one for caution. One might imagine that the trope would become more prominent if CT would follow a scenario in which humanity having embraced it for increasing performance would discover that they also deny their flourishing while their pervasiveness makes them inescapable.

However, the absence of the invocation of King Midas inversely to warn about destruction may be a sign of the credibility that technology in general currently holds and its potential for fruitful outcomes. This can be deduced also from the reformulation of the proponent/opponent dichotomy, which becomes proponent/skeptic. The distinction is significant in that opposition tends to avoid blunt rejection but making instead pleas for caution.

From novelty to business as usual

It is observed in NEST-ethics that in face of opposition stressing the side effects of the novel technology, proponents are faced with the choice of shifting away from the initial emphasis on novelty and presenting the technology as nothing unusual but as a continuation of previous developments. This pattern can be seen in the CT debate but not without interesting variations.

Clearly the US initiative emphasized novelty and that novelty was picked up by critics to disclose possibly unintended and undesired side effects. In turn the debate already shows signs that the discourse of the promoters is going to change. The most recent NBIC report prompts this choice explicitly. In his article in the report, Khushf suggests that those crafting the NBIC initiative could take the strategic path of purging the discourse of the controversial areas, postponing public debates and thus easing the road for industrial and governmental funding. “In other words, put off the difficult parts of debate until a later time, when you have already gotten the initial funding and infrastructure in place”(p. 277). Such a shift in argumentation that downplays the radical character of CT can already be seen, for example in Clark’s paper, where he argues about converging

² President's Council on Bioethics, 2003: “*Beyond Therapy: Biotechnology and the Pursuit of Happiness*”, p. 300

technologies for cognitive enhancement that “are just one more step along this ancient path” (Clark 2007, 17).

By appealing to the extended mind thesis he proposes a reconceptualization of the mind as having constantly negotiable boundaries with the world, “criss-crossing the boundaries between biology and artifact” (Clark 2007, 17). He thus argues that we have a long history of enhancing ourselves through sensory substitutions, bodily extensions and cognitive reconfiguration. On this line he sees nothing new in converging technologies for human enhancement but just one more step along an ancient path. However, he suggests a guarded optimism concerning their advancement and he warns that this conceptualization of the mind as a soft self can lead not only to repair, empowerment and growth but just as well to coercion, monsterring and subjugation.

A similar swing of discourse takes place with Bainbridge. However, he is not playing down the novelty but changes his discourse in that it draws a much bleaker view of the current context in which converging technologies would feature. If initially they were presented as bringing a blissful state of prosperity in a rather short time, now they are depicted as a necessity for avoiding civilization collapse. If one should relate this turn to the inevitability thesis, it could be argued that this strategic discursive shift prompts towards moral inevitability: We are morally obliged to act now when confronted with potential disastrous consequences. Here, the appeal to moral intuitions works not so much from linking with precedent developments but by showing the novel technology as necessity and not as luxury.

Precedent and consequent

The argument from precedent links past technological developments to the emerging one, in order to show that the current one is essentially the same despite its appearance of novelty. If we accepted breeding techniques for modifying the genetic traits of animals, shouldn't we be consistent to accept genetic modification and cloning?

The argument from consequent, which is about applying criteria based on desirable/undesirable future to the past or the present, is not yet present prominently in the converging technologies for improving human performance debate. This is most probably because there is no consensus yet that converging technologies are unacceptable as such. That is, even critics of the initiative acknowledge some positive outcomes. The *Beyond therapy* report as well as the *European* report, speak about many positive outcomes of the convergence of technologies. To turn the argument from precedent around into one from consequent there should be consensus about the prospects analyzed as being unacceptable and that should form the basis on which the doubt is cast on similar previous or current developments. The CT debate did not reach that state yet. The conditions for the raise to prominence of the argument may be a widespread condemnation of unacceptable practices or a moratorium. For example, if we agree that CT for improving human performance brought about unacceptable loss of privacy due to brain-computer interfaces, or unacceptable instrumentalization of the life world through

genetic engineering than we should reassess our current practices in relation to invasions of privacy or our practices in the bio-industry.

Habituation and moral corruption

Another pattern of argumentation concerns technologically induced moral change, which has two mirroring arguments, habituation and moral corruption. It has been argued that these arguments occur latter in debates when first round of arguments seem unable to win. However, in CT debate we see them right from the beginning. The habituation argument holds basically that although currently the new technologies seem to be against established moral norms, in time there will be reconsideration of the morals when people become used to the technology. However, the US NBIC initiative on converging technologies started from the beginning with the presupposition that widespread ethical consensus will be built on the way. Since the visions on CT for improving human performance remained basically the same in the next report, it follows that the promoters expect morals to change as the visions are concretized. However, it must be said that defenders of CT did not engage in this argument explicitly by invoking previous cases where people got used in time with the technology. Moreover, Bainbridge acknowledges explicitly, “when confronted with such ideas [...] many people will resist”(Bainbridge 2007, 17).

This is not the case with the moral corruption arguments. They feature fully in the report of the PCBE and in the European report. In the form of slippery slope, the argument can be found in the European anxiety on the military potential of CT for improving human performance. Although the report acknowledges the benefic potential of converging technologies it warns that the same technologies could lead to “remote manipulation of soldiers’ minds”, “surveillance and invasions of privacy”, “selective bio-weapons that could target individual politicians” leading to a “highly unstructured and non-negotiable arms race” that might “decrease stability and endanger international security”, “undermine and jeopardize the international law of warfare”. This in turn, the argument goes, is easy to imagine that it may inspire abuses by groups of militants, by criminals and perhaps abuses by the government. For example, governments might “employ surveillance technology for sophisticated forms of industrial espionage or to gather data about consumers and citizens” (HLEG 2004, 40). The solution proposed in the European report is not to stop the development now in order not to dive into this moral abyss but to maintain a strict line delineating the military ambitions and also to put in place supra-national mechanisms for assessing developments, limitation treaties and codes of good conduct.

The President’s council on bioethics makes a similar argument in the Beyond Therapy report. It also acknowledges the therapeutic potential of these technologies but warns about the new uses once they become available: “Even the prospect of machine-brain interaction and implanted nanotechnological devices starts with therapeutic efforts to enable the blind to see and the deaf to hear. Yet the “dual use” aspect of most of these powers—encouraged by the ineradicable human urge toward “improvement,” exploited by the commercial interests that already see vast market opportunities for nontherapeutic

uses, and likely welcomed by many people seeking a competitive edge in their strivings to “get ahead”—means that we must not be lulled to sleep by the fact that the originators of these powers were no friends to brave new world. Once here, techniques and powers can produce desires where none existed before, and things often go where no one ever intended”(PCBE 2003, 12)

Government vs. Governance

At this point the moral corruption argument leads into calls for control of the development with many possible solutions from governmental moratoriums to self-governance by the industry. With this respect, both the European report and the second NBIC report make extensive efforts. The European report makes an explicit recommendation towards “transparent decision making processes” and “new models for participatory research governance”. Besides this it also emphasizes the need for “mechanisms for public deliberation and social engagement, including the participation of social scientists and ethicists in the agenda-setting and research process”³.

In face of the critics that the initial NBIC report does little to tackle the risks, the last US report meets explicitly the issues of managing the development of CT for improving human performance. It also emphasizes the shift from government towards governance arguing that “newly developing form of ethical reflection, can responsibly lead into a future, where the engines of growth are also the engines of self-regulation, reflection, and mature governance”⁴. A framework of good governance proposes a broad and transparent approach, advancing responsible development dealing with health, safety and ethical concerns and risks, encouraging global partnerships, establishing long-term commitments and planning and the inclusion of all those forging and being affected by the new technologies,

However, the report still places emphasis on the need for government policies that should foster the convergence itself. In the NBIC version of convergence, government is assigned a major role in allocating funds and gathering the industry and academia into programs focused on promoting the development. So far, the debate did not slip into arguments about the practicality of the strategies but it may be anticipated that once undesired outcomes appear the consequent crisis would trigger an assessment of what has been proposed so far in the area of governing the converging technologies for improving human performance.

The following chapters go into patterns of ethical argumentation starting with consequentialist arguments and continuing with deontological, good life arguments and justice arguments. The next chapter scrutinizes consequentialist argumentation in the debate so far, as it is argued that NEST debates start in practice with arguments of a utilitarian nature.

³ *ibid.* p. 36

⁴ Roco Mihail C., Bainbridge William S., 2005, “*MANAGING NANO-BIO-INFOCOGNO INNOVATIONS: CONVERGING TECHNOLOGIES IN SOCIETY*” NSF/DOC-sponsored report, National Science Foundation., p. 263

5 Technologies and their consequences

According to NEST-ethics, consequentialist argumentation makes its plea for or against an emerging technology by anchoring the case with reference to the consequences produced by it. There is also a link in these arguments with meta-ethical issues, for example, with respect to the basic attitude towards technology underlying these arguments. Therefore, two perspectives on technology may fuel consequentialist argumentation: technology is ultimately beneficial or inherently dangerous.

Enormous benefits

We need these technologies because their consequences are overwhelmingly and ultimately desirable. The new technologies are advocated for being instrumental in bringing about certain consequences that are believed to maximize overall happiness. NEST-ethics argues that in practice, NEST debates start with utilitarian argumentation: If we invest in this science or technology we will be able to manipulate the natural world and obtain such and such positive effects. This kind of argumentation projects visions of desirable outcomes making assumptions about their deontological and good life incontestability. Moreover, NEST-ethics argues, the optimism gets rid of the problem of ignorance and uncertainty about the future by downplaying negative consequences as accidents and gets extra strength by allying with technological determinism: resistance is undesirable but also futile.

