SUMMARY REPORT OF THE CONFERENCE AND ROUNDTABLE OF EPTA ON CONVERGING TECHNOLOGIES

The next technology wave: can policy keep pace with progress? The case of converging technologies

FLEMISH PARLIAMENT, BRUSSELS, OCTOBER 17-18, 2005

viWTA SAMENLEVING & TECHNOLOGIE

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1. CONFERENCE OPENING SPEECHES

1.1 Welcome speech by Norbert De Batselier, Speaker of the Flemish Parliament[1]

Dear Colleagues,

Ladies and Gentlemen,

I will alternate English, the conference language, and Dutch, the official language of the Flemish Community. I am aware that this means that some of you probably will not understand everything I say. However, I'll immediately set their minds at rest. The English and Dutch versions of my speech are part of the documentation you received when you arrived.

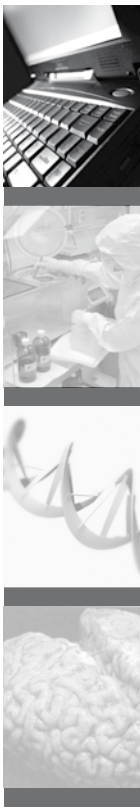
First of all, welcome in the Flemish Parliament. You will notice that a lot of glass has been used all over this building. That was a conscious decision. We wanted and still want this building to be a glass house for the Flemish people. Since transparency is an essential characteristic of our democratic system, policy-making and policy control must become transparent processes in the eyes of the population.

This idea of transparency brings me to the core activity of the network that is having its conference here today. As a former vice-president of the Flemish Government and as a minister of economy of the Flemish Community, I have always endorsed the necessity of technology assessment. In my policy letter "Technologiebeleid in Vlaanderen" [Technology Policy in Flanders], published in 1991, I devoted a section to technology assessment, and in my work, I urged for integrating technology assessment in all aspects of technology policy. In the opening speech to the Flemish Parliament in 1999, I referred to the importance of the further development of scientific support and technology assessment as cornerstones of a substantive debate. Even though that is hardly sufficient to qualify as one of the fathers, I can certainly claim to be one of the co-defenders of the creation of a Parliamentary TA Institute within the Flemish Parliament.

You may therefore count me among the 'believers'. Although I am strongly attached to the principle of free scientific

[1] *The pronounced speech may differ from the text in this report. Only the pronounced text is valid.*

inquiry, I strongly reject any technocratic or arrogantly elitist vision of science and technology. I believe the age of blind faith in progress belongs definitively to the past. You no longer need convincing of the importance of an immediate and thorough understanding of the societal aspects — favourable or not — of all kinds of scientific and technological developments. Together with many of my colleagues, I am well aware of the difficulty of guiding society in this complex and globalised world. More than ever, we need to translate that complexity into comprehensible terms.



In our Western society, where knowledge is increasingly becoming the principal ingredient of prosperity and welfare and where innovation is the key to economic growth and even survival, it becomes even more important to have an idea, as quickly and broadly as possible, of the opportunities, limits and threats of the scientific and technological developments. The Parliament, being the steering and controlling agency of policy and the number one platform and catalyst of a free debate, needs that kind of information, technology assessment can deliver.

Much has been said about the imperfections of our democratic representative system. We must dare to acknowledge this criticism. During the past terms of the Flemish Parliament, I commissioned a number of studies to prepare this institution for the 21st century. In line with a benchmarking project conducted in other European regional and national parliaments, a number of academic contributions were compiled into a book entitled: "Levende democratie, de kracht van een parlement in de 21e eeuw" [Living Democracy, the Power of a Parliament in the 21st Century]. The basic assumption of the book is that the representative democracy, as we know it today, still remains the most efficient and effective political system. Still, that does not alter the fact that there are real problems that call for a solution. The first of five major trends that can be inferred from this academic research is the growing interactivity between Parliament and society. The second has to do with the Parliament itself, that is becoming more and more a junction of information flows. The third trend is that the Parliament is constantly called to account for its actions to society as a whole. The fourth finding, which I mentioned higher, is the context of globalisation and individualisation. The fifth and last trend is that politics, and consequently, the Parliament, is having to come to terms with the fact that time is becoming a scarce resource.

It is obvious that science and technology assessment is one of the tools that will help us to keep in step with these trends. Particularly the participation of the general public, indeed a key element in TA research, should contribute to supporting and promoting interactivity with society as a whole. Obviously this interaction will not involve decisions that

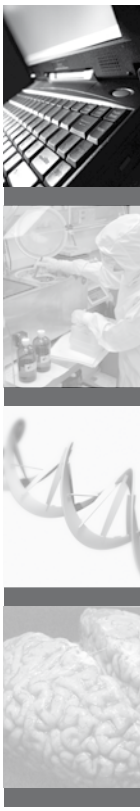
have already been taken, but will be undertaken with a view to improving the debate and sensitising both politics and society. TA also has a clear and obvious role with regard to information-gathering.

It will not surprise anyone that I also link the factor of time to this. Together with the possible recommendations to policy-makers, we want and need an analytical investigation as well as a synthetic picture of these ever more complex connections. In this way, the most objective possible picture for the parliamentary community can serve a double purpose: enrich the political debate with different views and opportunities and, at the same time, inform the parliamentary community as a whole, both majority and opposition. This ensures that all the participants have equal access to the same information and improves the democratic quality of the debate.

Many of you no longer need convincing of the benefits of technology assessment. But allow me to situate it in the broader context of political decision-making. The public interest is not served by populism or by giving in to fears and stereotypes. But neither should politics be directed by some kind of belief in the determinism of scientific and technological evolutions. The central question is to what extent scientific and technological developments can and should be steered. I therefore look forward with great interest to the results of this conference, which might give some answers to that question. Besides, the viWTA recently conducted a survey among the members of the Flemish Parliament to identify their opinions on science and technology. My esteemed colleague Robert Voorhamme, Member of Parliament and President of the Board of viWTA, will pursue this question in more depth. However, you will notice that the subtitle of this conference, namely 'Can policy keep pace with progress?', was not added for purely decorative reasons. Quite on the contrary, it is a pertinent question and, as a matter of fact, one that should even be extended. As I see it, the convergence of certain older and more recent technologies will raise the control question in an even more pressing way. ` I hope this conference will contribute to raising awareness of these issues.

I have already referred to the complexity and interrelated character of these issues in a globalised society. Against that background, cooperation is of vital importance, for several reasons, of which I will only mention a few. From the point of view of efficiency, consolidating the efforts, certainly with regard to public funding, is a necessity. This is obvious, because the opportunities and challenges are international, and the same for all countries. Alongside cooperation, precisely because of this complexity, there is also the associated need for a multidisciplinary approach to problems,

which are sometimes critical. Technology, and especially ICT, is at the very basis of globalisation and offers extraordinary opportunities with regard to building networks. Moreover, our networking society is considered as the driving force behind the knowledge society. Europe must be able to make use of those networks in the worldwide economic struggle concerning the knowledge society. Our cultural diversity and the associated wealth of approaches and possible solutions, but also our flexibility and adaptability, might make the difference in the confrontation with other economic powers.



Cooperation on a European level is therefore a necessity. I am pleased, therefore, to see more and more cooperation and exchange of knowledge and methods in the area of technology assessment at the international level, and definitely at the European level. Consequently, the EPTA network is not only a welcome development, but in fact an indispensable one.

Allow me to come back to the subject of transparency with regard to the political decision-making. A modern democracy requires a well-informed and critical population. Not only prior to the policy debate, but also afterwards. Therefore, parliaments should give much attention to communication. For this purpose, modern information and communication technology is an excellent, albeit not perfect, instrument. In my view, parliaments should also invest in advice and guidance to citizens. I prefer to avoid the somewhat patronizing term 'education'. The Flemish Parliament already has one such programme, aimed at young people, entitled 'De kracht van je stem' [The Power of Your Vote/Voice]. On top of that, we have also paid a lot of attention, in our various policy plans and in practice, to improving the accessibility of our Parliament, not only as a building, but also with regard to particular issues. It has always been our policy, wherever possible and desirable, to organise lectures that are open to the public. From a democratic point of view, therefore, this conference is a greatly appreciated initiative.

Finally, in this international assembly, I would like to devote some attention to the Flemish chairmanship of the EPTA network in 2005. The Flemish Parliament attaches a lot of importance to European cooperation. For that reason, we became an active member of the CALRE network – the Conference of European Regional Legislative Assemblies – and, more recently, we founded a European unit within our parliamentary administration.