The CT for improving human performance debate surely follows this pattern but also presents deviations as it will be showed later in this chapter. The initial NBIC report was conceived as a visionary document in which authors projected visions of the benefits that CT may bring: “Examples of payoffs may include improving work efficiency and learning, enhancing individual sensory and cognitive capabilities, revolutionary changes in healthcare, improving both individual and group creativity, highly effective communication techniques including brain-to-brain interaction, perfecting human machine interfaces including neuromorphic engineering, sustainable and “intelligent” environments including neuro-ergonomics, enhancing human capabilities for defense purposes, reaching sustainable development using NBIC tools, and ameliorating the physical and cognitive decline that is common to the aging mind” (Roco& Bainbridge 2002, 9). In another place, converging technologies are argued to bring contributions to “societal productivity, in terms of well-being as well as economic growth, security from natural and human-generated disasters, individual and group performance and communication, life-long learning, graceful aging, and a healthy life, coherent technological developments and their integration with human activities, human evolution, including individual and cultural evolution”(Roco& Bainbridge 2002, 18).

These quotes are just some among many in the report starting the debate, displaying the confidence in the overwhelming benefits that the convergence of technologies could bring. There is practically no argument of a deontological or virtue ethics nature brought up in the initial report. The examples are given with the presupposition that their consequences are overwhelmingly desirable while any potential drawback is going to be

solved along the way as this statement suggests: “widespread consensus about ethical, legal, and moral issues will be built in the process”(Roco& Bainbridge 2002, 19).

Here we see how this view of technologies as having ultimately overwhelming beneficial consequences links back to a meta-ethical issue that can be found also in the habituation argument usually used by promoters: Despite all the risks and accidents that may happen, morality will change and people will eventually embrace the new technology as the consequences will be considered much more beneficial than the drawbacks. The following quote shows again that consequentialist argumentation is influential in the thinking of promoters of CT for improving human performance, relegating risks as challenges to be overcome in the name of benefits that cannot be ignored: “we all agree that while all possible risks should be considered, the need for economic and technological progress must be counted in the balance” (Roco& Bainbridge 2002, 109).

Enthusiastic promises and visions of benefits brought about by the new technology have the role of rallying allies and tempt investors. However, it is also the incentive for critics to doubt the underlying assumptions of the announced benefits. Consequentialist contestation, NEST-ethics argues, looks for undesirable consequences of the new technology in order to highlight alternatives, question feasibility, the cost/benefit ratio or the character of the benefits.

Consequentialist contestation

NEST-ethics frames consequentialist contestation as the set of arguments anchored in the consequences produced by the new technology as contrasted with those based on deontological and virtue ethical grounds. Relating them to meta-ethical attitudes, consequentialist contestation may tap into a pessimistic attitude concerning technology. When it does, NEST-ethics argues, it also gets rid of uncertainty about the future, just like the optimist attitude, but by arguing that the technology will definitely bring undesired consequences in the future even if we currently may not know exactly how. Such pessimism may lead towards either voluntarism fueling attempts to change the course of events but also towards fatalism when combined with determinism. NEST-ethics identifies three lines of contestation in the consequentialist vein.

The first axes of contestation questions the feasibility of the advanced project. Because visions are based on assumptions, we’d better get the facts straight before investing, so the argument goes. As examples of highly improbable visions of technologies, NEST-ethics gives one of the NBIC promises, the brain implantable chip useful for learning a language. Learning a language is such a complex process that a brain-chip interface will have immense difficulties to even prove theoretically feasible and be taken seriously.

The converging technologies debate certainly does not lack voices that question the feasibility of NBIC visions. The European report introduces some doubts about the feasibility of some projects within convergence besides their consequential critique as this quote shows: “CT visionaries and their critics tend to assume [...] that brain implants to enhance mental capacities are technically feasible.” (Nordmann 2004, 21). In another

article, Nordmann deals extensively with the speculative nature of many of the visions, questioning their feasibility. He criticizes not so much the visions themselves but the discourses wrapping them up in a realm of immediate attention when they are hardly theoretically possible. As examples of projects that he argues are a waste of ethical concern are “(unlimited) life-extension, mind-machine and mind-mind interfaces, expanded cognitive power or new sensory modalities” (Nordmann 2007, 3). Besides criticizing the rhetoric of shortcutting any conditionality in presenting the visions, his analysis challenges also the idea that what could be physically possible is also technically possible, which seems to be behind many of the visions of the US NBIC reports. In support of dismissing many of the extravagant visions, he reminds some of the fringe-science of previous decades like cryonics. So, it can be said that the CT debate follows this NEST-ethics pattern.

However, it must be said that other critics take the proposals for what the promoters say they are, assuming their feasibility. The US PCBE *Beyond therapy* report engages fully some of the technical visions scenarios derived from the US NBIC report. Although the council acknowledges that “taking up these semi-futuristic prospects may seem a waste of public attention, especially given the more immediate ethical issues that clamor for attention”, it still considers “important to open up this subject for public discussion. For it raises some of the weightiest questions in bioethics. It touches on the ends and goals to be served by the acquisition of biotechnical power, not just on the safety, efficacy, or morality of the means. It bears on the nature and meaning of human freedom and human flourishing. It faces squarely the alleged threat of dehumanization as well as the alleged promise of superhumanization” (PCBE 2003, 31).

The second axis of consequentialist contestation focuses on the ratio between the benefits brought about by the new technology and the costs it implies. If we should proceed with this new technology, we should first weigh its costs (e.g. health, environment or safety risks). By linking this line of argument with warnings of transgressing limits and our cognitive capacity or with the wisdom of stories like the Sorcerer’s apprentice, NEST-ethics argues that consequences for the good life can be viewed also in terms of benefits/costs ratio. Although the implications of a new technology for the good life can be viewed in term of consequences, this kind of arguments will receive a separate analysis in a later chapter. Stories that highlight the consequences of irresponsible behavior and transgressing limits certainly have their role in reminding about possibly neglected wisdom, which cannot be seen so easily with a cost/benefit analysis.

The converging technologies debate certainly does not lack cost/benefit analysis, which can be encountered at most critics of the development, however each with different flavors. The two reports we will refer to, the *European* report and the *Beyond therapy* report are conceived especially to show other sides to converging technologies but differ in the emphasis they place on various kinds of risks. For example, it can be noticed that in the *European* report economic and social costs are predominant whereas in *Beyond therapy* there is a stronger emphasis on consequences that present risks for the good life but it elaborates on social risks as well.

The *Beyond therapy* report classifies the analysis based on major themes of improving human performance: better children, superior human performance, longer lifespan, enhanced mental states. For example, the report views the social risk of selecting the sex of children in terms of the tragedy of the commons. That is, individuals acting in their self-interest could jeopardize a shared resource and in the end wrack their benefits as well. For example, if parents will be allowed to choose the sex of their offspring, the risk is that certain cultural predispositions (for example to want boys) will create, in the long run, a social unbalance at the macro level even if the micro level, the family, might not see it as a risk on the short run.

Other long-term consequences identified in the report concern the diversion of the technologies towards ends not initially intended. For example, it is warned that the power of these technologies is so great that the temptation to divert them to undesired uses, once developed, is significant. What started being advertised as promising benefits in the interest of the majority can easily be transformed in agents of social control in the interest of an elite. For example, genetically engineered super-pathogens as tranquilizers for the unruly (PCBE 2003, 29).

The European report identifies also several risks, which are labeled as “threats to culture and tradition, to human integrity and autonomy, perhaps to political and economic stability” (HLEG 2004, 7). Concerning economic risks, the report warns that promises could not materialize and investment could be lost. For example, brain-to-brain communication might be a non-starter therefore investing in this technological promise could loose public and private funds. This argument is similar in effect with the argument of feasibility: Investment needs caution, as many visions may prove unfeasible in the end.

The report identifies also other sources of economic and social costs. They might come from the unbalances in the work and leisure that these technologies with such a tremendous power might create. For example, high efficiency would create unemployment, targeted medical treatment increases longevity putting pressure on the medical system with respect to taking care of the elderly, highly efficient agricultural technologies would put pressure on traditional cultures, which would be unable to compete (HLEG 2004, 40).

A special section in the European report deals with the consequences inflicted by converging technologies for improving human performance in the battlefield. The report warns about the dangers to the integrity of the soldier if such technologies would be used to enhance his body, the loss of freedom and privacy. These military applications of converging technologies, especially the autonomous robots could also generate an unstructured and non-negotiable arms race, disturbing the international law in warfare (HLEG 2004, 40).

So, it can be said that in the cost/benefit axes of contestation presents a rich set of arguments that can be encountered in the debate on converging technologies. This type of argumentation can be found with preponderance in expert reports, which need to draw operational recommendations to social actors including governmental bodies, which might have to balance the benefits and costs in face of investment decisions.

This verifies another NEST-ethics observation. Usually, experts perceive risks in quantitative terms whereas the general public tends to view them in qualitative terms. This can be encountered in the set of selected documents, in the sense that the risks identified by the expert groups are mainly ones that can be translated in recommendations, which can be implemented. For example, the European report translates the analysis into a set of 16 recommendations towards the European Commission and Member States. However, there are also risks through which the expert groups that elaborated the reports gave voice to general public concerns. This is more the case of the PCBE, which focused more on risks for the good life but this will be dealt in a future chapter.

A third line of consequentialist contestation, proposed by NEST-ethics questions the benefic nature of the consequence. Are these benefits really benefits? As an example, NEST-ethics gives the rejection of cochlear implants by the deaf community, precisely because it would have jeopardized their own culture. Such a line of argument appears when the assumptions made by the promoters of technology are not universally accepted. Usually, promoters assume that anyone would want the consequences they envision the technology might bring but it turns out that this is not always the case.

In the converging technologies debate, the European report anticipates that highly efficient applications of converging technologies used in agriculture, could be rejected by traditional cultures as it would extinct their lifestyle. The European perspective on converging technologies embraces such justified resistance and argues that they have a positive shaping effect on the process of converging technologies. “Resistance was by no means irrational. It can be seen as a component of the process by which societies select among technological options”(HLEG 2004, 35). Such resistance is inevitable in a pluralistic society where many worldviews share the same discursive universe. Therefore, it seems that the European perspective goes along the overall NEST-ethics approach that of a pragmatist ethics in which participants cannot be a priori branded as unreasonable. Such clashes highlight that the utilitarian ethics aiming for maximizing happiness and minimizing pain might not always be adequate in taking decisions.

A similar contestation of the benefic character of the promises can be found in the *Beyond Therapy* report. Although acknowledging the potential benefits of converging technologies, the council through the voice of Leon Kass, the PCBE chairman, states: “Yet the very insouciance of some of these predictions and the confidence that the changes they endorse will make for a better world actually serve to increase public unease. Not everyone cheers a summons to a “post-human” future” (PCBE 2003, 7). In another article (Kass 2008) he highlights that the benefits of biotechnology are in the same time a threat to human dignity: “the President’s Council on Bioethics [...] has paid considerable attention to various aspects of human dignity that are at risk in our biotechnological age: the dignity of human procreation, threatened by cloning-to-produce-children and other projected forms of “manufacture”; the dignity of nascent human life, threatened by treating embryonic human beings as mere raw material for exploitation and use in research and commerce; the dignity of the human difference, threatened by research

that would produce man-animal or man-machine hybrids; the dignity of bodily integrity, threatened by trafficking in human body parts; the dignity of psychic integrity, threatened by chemical interventions that would erase memories, create factitious moods, and transform personal identity; the dignity of human self-command, threatened by methods of behavior modification that bypass human agency; the dignity of human activity and human excellence, threatened by reliance on performance-enhancing or performance-transforming drugs; the dignity of living deliberately and self-consciously, mindful of the human life cycle and our finitude, threatened by efforts to deny or eliminate aging and to conquer mortality; the dignity of dying well (or of living well while dying), threatened by excessive medical intervention at the end of life; and the dignity of human being as such, threatened by the prospect of euthanasia and other “technical solutions” for the miseries that often accompany the human condition”. In sum, the council questions the very benefic character of the announced technologies. The contestation present in this quote reminds that the assumption that the consequences of these technologies are universally embraced is not valid. There are at least some among the beneficiaries who do not agree.

So far, this section has tested the validity of the analytical categories of consequentialist argumentation advanced by NEST-ethics. Although argumentation from all three lines of contestation was found in the CT debate, the analysis has not yet reflected flows of arguments, which form argumentative patterns. In the following we show how such a stream of arguments features in the CT debate.

Upstream solutions vs. technological fixes

NEST-ethics inventories three recurring tropes following a pattern in this consequentialist cluster. The first could be called the “upstream solutions” argument. It basically pleads in favor of the new technological development because this might help us get rid of solving certain problems in cumbersome ways and deal with the root cause. No longer must we operate by chopping the body because the laser technology will only need a small incision. No longer must we dedicate so much effort to deal with epidemics because vaccines solve the problem at the core. No longer must we deal with the problem of street dogs when sterilization or a vaccine reduces the population drastically. The second argument, coming as a response, could be called the “technological fix” argument. It could be easily integrated in the third consequentialist axes questioning whether the benefit is really a benefit. Its basic tenet is that the proposed “upstream” solution is only superficially patching a more complex problem, which requires a broader approach: For example, we might have thought that cars solved the problem of pollution from horses in cities but the test of time showed that it created more pollution problems than it solved. The third trope is the answer of the proponents and argues that the technological solution is more realistic and feasible and accuses the critics of holding to dogmatic beliefs, for example that social problems necessarily require social solutions.

This pattern can be encountered throughout the whole debate on converging technologies. Trademark examples of NBIC convergence are the implanted nano-sensors constantly monitoring body characteristics like blood pressure and the engineered bio-molecules

targeting specific cells like cancer cells (Bainbridge 2002, 392). It is argued that such technologies combining knowledge from nanotechnology, biotechnology and information technology would drastically increase health and decrease the costs of healthcare by signaling problems very early (Roco& Bainbridge 2002, p. 280). Besides health care, the report gives other examples of upstream solutions where CT for improving human performance could solve what is viewed to be the cause of many contemporary problems. It is argued, for example, that a brain implant sending certain inputs to a driver could reduce the number of traffic accidents caused by drivers falling asleep. This could be done through a feedback system sent from a computer through the implanted device to the brain of the person “since the possibility of implanted devices to stimulate or improve cognizance are emerging, the driver may also benefit from neuronal stimulation designed to keep him or her alert and performing optimally during the trip” (Roco& Bainbridge 2002, 202). To this end, “Convergenists advocate aggressive research in cognitive science, including computational neuroscience, to understand how the human brain actually creates the mind, and thus how to emulate it” (Bainbridge 2006, 4).

The President’s Council on Bioethics calls “cheating” the implants and biotechnological products that goes beyond therapy. The examples used highlight the technological fix character of the solution. “People who take pills to block out from memory of painful or hateful aspects of a new experience will not learn how to deal with suffering or sorrow. A drug that induces fearlessness does not produce courage”(PCBE 2003, 291). Biotechnological products, which are “readily available to satisfy short-term desires or to produce easy contentment, change the character of human striving profoundly and the desire for human excellence fades”(PCBE 2003, 285). This is particularly relevant in sports where certain technological enhancements are argued to violate the integrity of that particular sport. For example “corked baseball bats, are believed to permit increased bat speed and thus hitting power. Yet they are considered an unacceptable form of cheating and are illegal in professional baseball”(PCBE 2003, 109).

It can be deduced from the US President’s Council on Bioethics examples that the critical view it has on biotechnologies enhancing human performance beyond therapy is based on ideals of human excellence and categories that distinguish human effort from technologically enhanced one. Referring with the term “cheating” to situations where the human body and mind performs an activity aided by a technological artifact, presupposes positing an ideal for the particular activity anchored in traditional categories.

A similar adherence to traditional values can be read at Dupuy in Europe: “When one loves somebody, one does not love a list of characteristics, even were it to be sufficiently exhaustive to distinguish the person in question from everyone else. The most perfect *simulation* still fails to capture something, and it is this “something” which is the essence of love, that poor word that says everything and explains nothing. I greatly fear that the spontaneous ontology of those who wish to be the makers or re-creators of the world knows nothing of the beings that inhabit it but lists of characteristics” (Dupuy 2007, 22). “We should not renounce attaining the perfect knowledge that makes us capable of creating a man, but once we attain the knowledge, we should abstain from acting on it” (Dupuy 2007, 25).

When he criticizes the attempt to simulate life by means of bio-nano-info-cogno technologies as having as a consequence confusion in the world, Dupuy adheres to traditional values and dogmas. His argument would translate: The potential for love in humans and the impossibility of technology to simulate this realm suggests that the attempt to re-create a world in which humans and other life forms are relegated to lists of characteristics is bound to be one in which there is inherent injustice towards these beings. Moreover, he makes a strong plea, “before it is too late”, in favor of practicing abstinence from giving in to exercising our knowledge and power to remake the world and ourselves, should we obtain such knowledge. In this light, behind the story of the Man who has full knowledge and power over the world but he chooses to withdraw from exercising it, one could read an echo of the story of the rejections of Satan by Jesus in the desert.

Bainbridge’s visions, namely improving human performance indefinitely and “redefining human personalities as dynamic patterns of information, and human life as a process of evolution from material to computational planes of existence” are advanced along with a rejection of traditional values and dogmas. “The Convergence agenda is aimed at improving human performance without limit, and many of the anticipated technological spin-offs would be useful for recording, preserving, and reanimating human personalities—ultimately creating cyberimmortality” (Bainbridge 2006, 4).

This agenda for Convergence, Bainbridge argues, requires “a fresh foundation for culture and civilization” (Bainbridge 2007). This argument is a response to critics of his vision for converging technologies as many of these are founded on traditional values and dogmas. He makes it clear that “it is pointless to be cautious about developing new Converging Technologies” and the convergence of technologies requires renunciation of many traditional values and dogma: “Research enabling you one day to archive and regenerate your memory, personality, and consciousness—giving you cyberimmortality—may meet resistance from religious groups arguing that the soul is a spirit, not a system”(Bainbridge 2006, 1).

So, this NEST-ethics pattern can be fully found in the debate over converging technologies. “Upstream solutions” are called then “technological fixes” and these are accused in turn of “clinging to dogmas”.