To outsiders, our Belgian federal state structure may seem rather complicated, but nevertheless it produces more dyna-

mism than dynamite, as I once put it in a book of mine. In our federal state structure, the regions and communities have considerable powers. On the strength of its powers, Flanders should therefore be considered as a fully-fledged partner in the broadest sense of the word. I am very pleased that the viWTA is the first TA institute belonging to a regional parliament that has been accepted as a member of the European network of parliamentary TA institutions, and received the honour to preside the network this year.

Dear colleagues, ladies and gentlemen, you are warmly welcome in this Flemish Parliament and I wish you a very interesting conference

1.2 Opening speech by Robert Voorhamme, Member of the Flemish Parliament, president of the Board of viWTA[2]

Dear Colleagues,
Ladies and Gentlemen,

Following the opening speech by the Speaker of our Parliament, Norbert De Batselier, I bid you welcome in the Flemish Parliament, speaking both for myself and on behalf of the Flemish Institute for Science and Technology Assessment, viWTA. It is a privilege for the viWTA to organise this annual activity of the EPTA network.

Tomorrow, we will hold a closed meeting of the network's Council, a round table of members of parliament who are members of the EPTA Council, and a workshop of that same Council together with STOA. All these activities will be expertly chaired by my esteemed colleague and vice-chairwoman of the viWTA, Mrs Trees Merckx-Van Goey.

In his opening words, the Speaker focused on the importance of technology assessment for the operation of democracy in general and for parliament in particular. He rightly urged for policy to direct and control scientific and technological developments. The demand for policy guidance has indeed become acute, certainly in the area of converging

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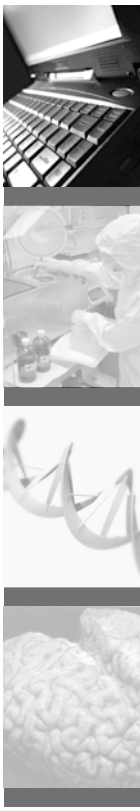
technologies. I must confess that some people had reasonable doubts about the choice of this subject. Some of these doubts are inherent in the question of whether science and technology can in fact be guided at all. In the light of this question, the results of a recent survey among the Flemish MPs are very interesting. By way of illustration, I will give you a few findings of this viWTA survey. The attitude of the Flemish MPs to science is very positive, more than that of the Flemish people as a whole. But the parliamentarians are not uncritical: approximately one in six is concerned about the social impact of science and/or believes that the pace of the changes wrought by science on society is too fast. The MPs view technology with even more scepticism and concern. Whereas they tend to perceive science as 'pure' or 'neutral', they see technology as the way science is translated into relevant effects on society. And it is precisely this translation that worries them. The survey revealed that the Flemish MPs can be neatly divided into three roughly equal-sized groups: one group of technology pessimists, one of technology optimists, and a group that takes a more hesitant stance midway between the two extremes. This clearly indicates that there is considerable concern about the social impact of technological innovation. This concern is strongly connected with the view taken by one in three MPs of the people who are responsible for technological innovation: they believe that these innovators largely disregard the societal aspects of their innovations and are driven by commercial interests. Consequently, one third of our MPs feel that scientific and technological evolution can no longer be guided by policy or society. Notwithstanding the fact that they acknowledge the important social aspects of technology and science, Flemish MPs are very reticent as regards the roles of citizens, parliament and government in the process of technological innovation. The conceptual and experimental work that lead to technological innovation are considered a matter of scientists. In theses stages, they think the main actors should be scientists and large companies. More than half of our MPs believe that the participation of citizens, parliament and government is limited to the stage of social implementation. They only see a role for themselves in the final stage of the development cycle. In other words, they allot politics and policy a merely reactive role, and certainly not a proactive part, in technology development. Of course, opinions are divided. A large minority of the MPs is of the opinion that parliament should also be involved in the conceptual and development phases. For that matter, our MPs are not yet very familiar with the scientific discipline aimed at supporting this involvement: technology assessment. Our MPs don't consider themselves as well informed on specific domains of scientific research and technology development. Regarding established technologies, such as environmental technology, energy, transport and ICT, many MPs still consider themselves well to very well informed. But when it comes to new technologies such as nanotechnology, that figure drops considerably. In the case of nanotechnology, it is only 5%. The survey reveals the strong link between familiarity with a



scientific domain on the one hand, and the social implications which the MPs can connect with these scientific developments on the other hand.