However, it should be noticed that Bainbridge does not have problems with upholding dogmas but with upholding certain dogmas. This is because he envisions a new religion (Bainbridge 2007), he uses religious motifs when he likens “convergence” seeking cyber-immortality with “the proverbial Christians thrown to the lions” (Bainbridge 2006, 5) and he proposes that converging technologies should be pursued as a creed to replace religion (Bainbridge 2007).

This chapter investigated how does consequentialist argumentation feature in the converging technologies debate. The next chapter will concentrate on deontological arguments and arguments pertaining to justice and distribution of goods. NEST-ethics argues that deontological arguments enter the debate later on, when certain issues cannot

be resolved with consequentialist argumentation. We will verify if this pattern is found along with the ones about justice, which are argued to receive only passing reference in debates on new technologies.

6 Duties and rights

Consequentialist argumentation judges the rightness of actions based on the consequences they produce. In contrast, deontological argumentation judges the rightness of the action in itself, irrespective of the consequences. Therefore, deontological argumentation is anchored in references to duties and rights.

NEST-ethics argues that deontological argumentation is brought in the debates on new technologies when the technology announces to touch on deeply held beliefs or to infringe on rights and the consequentialist argumentation seems unable to do justice to the issues. For example, even if a technology might maximize overall public health or increase efficiency, its development could be contested if it involves cruel experimentation on vulnerable entities or if it infringes on fundamental human rights. However, NEST-ethics argues, deontological arguments are not only called to counter optimistic promises of benefic consequences but are also advanced in support of the technology, for example by invoking the duty to diminish human suffering or the duty to acquire knowledge and further progress.

Three ways are identified in NEST-ethics in which deontological arguments are contested. The first is by arguing that another principle takes precedence in front of the one initially invoked. This can be done either in favor or against the technology. For example, although we have as a principle promoting health and benefiting the public, we first have the duty not to cause harm to human beings and animals in the process, so we should ban demands of technologies that imply cruel experiments. The second way to counter a deontological argument is by arguing that the principle does not apply to the technology in question. For example, we have the duty to help parents, which are unable to procreate if they wish to but this might not apply if they want to clone themselves. The third is by invoking the principle differently and turning it in favor or against the technology. For example, the principle of freely using a technology might prove in practice to create the conditions in which people are forced to use a technology.

In fact, it can be observed that many of the patterns identified in consequentialist argumentation can be sometimes reformulated in terms of duties and rights. Rights are also often invoked in debates on new technologies. NEST-ethics identifies the right to informed consent in using the new technology including the right not to use the technology. A pattern of argumentation occurs when the right to freely use a technology is viewed by critics as infringing on the right not to use the new technology. For example, some might invoke the right to security when embracing information-rich systems for the prevention of terrorism. However, we should not allow these systems to compromise the right to privacy, which should take priority, so the argument goes, at least in European societies. Or, some argue that they have the right to freely choose to enhance their offspring if the technology offers them the possibility just as they have been given the right to select among embryos. However, others would argue that such a right might infringe on their right not to choose, as after a while the social unbalances in a competition culture would practically force them to enhance their children as well.

The duty to further (human) progress

The initial US NBIC report does not focus on deontological arguments but on consequentialist ones. However, one could identify in various statements, positions seeking a deontological anchor. For example, the converging technologies effort is presented as “a broad, crosscutting, emerging and timely opportunity of interest to individuals, society and humanity in the long term” (Roco& Bainbridge 2002, 9). The timely characteristic of the opportunity injects a sense of urgency to the endeavor and points towards a duty we have to engage with it in order to further (human) progress.

This obligation to further progress is reiterated stronger in the 2006 US NBIC report when the plea for fostering this technological development is justified in the name of saving the civilization itself. “Only by moving to a higher technological level will it be possible for all of the peoples of the world to achieve prosperity together without depleting essential natural resources to the point at which the future of civilization itself is in doubt” (Roco&Bainbridge 2006, 10).

But explicitly deontological arguments come to prominence only in the *Beyond therapy* report, which counters many proposals of the US NBIC report on deontological grounds. For example, when the NBIC report announces the benefits of converging technologies that give us the possibility to “control the genetics of humans, animals, and agricultural plants [which] will greatly benefit human welfare”(Roco& Bainbridge 2002, 19), the report of the President’s council on bioethics brings up issues of human rights countering some of the enthusiasm. The countering of deontological arguments happens in the last NBIC report (Roco& Bainbridge 2006), which took up some of the criticism of the council and provided answers.

Much of the exchange of arguments can be followed using NEST-ethics, which correctly identifies certain patterns. Consequentialist arguments promoting benefits are countered with deontological arguments highlighting conflicts with deeply held beliefs, principles or rights. However, there are situations in which consequentialist arguments are the ones that counter deontological ones. These patterns and deviations from NEST-ethics will be highlighted in the following sections. In order to show them we will discuss the case of sex selection of offspring, addressed in the *Beyond therapy* report. Besides featuring extensively in the report, exploring this discussion in this document is justified as being a preamble of the announced benefits of controlling the genetics of humans proposed by the NBIC vision of converging technologies.

Sex selection: anticipating genetic alteration?

Selecting the sex of offspring, as the name suggests, is the practice of choosing explicitly the sex of the child. The practice does not modify any characteristic of the selected fetus. However, having a male child, for example, is considered in some cultures preferable to a female child so in this sense sex selection opens the possibility of “better children”. This

situation offers an example of the kinds of problems that might be created by the marriage between NBIC technologies and traditional customs or cultural aspirations, triggering also issues of rights and duties.

Technologically, there are three ways in which the desired sex can be obtained in the offspring. Two of them use prenatal diagnosis to disclose the genitalia of the fetus and then they are followed by the abortion of the fetuses having unwanted sex. The third method, less precise, aims at producing the desired sex at the time of conception followed by artificial insemination or in vitro fertilization. The practice of sex selection is currently growing despite the discouragement of ethical committees. The council invites a serious reexamination of the matter of sex selection, as the service is openly advertised on the Internet and promises to become a big business in the future (PCBE 2003, 63)

The PCBE adopts two lines of criticism, one concerning the means, one the ends. One critique is towards the method of abortion in selecting the desired embryo. Another refers to discrimination against women, given the “abortion of female fetuses on a massive scale” (PCBE 2003, 65). Paradoxically, the council argues, the right to choose, which was defended in the name of equality for women, has made permissible in this way, the disproportionate choice for aborting female fetuses.

Yet another line of criticism presented by the council has to do with liberty and its limits. The council acknowledges the cherished ideal of individual autonomy and liberty but goes on to point its limits concerning the issue of sex selection. The main argument in this case is against the ends of the practice and shows that the unrestricted individual choice to practice sex selection combined with cultural preferences for example for male children, leads to society-wide unbalances. Given the preference for boys in some societies or cultural groups, the practice causes dramatic alterations in sex ratios (PCBE 2003, 67) and this in turn could foster other society-wide unbalances such as problems for individuals in finding an acceptable mate and in general greater social troubles closely associated with an abnormally high incidence of men, especially unmarried men.

This exchange of arguments can be fed back into NEST-ethics and point out the ways in which the debate follows the identified patterns but also the ways in which it deviates. For one, we can observe that deontological arguments have been called to counter optimistic projections of benefits. Controlling the genetics of humans has not been accompanied in the initial NBIC report by an analysis of potential downsides. The case of sex selection shows that even a simple binary genetic modification such as the sex of the offspring is not free of problems also with deontological implications.

The arguments defending the practice appeal to the right to reproductive freedom as well as the right to choose an abortion. What can be observed in the objections of the council is that certain principles are countered with appeal to others. For example, it is reminded that the right to choose an abortion could lead in this case to discrimination against women as cultural predispositions combined with the possibility for sex selection leads to the dismissal of large numbers of female fetuses. In this case, the right not to be discriminated as women is called to counter the right to reproductive freedom.

So far NEST-ethics identified correctly that many appeals to rights are countered with appeals to other rights, argued to have higher priority. But the debate over sex selection introduces a novel situation: The situation in which deontological arguments are the ones being countered by consequentialist arguments. This can be analyzed by looking at the last line of criticism of the council. The argument that the free practicing of the right to reproductive freedom leads to undesirable society-wide effects can be seen as a classic example of the paradox of the tragedy of the commons. These are situations in which the actions of individuals striving towards their self-interests jeopardize a shared resource or unbalance a common concern and by this undermine their own interests on the long run.

Behind the tragedy of commons argument we see a case in which consequentialist argumentation is used to counter deontological argumentation. In this case of the tragedy of the commons, the individual interests are the desire of the families to have a certain sex for their offspring and the common concern is the society-wide balance of males and females, which is jeopardized by the practice with far reaching implications for the members of the society as well. The argument points out the (undesired) consequences that would follow if individuals were allowed to exercise their rights (of reproductive freedom) and pursue their self-interests in virtue of this right. Should the resolution of this issue be done in the future based on the tragedy of the commons argument, NEST-ethics could be augmented with the situation in which consequentialist argumentation manages to surpass deontological appeals to rights and duties.

The 2006 US NBIC report takes notice of the critiques on this issue by the council but does not combat them directly, acknowledging that such developments of converging technologies including here also “longevity medicine, life extension, and the augmentation of human performance [...] will frustrate some” but will be celebrated by others as “NBIC democracy”. The report anticipates that modifying physical characteristics with the aid of converging technologies, so including and far outpacing sex selection, will become issues of social debate: “Radical choices will be offered to families who want certain characteristics in their children yet to be born, such as genetic augmentation of intelligence and preferred physical attributes. In other words, with human nature being what it is, improvement and enhancement of human performance will become a product offering in the global marketplace”(Roco& Bainbridge 2006, 51). Rendering these issues as matters of “NBIC democracy”, the report defends such choices in the name of “rights that need to be battled for”. In NEST-ethics terminology, this answer could be read as an appeal to a principle considered as having higher priority: free choice despite consequences.

These issues of contention concerning technologies for sex selection are a preamble of the many issues of contention that will surround converging technologies for improving human performance. Should intelligence be changeable at conception, one might imagine parents battling for the right to maximize this variable thus prompting yet other society-wide unbalances. As we have seen, there is a strong push on the part of the promoters to increase the contingency of human condition and open for choice more aspects of inborn physical and mental characteristics. From genetic augmentation to memory and cognitive

enhancements, it is likely that this push will trigger more arguments involving human rights and duties. “In several decades, I think it will be clear that these events marked a turning point – the first explicit shots fired in the techno-politics of the 21st century. These coming techno-political conflicts will be fought over the development, regulation, and accessibility of human enhancement technologies and will bring to the table fundamentally different conceptions of citizenship, rights, and the polity”(Roco& Bainbridge 2006, 294).

However, perhaps it is indicative of how difficult it is to resolve these debates on principled grounds of duties and rights that the resolution on the issue of sex selection has remained still unconvincingly settled, even after the exchange of consequentialist and deontological arguments. This example shows that there is place for other kinds of arguments that might help in providing orientation. In the following chapters we will investigate how do arguments pertaining to justice and distribution of goods feature in the debate and also the arguments asking questions concerning the good life.

7 Justice

Another cluster of arguments identified in NEST-ethics deals with the issue of distribution of goods and costs brought about by the new technological development or more broadly with what is just or right in this allocation. Distributive justice is concerned no so much with the fairness of the processes by which decisions are made but with outcomes and consequences of the particular technological development in society.

There are many views on what constitutes a just distribution of goods and costs depending on the criteria used: equality, need, merit, effort and a combination of these. In NEST debates, a recurring framing of these issues is in terms of the technological divide, between those that have and those that don't have access to it. This takes the form of discussions about the gap between the rich and poor countries, the gap between rich and poor strata of the population.

NEST-ethics identifies the maximin rule, namely that the technological development promotes justice if it benefits those that are the worse off before its implementation. Under this guidance, the promoters of the technology argue that the developments, often expensive in the beginning, need to be addressed to the rich in order to be able to grow and then trickle down to the poor. The argument is that the technological development will create more goods in absolute terms and everyone will be better off as the amount of goods grows itself. "Today's average westerner is better off than the 13th century noble man".

The answer in the pattern is that even if the technological development reaches the poor, the divide between those reaping the most benefits and those picking the crumbs continues to widen, that is the poor do not easily obtain access to the new technology and the lives of the "have-nots" are still dramatically different than the lives of the "haves". The conclusion of such exchange of arguments, NEST-ethics argues, results in a plea for making the technological development in the direction addressing the needs of the poor (countries) and not leaving it only to the trickle down effect. This is because it is unfair, the argument goes, to have so many problems with people lacking basic needs and to divert significant resources to technologies that do not address them at all.

However, NEST-ethics claims, arguments of distributive justice do not feature too much in NEST debates because of the speculative nature of the impacts on the distribution of goods inflicted by the technological development. They are brought up though and many participants find them relevant hoping that inequities will be mitigated somehow. This section will follow the exchange of arguments concerning the issues of distributive justice in the debate on converging technologies for improving human performance.

Malaria first argument

One distributive justice argument is based primarily on need. Is it fair to invest so much on expensive technologies when there are great problems with so many people lacking

basic needs, which require much less? We find this critique of funding distribution in the President's council on bioethics report: "In 2002 Americans spent roughly one billion dollars on drugs used to treat baldness, about ten times the amount spent on scientific research to find a cure for malaria, a disease that afflicts hundreds of millions of people worldwide"(PCBE 2003, 9). In another place, the report makes a mea culpa for discussing issues of biotechnologies used beyond therapy "when, in the present misery-ridden world, millions are dying of AIDS, malaria, and malnutrition, in part owing to the lack of already available biomedical technologies"(PCBE 2003, 8).

Coming to meet such worries, the 2006 NBIC report dedicated a special chapter to converging technologies in developing countries in which it "urges scientists, engineers, and entrepreneurs to work together passionately, using the power of converging technologies to move forward, to keep our humanity alive, to help the world to live, grow, and adapt" (Roco&Bainbridge 2006, 111). The report goes on to exemplify foundations, corporations and individual persons who took this call and showed that it is possible to contribute and improve human performance in the developing world. "Paul Meyer, Lee Thorn, Kofi Annan, Bill Gates, Kamran Elahian, and Barbara Waugh" "would say they are not heroes, that they are just working to solve problems that desperately need solving, so that people can live human lives, with a bit of hope, with a little less desperate suffering. These heroes move us forward, they keep our humanity alive, and they help the world to live and grow and adapt. Without these heroes, we would be lost"(Roco&Bainbridge 2006, 112).

For example, a nanotech based portable water purifier could help in eradicating waterborne pathogens as 80% of human diseases are carried in this way. Such a device could reduce the number of hours people spend daily on carrying contaminated water in many parts of the world only to poison their children. Moreover, they could dedicate this time to study or work and in this way people in the developing world could improve their performance by incorporating new technologies effectively (Roco&Bainbridge 2006, 121).

Still, this answer emphasizes the importance of people (i.e. the heroes) that are using technologies to promote human values like health or knowledge. This observation accords with another remark in the report: "This is not to pretend that NBIC will be a new magic bullet, able to bridge the gap between the haves and have-nots, or be the slayer of social inequality"(Roco&Bainbridge 2006, 52). Therefore, the critique concerning the directing of funds remains. Since there are already technologies available to significantly improve the lives of millions in very poor countries, it is not so much new technology that is missing to ameliorate these problems but lack of will.

The gap between haves and have-nots

The last quote revealed another way in which the issue of distributive justice is framed, that is the paradigmatic gap between haves and have-nots. In general, the reports express some concern about this issue. Will converging technologies widen this gap or shrink it? For example the president's council on bioethics considers that "the issue of distributive

justice is more important than the issue of unfairness in competitive activities, especially if there are systemic disparities between those who will and those who won't have access to the powers of biotechnical "improvement." Should these capabilities arrive, we may face severe aggravations of existing "unfairness" in the "game of life," especially if people who need certain agents to treat serious illness cannot get them while other people can enjoy them for less urgent or even dubious purposes. If, as is now often the case with expensive medical care, only the wealthy and privileged will be able to gain easy access to costly enhancing technologies, we might expect to see an ever-widening gap between "the best and the brightest" and the rest"(PCBE 2003, 282).

The European report expresses similar concern. "Even when they work as reliably and successfully as one could wish, CTs may have a socially destabilizing effect as economic efficiency produces greater unemployment, as targeted medical treatments increase longevity, as CTs exacerbate the divide between the rich and the poor, between technologically advanced and traditional cultures" (HLEG 2004, 8).

As suggested, the US NBIC reports acknowledge that converging technologies are not a silver bullet in bridging the gap between rich and poor and calls for political action in order not to allow this gap to widen. "NBIC technologies are in the vanguard of this Innovation Economy, offering a new paradigm of discovery. This paradigm recognizes that the problems we face today and will face in the future require a more integrated interdisciplinary solution to better manage global crises and challenges. This is the challenge before us as we map the future of NBIC. Economic prosperity, security, and quality of life can be geostrategic goals to address by focusing the tool set of NBIC, if leaders will hear the call and rise to meet the challenge" (Roco& Bainbridge 2006, 52).

In another place we find the same emphasis on concerted effort that is needed to make a fairer distribution of the outcomes of converging technologies. "Along these lines, I argue that there must be a concerted effort by the developed world to apply the derived benefits of converging technologies to the developing world. It is clear that potentially extraordinary gains could emerge once different technologies begin to work together – gains that are most needed and would be most useful in areas of the world that are suffering from extreme poverty and degradation"(Roco&Bainbridge 2006, 73).

So there seems to be a consensus between reports that a fairer distribution of goods helping to reduce the gap between haves and have-nots is not to be left to chance but needs concern and concerted efforts in order to happen. This observation is similar to the one that the trickle down argument is apparently missing from the debate. The reports so far seem not be happy with leaving only crumbs to trickle down to the have-nots but they are advocating determined effort to make it such that technologies will be reachable by the poor (countries).

However, it should be noted that the haves and have-nots framing of distributive justice is based on the assumption that the technologies are inherently desirable and benefic for everyone they could be available to. The poor are relegated as have-nots who would become better off if only the technology could be made available to them. This may

indeed be the case for certain combinations of technologies and situations but not necessarily for all. Sometimes, this framing of the issues of distributive justice could be reframed using consequentialist argumentation, more precisely with the argument brought up by certain groups questioning the inherently benefic character of technology.

Despite this exchange of arguments on distributive justice, NEST-ethics is right to predict that these arguments feature low in the reports on converging technologies for improving human performance. This may be due to the early stage of this technological development in which it is difficult to devise detailed analysis concerning the fairness of the distribution of its specific outcomes. However, there are debates addressing similar issues, which go in more detail on matters of fairness about increasing human performance. Most of these debates like the one about human enhancement or the one about transhumanism start from visions projected in the reports on converging technologies.