Ladies and gentlemen, two of the things we learn from this survey are these: first, there is evidently a need for information; and secondly, the direction of science and technology by policy, and therefore technology assessment as well, cannot be considered achieved as yet. For I believe that some of the doubts expressed by our MPs are dictated by the Collingridge dilemma. I quote: 'attempting to control a technology is difficult, and not rarely impossible, because during its early stages, when it can be controlled, not enough can be known about its harmful social consequences to warrant controlling its development; but by the time these consequences are apparent, control has become costly and slow'. In the case of converging technologies, we are clearly situated in the first and early stage of developments, as raised by the Collingridge dilemma. That is precisely why we chose converging technologies as the subject of this conference.

But another source of some of the doubts about the choice of subject is probably ignorance. Allow me a brief explanation of what we mean by converging technologies. It is common knowledge that information technology and communication go hand in hand. An example is the latest mobile telephone technology, which enables users to take pictures and transmit them directly. Biotechnology, and the attendant biomedical domain, also has its roots in the previous century. It is known for several notorious controversies such as the controversy on genetically modified organisms, but it is also known for the rapidly growing body of knowledge of the human genome and the characteristics of the human body. Cognitive science, including cognitive neuroscience, has been through a very fast development in recent years, partly thanks to new scanning techniques. Last but not least, nanoscience and nanotechnology are gradually beginning to show their possibilities and limitations. But whereas each of these technologies in itself is already an 'enabling' technology, a technology with great potential making rapid progress, their joining forces, their interaction and mutual influence, in short, their convergence, harbours even greater potential. The effect of convergence is cumulative: it is in a certain sense technology evolution raised to a higher power. What the future of this NBIC convergence could hold is the subject of conferences such as this. In specific domains, such as brain science, there is already sufficient awareness of the opportunities, the threats and the ethical challenges, witness the European 'Meeting of Minds' TA project, in which several EPTA institutions are involved as partners. To some, converging technologies probably seem very much like science fiction, unlikely to ever reach them. But the future is already here! We have sun

creams containing nanoparticles, a radio frequency chip implanted in the human body, a cancer chip, Ritalin, brain electrodes for stabilising Parkinson's disease, inner ear implants, software for the semantic web and search engines, biometric identification systems, etcetera.

Unlike before, the practices of looking at the future or 'foresighting', and feeding this back to the present, with suggestions for adjustments, known as 'backcasting', are now increasingly being adopted by serious scientists and technologists. In her book 'Tomorrow's People', Baroness Susan Greenfield quotes the theoretical physicist Michio Kaku: 'the problem with extrapolating the future in the past is that it hasn't been the scientists themselves making the predictions. Now they are in a very good position to do so' (end of quote). Baroness Greenfield, a member of the British House of Lords, but in the first place a renowned neuroscientist, adds, in the introduction of her book: 'We must be pro-active and set the agenda for what we want and need from such rapid technical advances; only then shall we, our children and our grandchildren, come to have the best life possible. So first we need to evaluate the 21st-century technologies, and then unflinchingly open our minds to all possibilities...'

For my part, I wish to sound a note of warning here. We must beware of taking an overly negative one-sided view on developments and of overemphasising the dangers. For scientific and technological progress are indispensable if we are to meet the challenges of the present and the future. I will list a few of these challenges, and you can probably add many more: the gap between rich and poor, north and south, overpopulation on one side and an ageing population on the other, climate change, energy production, health and care, the food problem, the safety problem, and so on.

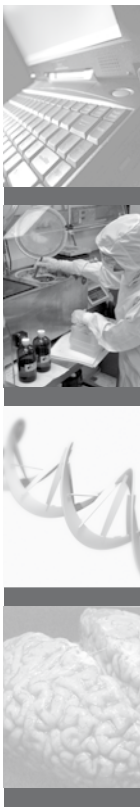
So far, two authoritative reports have been written on the subject of converging technologies. Although they both urge to give adequate attention to the ethical and social aspects, they each present a different view and lay different emphases. The American report from 2002 of the National Science Foundation, compiled by Mihail Roco and William Bainbridge, is entitled 'Converging Technologies for Improving Human Performance'. It focuses on the 'makability' of human beings, on ways of altering and correcting the human body via technological interventions. The European Report of the High Level Expertise Group Foresighting the New Technological Wave, commissioned by the European Commission and published in 2002, is entitled 'Converging Technologies – Shaping the Future of European Societies'. The central focus of this report is the modelling of society aided by technology. Whether this difference in focus – on the one hand, the makability of man, with the emphasis on the individual, on the other hand, the makability of society, with the

emphasis on the collective – is merely a difference of nuance or a fundamental difference in vision of society – for the moment, I am deliberately passing over the economic significance of the two reports – I hope to learn from the rapporteur of the European report, Mr Alfred Nordmann, who is our guest here today.