Keeping in mind the argument concerning the question of the benefic character of the outcome of a technology, in general the distributive justice cluster of arguments converges towards a common direction, namely that converging technologies should be directed in order to benefit those that are worse off.

8 Good life ethics

Justice, deontological and consequentialist argumentation can cover many of the issues around new technologies. However, some of the issues are very difficult to be quantified and also to be articulated in consequentialist or deontological terms. They also pertain not so much to issues of rights, duties or justice but to what it means to lead a good life and by extension including issues pertaining to what it means to have a good society. Good life arguments appeal to myths to remind about possibly forgotten wisdom or to stories and scenarios to help visualize situations, which cannot be seen so easily with a cost/benefit analysis. Good life arguments have their role in projecting with particular force such scenarios, to appeal to culturally shaped identities or to answer, including others, the question of who we are, who we want to be and when are we transgressing those limits that jeopardize the good life?

NEST-ethics identifies myths such as Prometheus, invoked by promoters who identify with the Promethean mind that offers humanity otherwise inaccessible goods. Skeptics respond with appeals to the Faustian bargain warning that the respective technology might be a poisoned deal, or with the myth of Icarus flying towards the skies, not listening to the warnings, only to plunge to his death.

Another framing of good life arguments identified in NEST-ethics is done through discourses on limits, which are often invoked conservatively reminding that the given should not be transgressed. Many times one could find uses of the Greek word hubris denoting careless pride and arrogance, which usually ends in fatal retribution. Another recurring motif to be found in debates on new technologies, NEST-ethics argues, is that people should not play God with explicit reference to recreating nature. The underlying assumption of the motif may come from the conception of God as all knowing and all-powerful. Therefore, the minds believing they are all powerful as if in God's place, subject nature and living organisms, including themselves, to traumatizing experiences. Other limits are derived from what is deemed to be natural, from what is perceived as a moral order in nature and transgressing it will create monsters. In this line of argument, the monster of Victor Frankenstein is invoked. For example, Frankenstein foods or "frankenfood" is a term recurring again and again concerning genetically modified food.

Yet another way of framing the argumentation on good life is by projecting scenarios that describe visions of possible worlds in possible futures. Many times novels are invoked to help the imagination in assessing the possible future induced by the discussed new technologies. NEST-ethics identifies Brave New World, the novel of Aldous Huxley recurring repeatedly especially in debates over new biotechnologies but also on technologies invading privacy. NEST-ethics sees in brave new world a completely controlled world, which plies obediently to people's desires and in this way it suffocates human flourishing, as people need a world that puts up resistance in order to grow robustly.

In response, proponents of new technologies offer different interpretations of the motifs, suggesting that God wants us to play Him and that people are co-creators with Him, or that there is no moral order hidden in nature. Also, even if people have a bad track record of using their powers wisely over nature they are also learning. Concerning the argument regarding a “technotope” world that plies itself obediently to human desires, the proponents of the new technologies creating such a world argue that technology may replace nature as our living environment but it is just as capricious as nature is.

So far we have presented the repertoire of arguments identified by NEST-ethics in this good life cluster of argumentation. But besides individual motifs and arguments there are identifiable patterns going on.

Compared to consequentialist and deontological arguments, good life argumentation is the one mostly predisposed to lead the debates towards clashes between incommensurable worldviews. In this case, a pattern identified by NEST-ethics is that treating the arguments as private beliefs drains the power of these arguments. This is done usually by proponents as they are not interested in satisfying all conceptions of a good life and are satisfied if at least some interested parties have their wants fulfilled. This pattern creates a peculiar character to good life arguments as they are not met by counter-arguments but they are moving between the public and the private domain.

Another characteristic of good life arguments is that sometimes they get confused with deontological arguments. This happens because what belongs to the good and what belongs to the right is always a matter of contention. For example, in societies in which belief in God and in a moral order hidden in nature prevails, the arguments move towards the domain of the right. In a secular, pluralist society, the same arguments move towards the domain of the good.

The rest of this section will analyze how do these issues feature in the debate so far on converging technologies for improving human performance? First, it will go through a set of mythological motifs and how do they feature in the reports and reactions. Then it will augment NEST-ethics with a set of myths that appear in the documents but not yet identified by NEST-ethics. The same will happen with the discourses on limits and with the scenarios invoked to project visions of possible future societies. Finally, this section will discuss patterns of good life argumentation identified in NEST-ethics.

The initial US NBIC report is rather poor in good life arguments as it mainly concentrates on presenting all sorts of benefits of converging technologies and does this mostly in a technical and consequentialist terminology as we have seen. The European report is also rather poor in good life arguments. This observation, that two important reports lack such argumentation, suggests that good life arguments do not easily find their place in public policy recommendations. However, the fact that good life argumentation features prominently in other reports like the ones of the President’s Council on Bioethics, as well as in reactions of both promoters and skeptics of converging technologies for improving human performance, is an indication that they are not only taken in consideration as

informative guidelines but they do find their place in the public sphere as sources of orientation for important decisions.

Mythological motifs

In the meta-ethical issues chapter we have seen how mythological motifs are invoked as ways to mobilize the past in order to inform present decisions. In this section we will remind some of them but elaborate more on how mythological motifs are invoked to actualize archetypal figures helping current debates visualize patterns of human mind and behavior.

Already mentioned is the figure of Prometheus, the intelligent Titan of Greek mythology, who challenges the authority of Zeus and brings humanity otherwise inaccessible goods. Usually the figure of Prometheus is invoked as a protector of the ones who boldly reach for technological breakthroughs and NEST-ethics accounts for such invocations. However, in the converging technologies for improving human performance debate we see that other interpretations of the myth are offered as well. Dupuy invokes a Hesiodic variant of the myth when he assesses skeptically that NBIC is a “Promethean project if there ever was one” (Dupuy 2007, 15). The skepticism can be explained by the fact that in this variant of the myth, Prometheus is portrayed as a subversive character, chained for transgressing the moral order.

The President’s Council on Bioethics makes also invocations to mythological figures. For example, it argues, “the pursuit of an ageless body may prove finally to be a distraction and a deformation. And the pursuit of an untroubled and self-satisfied soul may prove to be deadly to desire”. Instead of treasuring the “engaged and energetic being-at-work of what nature uniquely gave to us”, these kinds of perfections are “at best passing illusions, at worst a Faustian bargain that could cost us our full and flourishing humanity” (PCBE 2003, 299). “In wanting to improve our bodies and our minds using new tools to enhance their performance, we risk making our bodies and minds little different from our tools, in the process also compromising the distinctly human character of our agency and activity” (PCBE 2003, 300).

When making these considerations about possible Faustian bargains, the council probably refers to visions for the human body and mind projected by the NBIC report. In that vision, the human body, conceived in terms of tools, “will be more durable, healthier, more energetic, easier to repair, and more resistant to many kinds of stress, biological threats, and aging processes” (Roco&Bainbridge 2001, 19). Similar visions have been articulated later by Bainbridge about “cybernetic immortality - the possibility that converging technologies will offer humans extended lives within information systems, robots, or genetically engineered biological organisms” (Bainbridge 2006, 1).

The strength with which the invocation of Faust resonates in contemporary mind is mainly due to the force with which Johann Wolfgang von Goethe adapted the classic German legend. In the first part of the play, Faust, the central character of the tale, is frustrated with the limits of his knowledge and power and aims at learning everything that can be known but away from righteous pursuits. His quest attracts the attention of

Mephistopheles who proposes Faust a pact: Mephistopheles will provide him with everything he wants on earth in exchange of Faust serving him eternally.

Probably the invocation is particularly forceful in this context as many of the visions for converging technologies for improving human performance, like genetic alterations, brain implants or psychotropic drugs, are on the one hand so tempting for many of the potential benefits they promise but on the other they might come with deals attached to them in far-reaching implications.

Golem

A theme often making use of mythological figures is the theme of technology out of control. NEST-ethics inventories here the story of the Sorcerer apprentice, anxious to test its new powers and releasing forces he can't control, being saved only by the Sorcerer who arrives to save the day. Another story also developing this idea is Mary Shelley's Dr. Frankenstein. Yet another variant of an archetypal figure embodying among others this idea of technology out of control turning against its creator is the myth of Golem. In the following we develop this last myth, as it is this variant featuring differently in the debate on converging technologies.

The myth was invoked in a particular way in the debate concerning converging technologies. The Golem is in Jewish folklore an animated being created from unanimated matter but lacking soul and speech. In rabbinic tradition having a golem servant was seen as an ultimate symbol of wisdom and holiness. In most versions of the story, the Golem is created by a wizard to be perfectly obedient, taking instructions literally but unable to speak. However, in many of the versions of the legend they become increasingly uncontrollable and violent, sometimes turning against the creator. The Golem can be deactivated and many times this deactivation succeeds but sometimes the creator is crushed under the crumbling Golem.