Ladies and gentlemen, my conclusion. If about one third of the Members of the Flemish Parliament are under the impression that the people responsible for technological innovation live in an ivory tower; if the same number believe that this means that scientific and technological development can no longer by guided by policy or by society, then there is a lot of work to be done by those who want to build a bridge between science, technology, society and policy-makers. Then there is work to be done by the TA institutes, the TA network and the TA community. For a person to want to guide something, he must first be convinced that guidance is possible. Overcoming this scepticism will take knowledge and information. Seeing that the majority of the population have not yet formed a picture of these developments, there is still time and room for a constructive and proactive debate on the future of these technologies and their convergence. Eric Drexler, who is generally considered one of the fathers of nanotechnology, maintains 'there are no good excuses for lack of foresight'. I wholeheartedly agree with him.

Thank you for your attention and your attendance. I wish you a productive conference.

2. REPORT



Impasse At The Start

Jean-Claude Burgelman studies one of Europe's most fundamental challenges _ how the continent will deal with its rapidly aging population. At the Institute for Prospective Technological Studies DG JRC in Seville, Spain, he stands at the cutting edge of research to investigate how enabling technologies converge and dovetail with social and political incentives to create a world of longer, more beneficial ''Active Aging.'' If ever there was a field where scientists could advance hand in hand with social and political stakeholders for the improvement of society, this was it.

Yet, addressing about 100 scientists and policy makers at the European conference of the EPTA network on ''The next Technology Wave,'' Burgelman came to a pretty glum conclusion. He already spoke of an ''impasse, if I can use a strong term,'' in a nascent field where kindred spirits should all be working toward one goal.

It immediately underlined the use and timeliness of the conference organized by the Flemish Institute for Science and Technology Assessment _ also known by its acronym viWTA _ on Oct. 17, 2005. viWTA organized and hosted the conference as the 2005 president of the European Parliamentary Technology Assessment network (EPTA). The issue of seeking the right balance between science, technology and society was picked up again a day later by the Council of the EPTA network. The goal of the conference was to increase awareness of the convergence of the nano-,bio-, info- and cogno-science in Europe and to plot a way ahead for politicians and society at large to become active contributors in this process. The subtitle of the conference _ ''Can policy keep pace with progress'' _ already indicated how urgent the issue could become. Playing catch-up was much more than just filling in the proverbial blank spaces, said viWTA Director and conference organizer Robby Berloznik. For the technology assessment community, it meant taking a leap, some would say a blind one, into a massive, blank space. ''Traditionally, we deal with technologies that exist, and we look at their societal impact. So we are facing a big problem here because there are no technologies, no impact, yet which are visible,'' Berloznik said. His answer was not so much as to search for science but instead to discover a need within society and pull technology toward it.

One could easily ask the question : So why not wait until the dust has settled and see what converging technologies have wrought. Be reactive instead of proactive. Most of the speakers however insisted that the practical implications of the converging of enabling technologies would have pre-empted moral and ethical discussions. The famous quote from Mark Weiser _ ''The most profound revolutions are not the ones trumpeted by pundits but those that

sneak in when we are not looking" _ also appeared on the Power point presentations here. And Robert Voorhamme, member of the Flemish Parliament and chairman of the viWTA board, highlighted the Collingridge dilemma which claims that ''attempting to control a technology is difficult, and not rarely impossible because during its early stages, when it can be controlled, not enough can be known about its harmful social consequences to warrant controlling its development; but by the time these consequences are apparent, control has become costly and slow."

Yet, the need for swift action was clear. Different experts spoke about a kaleidoscope of future options _ from a fully robotic war to the development of a sixth (or seventh) sense through brain manipulation. Besides vaunting the advantages of the new technologies to create ''smart environments," Mark Van Rossum, a professor in nanoelectronics at Leuven University, also assessed the down side of a technology so small and smart, it could once control our lives without us knowing it. ''They can penetrate everywhere. They can spread over the environment, infiltrate daily life in an invisible and unobtrusive way." In that sense, he said ''converging technologies are also the drivers of ethical concerns. If things penetrate everywhere in an invisible way, the question is : do we keep control?" Driven to the extreme, one could envisage people, ripped bare of any sense of privacy, living like drones on automatic pilot since technology takes care of everything.

At the end of the day, one contributor from the floor said that ''the seeds of Huxley's Brave New World" were already being scattered around. Several others said the many rifts within our global village would surely deepen if the enabling technologies were allowed to run rampant, unchecked. ''The ones who know versus the ones that don't _ that is the democratic challenge," said Françoise Roure, a Docteur d'Etat in economic sciences and a member of the European Commission's High Level Expert Group. Her comments were echoed by several others. Robert Voorhamme turned it around and saw the potential of enabling technologies as a way to cure such ills. ''Scientific and technological progress are indispensable if we are to meet the challenges of the present and the future. I will list a few of these challenges and you can probably add many more: the gap between rich and poor, north and south, overpopulation on the one side and an aging population on the other, climate change, energy production, health and care, the food problem, the safety problem, and so on."

Reason enough to prick up the ears. Yet, that remains a challenge for the public at large and even for many of the stakeholders. ''The demand for policy guidance has indeed become acute. Certainly in the area of converging technologies. I must confess that some people had reasonable doubts about the choice of this subject," said Voorhamme. ''Some of these doubts are inherent in the question of whether science and technology can in fact be guided at all," he said.

Professor Alfred Nordmann from Darmstadt Technical University and the rapporteur for the European Commission's High Level Expert Group Foresighting the New Technology Wave elaborated on those ''reasonable doubts." He started out with the roadblocks in people's minds. ''People say we had a hard enough time to get our heads around nanotechnology, so now you come with an even more abstract and general concept. Why should we bother with that," he said. Another reason people could not sufficiently focus on the issue was that the idea was considered all too vague to put one's finger on. ''Everyone uses the term as he likes. If we have all these different uses for the term, what does it mean anyway and why should we take it seriously?" .

In a concluding debate Professor Jean-Jacques Cassiman of Leuven University said the lack of interest of the public at large was a sign of the times. He told the conference it was worrying that all this was happening ''in a society where people are not particularly keen on having science taking a lead. People are anxious." Such circumstances are far from ideal to introduce complicated new technological concepts. ''They don't accept scientific explanations. And the technological revolution, for one thing, is going too fast. People want to return to simple things, to nature," he said. ''We see very little interest in science and we see a growing return to conservationism, whether it is religious or not." The pace of technology was also a problem for the political institutions, said Jyrki Kasvi from the parliament of Finland: ''The real challenge we are facing is that the legislative process, the parliamentary, democratic process is so slow, that we are only spectators on what is going on," he said.

Jan Staman from the Dutch Rathenau Institute indicated that science was no longer necessarily morally good. He said the public was taking an ever dimmer view of science. ''My idea is that they don't believe, at least in Europe anymore, in progress in the sense of a better society but that they have the idea that science and technology is also a

branch of industry, just like any other." Staman harked back to a time when science brought deliverance. ''In the world of enlightenment, science and technology gives us a better world, not only in welfare and so on, but also a morally better world. It is the big promise of enlightenment and I have the idea, and this is my worry, that this is shifting now."

Dr. Jorgo Chatzimarkakis, a German member of the European Parliament, agreed that such a danger lurked and urged the leaders of the science community to promote such ethical causes like development aid, the environment and health to ''let the image of research in general become better again _ because it has worsened." The shift is also noteworthy when it comes to the defining purpose of science. Rinie van Est of the Dutch Rathenau Institute said that the advantages of science and technology were much easier to see in the 1900s. And, at the same time, he underscored the value of need-oriented assessment. ''One hundred years ago it was quite clear there was a societal consensus of what was needed _ health was needed, food was needed. Now we are in a situation (that) the goals of science, what we want to achieve the next 20 to 30 years, are totally unclear. The question of need, where you want to go to, actually, it is about progress."

It is in this largely indifferent, sometimes hostile environment, that the advantages of technological assessment and integration into policy need to be promoted. ''In this type of society, to bring this tremendous new technology where there is a gap between what people understand and what is offered to them, is a major challenge," said Jean-Jacques Cassiman.