However, in the converging technologies debate we see a variation from the classic invocation of such myths. This is done in Dupuy's invocation of the Golem. He recollects the story of Golem in the variant of a Talmudic tale of the 13th century in which the prophet Jeremiah succeeds in creating a Golem. Just as in the classical stories, this act of creation is not seen as an act of revolt against God but as the culmination of a long ascending path to holiness and knowledge. What is distinct though in this version of the story is that the Golem speaks and that he does not become violent. Quite naturally he addresses his creator appealing to his conscience: "Do you realize the confusion you have just introduced in the world? From this day forward, when one meets a man or a woman in the street, one will never know if it is one of God's creatures or one of yours!" It turns out that Jeremiah did not think of that and very troubled seeks advice from the Golem to rectify the situation he had created, to which the artificial man replies: "All you have to do is to un-make me, just as you made me" and the rabbi does so (Dupuy 2007, 25).

In this invocation of the myth of Golem, the trespassing of limits does not refer to catastrophic events that converging technologies would create, as Frankenstein would

suggest. In this story of Golem, the technology does not get out of control and it does not turn against its creator. Instead it functions so well that it introduces confusion in the world: The technologically created golem risks to be confused with real people. However, Dupuy does not elaborate further the implication of this elimination of distinctions for our categories in thinking.

Discourses on limits

Another framing of good life ethics comes in discourses on limits. Many times these discourses are conservative, namely that certain limits should not be crossed. However, we find another attitude when promoters of technologies use discourses on limits. In these ones, the limits are meant to be crossed to the greatest extent possible.

A theme we see often in the debate on certain new technologies is that people should not play God. In the debate on converging technologies for improving human performance we find the PCBE taking this position: “Not everyone likes the idea of “remaking Eden” or of “man playing God”(PCBE 2003, 7). Such ideas as creating an “entirely fresh foundation for our culture and institutions” were articulated later by one of the main architects of the US NBIC report (Bainbridge 2007, 3). This is also the place to mention that promoters of converging technologies reveal the vision for their project as one breaking limits, “establishing a dynamic new creed to replace religion” (Bainbridge 2007, 3).

Feeding this back into NEST-ethics, the playing God motif appears conventionally in the discourse of the council: humans, with all their imperfections, should not pretend to be all-powerful and all knowing and recreate things that only God is entitled to create. Where the pattern differs is concerning the attitude of the promoters of technology. This time they are not only arguing that we should pursue this technological development because “God wants us to play Him”, but they are arguing we should embrace the technologies themselves as a creed instead of religion and consequently instead of any god.

This insight allows for emphasizing the particular character of the visions the promoters have for converging technologies for improving human performance, different in kind to many new technological developments we have seen so far. This can be seen in the way in which its main promoters refer to it as fostering a “transcendence of the traditional human condition” to the point of transforming human nature itself and “establishing a dynamic new creed to replace religion” (Bainbridge 2007, 2) thus going beyond a “simple” new technological development.

Brave new world

Besides mythological motifs and figures, another way in which good life arguments are framed comes in the form of scenarios. Many novels are invoked as sources of inspiration. NEST-ethics identifies the 1932 novel of Huxley as being repeatedly invoked in debates on new biotechnologies and features also intensely in the debates on converging technologies for improving human performance as well. It is most often

invoked by the works of the President's council on bioethics but it is analyzed also in the works of sympathizers of converging technologies as well.

NEST-ethics refers to brave new world as a technological world plying itself obediently to every human desire. However, in the debate on converging technologies for improving human performance, the novel is invoked somewhat differently. The *Beyond Therapy* report invokes it multiple times to make several points. For example, it is concerned with psychotropic drugs, which may induce shallow happiness to inhabitants who, by any decent standard, should not be happy: "Some suspect it could rather resemble the humanly diminished world portrayed in Aldous Huxley's novel *Brave New World*, whose technologically enhanced inhabitants live cheerfully, without disappointment or regret, "enjoying" flat, empty lives devoid of love and longing, filled with only trivial pursuits and shallow attachments."(PCBE 2003, 7).

Another way *Brave New World* is invoked emphasizing different aspects than NEST-ethics is with reference to its highly controlled and rigid class system. Huxley describes a world, in which technologies are used, beyond therapy, to genetically engineer humans at conception and later to condition them through psychotropic drugs, such that they fit and become content with a pyramidal system of castes, from a majority of semi-idiotic deltas to a tiny elite of alpha pluses. The council invokes *Brave New World* to criticize a system which uses technologies in this way because it "runs on a deplorable and impermeably rigid class system, but few people would want to live in that world even if offered the chance to enjoy it as an alpha (the privileged caste). Even an elite can be dehumanized, can dehumanize itself." (PCBE 2003, 283).

The council warns that the possibility exists for such a situation to come to pass if biotechnical powers, beyond therapy, become "readily available to satisfy short-term desires or to produce easy contentment" but then "the character of human striving changes profoundly and the desire for human excellence fades". Should this come to pass, the council argues, the best thing to be hoped for is "pockets of difference (as on the remote islands in *Brave New World*) where the desire for high achievement has not been entirely submerged or eroded"(PCBE 2003, 285).

But *Brave New World* has been invoked also by sympathizers of converging technologies. For example, Nick Bostrom argues that "in neither 1984 nor *Brave New World* has technology been used to increase human capacities. Rather, society is set up to repress the full development of humanity" (Bostrom 2005). He considers that "*brave new world* is not a tale of human enhancement gone amok but a tragedy of technology and social engineering being used to deliberately cripple moral and intellectual capacities" and "the exact antithesis of the transhumanist proposal" (Bostrom 2005b).

The 2006 US NBIC report also makes an invocation of a *brave new world* when it discusses the issue of identity in a world in which more and more sources of identity become variable due to converging technologies and left to individual choice. "With respect to identity, the main argument is that people's sources of identity will change and become more sophisticated. Most people will be able to handle this *brave new world*, but

many will not.” (Roco&Bainbidge 2006, 331). However, this invocation is not so much one of Huxley’s novel but one suggesting a world in which people are given so many choices that it will overwhelm them.

Concluding, NEST-ethics rightly identifies Huxley’s novel *Brave New World* as an important source of inspiration for both promoters and skeptics of converging technologies for improving human performance. However, as we have seen each invokes it differently to make various points, taking inspiration from the vision of Huxley and emphasizing different aspects and ignoring others. In general, skeptics of converging technologies invoke *Brave New World* to suggest that it is highly likely for our world to slip towards it, if biotechnologies beyond therapy (genetic engineering on humans, psychotropic drugs inducing content) become readily available, even if they may prove therapeutic and benign in the beginning. On the other hand, sympathizers of converging technologies suggest that in *Brave New World*, technologies are not used to increase human capacities but to cripple them, thus these authors deny the possibility of these technologies being used otherwise than they propose.

Good life patterns

NEST-ethics identified also some patterns concerning good life arguments. It argued that many times good life arguments lead to incomprehensible worldviews and then their power is drained by treating them as private beliefs.

So far, the debate partially exposes this pattern. Indeed, certain reports making recommendations to various sectors of society did not include good life arguments. However, as we have seen, other reports and multiple authors, both sympathizers and skeptics of converging technologies for improving human performance, do engage in good life arguments invoking the same mythological figures, stories and scenarios but giving them different interpretations, thus withdrawing from dismissing them from the public domain. With converging technologies announcing to drastically increase the contingency of human condition and the with the need for orientation being significant (Grunwald, 2007) it seem that in this early stage of the development of converging technologies there is at least cautiousness about dismissing good life arguments as private beliefs if not a growing interest.

9 Conclusion

The conclusion is split in two parts. The first part reflects on converging technologies for improving human performance, summarizing in the same time the interesting findings from the analysis. The second part reflects on NEST-ethics, summarizing first the observations made so far and finally making some structural comments towards improvement.

Converging technologies, changing societies

In 1972, a documentary was made based on Alvin Toffler's Future Shock. The movie having the same name used the book to present how the state of the art technology in the epoch challenged and changed society but it also anticipated on future technological breakthroughs. Breathing the flavor of the '70s in a narration of Orson Wells, the documentary inventoried technological developments like genetic manipulation and "designing the IQ, sex or color of the skin of babies", "changing the memory processes in human beings with drugs and electrical stimulation" and posed open ended ethical questions about the challenges of making "an artificial man". Interesting to note that the interviewed scientists anticipated that these breakthroughs are "just around the corner" and will arrive "within a very few years".

In this document we started from the contention of NEST-ethics that most of the arguments surrounding new technological developments are not new and follow identifiable patterns. This small intermezzo about the '70s documentary shows that not only are the arguments about new technologies not new, but the visions we started this analysis from are not so new either. Of course, this does not mean that the visions for converging technologies will not be realized because the scientists of the '70s rushed a bit with anticipation. But it does take away from converging technologies the flavor of absolute novelty. Still there is novelty left and the promoters of converging technologies substantiate the call for reaching their visions by highlighting the progress made in each of the technological fields, especially reaching access to the nano level. In this light the visions of the '70s, which actually have much older roots, received new impetus.

Just like the open ended questions of the '70s documentary, the renewed visions of the promoters of converging technologies for improving human performance gave rise to reactions sparking a lively debate which shows that the path is not set, that things are not inevitable and that effective steering is possible and calls for responsibility can and should be heard.

And this is indeed the case when both promoters and skeptics ask for novel ways to reflect and steer the development in more responsible ways. Be they public debates, consultations with the citizens or embedding ethicists in the research and development processes, they are all attempts towards a more democratic process of technological development acknowledging that choice is possible and resistance to some developmental

paths can be by no means irrational but a way in which societies may have more possibilities to select responsibly among multiple technical options.

Despite these efforts, the inevitability thesis can still be found embedded in the discourse of promoters when verbs describing the future of the development lack any conditional form or when international competition is invoked to justify the suspension of ethical deliberation because technological advancement will happen anyway. However, converging technologies, with the effort needed for them to happen as well as with the increase in contingency they bring to the human condition, also diminish the strength of the inevitability discourse.

This loss of certainty about the inevitability of this technological development can be seen also in the efforts promoters make to rally supporters. There is a swing of discourse found throughout the NBIC reports from the promise of remaking heaven on earth towards talking about avoiding civilization collapse therefore inducing a sense of moral necessity. Also, this document showed there are signs that the promoters could adopt the strategic path of eliminating from the discourse any problematic aspect until the infrastructure is in place (Roco & Bainbridge 2006, 277). The strongest justificatory argument the promoters offer is the duty to further progress, which receives particular force in the face of what the promoters project as the danger of civilization collapse. Despite all the ethical problems we might encounter developing converging technologies, the promoters expect morals to be the ones to change and choose to relentlessly push the process, advocating converging technologies even as a creed on a par with religion and even speaking of a new religion.

These vigorous actions towards promoting the visions for convergence did not go unanswered by critics. Some criticized the discourses advancing incredible scenarios and construing possibly emerging issues as if they are already presenting themselves and calling attention. Others assessed these visions and highlighted various ethical problems on a consequentialist, deontological or good life ethics line of argumentation, advocating an advance of this development under the guidance of a precautionary principle. Most of the argumentation can be encountered in NEST-ethics. However, some arguments represent interesting variations and worth mentioning.

One of them is the tragedy of the commons. In NEST-ethics terminology, this is a case where consequentialist argumentation is used to counter deontological grounds. In particular, it is the case when some individuals ask for the right to use particular technologies in the name of individual rights but in doing so, a certain shared concern or resource is being jeopardized thus undermining also the individual's interests in the end. In the document we reviewed the problems observed when parents decide the sex of their offspring but in doing so society-wide unbalances between sexes occur. It is to be expected that, as more aspects of the human body and mind are made variable by converging technologies for improving human performance, such kind of unbalances will occur. For example, should intelligence become decidable at conception we might expect parents battling for the right to influence it and increase society-wide unbalances.

However, it must be said that the argument needs to be carefully used as the appeal to utilitarian concerns to inhibit individual rights might generate also human rights abuses.

In face of this kind of unprecedented increase in contingency, when more and more aspects of the human body and mind appear to be formable by engineering, there seems to be an enormous need for orientation. It is in this context that attention has grown towards good life ethics, which through culturally shaped identities and myths helps the current debate visualize patterns of human thought and behavior. Moreover, compared to other kinds of argumentation good life/good society arguments offer, through scenarios of possible worlds, rich thought experiments that could help in visualizing the future. This might prove particularly helpful when considering the use of converging technologies both towards human beings as well as regarding robotics and artificial intelligence.

This analysis highlighted interesting invocations of myths that diverge from the invocations identified in NEST-ethics patterns. For example, Prometheus is invoked ambivalently emphasizing both his heroism of bringing humanity otherwise inaccessible goods and his transgression of the moral order for which he gets chained and being responsible for the unenviable state of humanity.

Two other myths offer particular orientation concerning bioengineering as well as concerning robotics and artificial intelligence: the legend of Golem and the story of Frankenstein. It can be said that Frankenstein is a variant of the story of Golem, which is much older. They are not only similar but also related to the one of Prometheus. It is not by accident, for example, that the subtitle of Mary Shelly's novel is "the modern Prometheus". Both deal with the problem of the creation of artificial life by human beings, the relationship between the creation and the creator and the problem of distinguishing between the identity of a human being and a golem. From both we can find orientation by listening to their details and solutions.

Frankenstein is the story of the monster that violently turns against its creator. But there are subtleties in the novel. There is deep suffering in the monster that longs for friendship and love, which he does not get from those around who being afraid, marginalize him. Lacking love and affection, the monster takes revenge on his creator. This aspect of the story highlights the irresponsibility of human beings to invade the divine realm, appropriating and illegitimately misusing the power.

The legend of Golem comes in many variants and offers its nuances. For one, it views the creation of Golem not as an act of transgression but as a culmination towards wisdom and holiness. However, it teaches that not only technical skill but also the wisdom to use it is required from the creators of golems. Part of this wisdom is to know when to create and when to stop creating and also to refuse breaking the link between moral wisdom and technical know-how. Benefiting from this lesson could boil down to restoring the link between ethical reflection and technological development, for example, by embedding ethicists in research and development but also by a more holistic restoration of this link.

The Golem could also be a source of orientation in other respects. In this debate the invocation goes back to early versions of the legend in which Golems do not turn violent as in the later ones. Moreover, in this version, the golem speaks and poses the problem of human identity. He speaks of the confusion that was introduced in the world by creating an artificial man. As compared to the later versions of the legend in which the golem is destroyed by the wizard only after becoming violent, in early rabbinic traditions golems have a brief existence being immediately destroyed after their creation. This version of the legend is similar as the golem is “unmade” in order to correct the problem of identity confusion. From this aspect of the legend we could learn that we can pursue knowledge and apply this knowledge to the world as long as we don’t allow confusion by raising golems to the status of persons or degrading humans to golems. This is also in concord with the advice of Norbert Wiener one of the founders of cybernetics: “On no account is it permissible to mention living beings and machines in the same breadth” (God and Golem, 9).

With a revolution of converging technologies still not in sight, there seems to be time for democratic societies to engage such debates and hope to effectively steer the technological development, thus relying on evolutionary changes rather than the shocks of revolutionary utopias. On the other hand, the unfolding economic crisis and any crisis it might entail, creates the premises for democracy to be suspended in certain respects, including technological development. If accelerating the development of converging technologies for improving human performance is done in such an environment, it is more likely that abuses will be covered up and catastrophes will be fostered. These in turn are not beneficial for anyone since they both create suffering as well as a counter reaction towards (converging) technologies.

Improving NEST-ethics

NEST-ethics was mainly articulated in the article of Arie Rip and Tsjalling Swierstra, which provided an inventory of arguments and patterns in their evolution concerning the debate on nanotechnology. Nanotechnology is one of the core domains of converging technologies. Many of the issues surrounding the nanotechnology debate were found in the converging technologies debate as well. In fact that was the contention of NEST-ethics, that most of the ethical argumentation surrounding new technological developments can be inventoried and patterns in its evolution anticipated. However, the debate on converging technologies introduces specific issues as it was framed by its initiators to be innately connected to the goal of improving human performance.

Still, NEST-ethics proved robust enough to capture most of the argumentation. Moreover, it proved to be a useful map for navigating through the formation of the discourse on converging technologies and extracting and categorizing the arguments from the various positions expressed. In this particular debate, NEST-ethics did not help in proposing too many new lines of argumentation but it did give the chance for insights about the technologies. The variations in patterns and the (non) occurrence of arguments posed open questions about the character of the technologies themselves.

NEST-ethics is a growing framework that could help at improving the quality of the democratic process of technological decision-making. It offers a map of all kinds of ethical arguments and articulated positions, which could benefit the process of advancing technological development by taking into account and appreciating all kinds of concerns. The offer of such a framework meets the recommendations of both European and American reports. The European report acknowledges that a real success of convergence cannot happen by condemning resistance but by embracing justified resistance as having a vigorous effect in forging converging technologies. The 2006 US report also acknowledges: “Without appreciating the arguments against enhancements, you cannot develop new enhancements that are responsive to the concerns embodied in those arguments. That is why the opposition needs to be incorporated into the debate” (Roco&Bainbridge 2006, 281). The President’s council on bioethics, which generally finds problematic the goal of technological improvement of human beings, still embraces the debate because “despite these genuine difficulties and objections, we believe that it is important to open up this subject for public discussion” (PCBE 2003, 8).

This thesis made a contribution towards improving NEST-ethics. It corrected some of the mythological invocations, it suggested that not always are some arguments to be found in most NEST debates and it added new arguments. Still, variations in repertoires are acknowledged in NEST-ethics. This study showed how such variations could also enrich and modify the repertoire thus suggesting that NEST-ethics can never be a finished project but an ongoing endeavor subjected to modifications as ethics and technology co-evolve.

From a structural point of view NEST-ethics proves its analytical value offering clear categories for arguments backed by the main moral standards referred to explicitly or implicitly. As expected, real debates show that argumentative patterns are often criss-crossing these categories. Nevertheless, the analytical distinctions offered the chance to see more clearly what kinds of arguments each actor tends to use and, in principle, it could offer the chance to question what kinds of arguments are sometimes missing in NEST debates.

However, filling up these categories can sometimes be a non-starter in the current shape of the structure. Although most of the arguments can be caught by the underlying ethical theories, sometimes, the character of the arguments makes them too varied for an inventory to be feasible. This is mostly the case with good life ethics and especially with its framing through stories and scenarios about possible future worlds. While myths could be considered limited enough for an attempt for their inventory to be conceivable, there are too many novels, stories and scenarios that could be invoked, thus inventorying them is equivalent with inventorying too much of the body of literature humanity has produced. Still, what could be attempted is a synthesis of such literary works, in which arguments and motifs are extracted, living off other details. Just as the myth of golem and the story of Frankenstein expose very similar traits, a categorization of NEST-ethics would refrain to label arguments by the name of novels (e.g. the brave new world argument) but would seek to extract the arguments likely to be found in other stories and scenarios as well.

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