The Options On The Table

So far, there are two major approaches when it comes to converging technologies, some called it Leitbilder, and it should come as little surprise they create the perception of a trans-Atlantic divide. To put it in blunt terms : In the United States, the converging of enabling technologies wants to create the perfect individual and the enhancement of human performance. Scientists waste little time on potential social and political implications. It is technology driven, market driven.

In Europe though, the onus is on the social applications and the possibilities of making a better society. It highlights the social, ethical dimension and respect for human rights. But waffling within several layers of decision-making is slowing down the process. Professor Nordmann, the rapporteur for the European Commission's High Level Expert Group, took time to put both the American (NBIC) and European (CTEKS) programs in perspective.

The U.S. model is based on the convergence of Nano-Bio-Info-Cogno technologies for improving human performance, an idea which has captured the public imagination. Nordmann said the NBIC concept is committed to the principle that humans will achieve their true potential through technological innovation. It is based on a total belief in progress as seen by ''Nano's man-on-the-moon" project which lives by the credo ''If the Cognitive Scientists can think it, the Nano people can build it, the Bio people can implement it and the IT people can monitor and control it." It was not Nordmann's idea of the future and, within this European gathering, it found few takers. ''This is based on very bad human and social science presuppositions," said Nordmann. ''The fact that it leaves out social science really comes to haunt this project in a very profound way. If you read it with a social science sensibility you know that it cannot even work," he said, highlighting such issues as language in brain-to-brain interfaces. ''This is from a social science point of view such a primitive conception of what human communication is like (that) you know that even if they could do a brain to brain interface that communication problems would not be solved." Besides that, he said, the project ''only involves a very self-selected circle of researchers and little public involvement or stakeholder involvement." Within the U.S. context of improved human performance, Professor Juergen Altmann of Dortmund University assessed the military applications of converging technologies, very much the domain of the U.S. defense community. Military applications have long been a prime vehicle to introduce technological breakthroughs in society and it could well open the way for NBIC technologies too. Altmann raised the specter of fully robotic battlefields where the final decision for war could well depend on a machine. The development of brain-machine interfaces to speed up the reaction time in battle and the development of dynamic battlesuits and ''exoskeletons" to improve the performance of soldiers were all part of that framework.

It was about as far as possible as you could get from the idea and applications of Europe's CTEKS _ the Converging Technologies for the European Knowledge Society. Rapporteur Nordmann's high-level group coined the phrase and the rapporteur lauded its social and ethical dimension. CTEKS projects will typically combine at least two of the enabling

technologies but will invariably also have a social science dimension, seeking to bring technology closer to the people and emphasizes the need for explicit agenda setting. The main message in the European model is that the enabling technologies will reach their true potential through social innovation. Nordmann said such a link ''makes a virtue out of necessity'' since researchers have to realize they have to link up with socially useful aspects to be effective. The basic tools of the new enabling technologies need to be turned into sectoral projects with practical problem solving capabilities. In that sense, many also saw the ethical advantages of CTEKS. The needs of society also have to inspire the scientists in the enabling technology field. Nordmann called it ''an opportunity for engagement from the social point of view.'' Although he mentioned the still fictitious project of Converging Technologies for Salmon Productive Aquatic Environments with its obvious environmental implications, he also came back to Jean-Claude Burgelman's Active Aging program.

''We were inspired by the CTEKS report,'' said Burgelman, arguing technology only had a purpose if it meant something in everyday reality. ''How can it help solve our problems?'' The political challenges of aging are formidable. Estimates show that the demographic pyramid in the 25-nation European Union will be turned upside down in two years time. The share of the 65-plus population will have risen to some 28 percent by 2050. So the challenge is simple: How to keep health costs under control; how to keep an aging population socially integrated and how to keep them active longer. The needs are clear and technology has to be crafted to meet them. ''First we define the problem and then we grasp the technology to solve the problem,'' said Burgelman. And even if the problem is clear, the process of solving it is slow and cumbersome and remains a huge challenge. ''Quite surprisingly, if you consider the societal problem of demographic evolution, very few studies do exist on how Converging Technologies can contribute to the needs of Active Aging,'' said Burgelman. ''There is not much Research and Development going on in this area and, when it is, it is mainly toward health and industrial applications. Not much technical research exists to help envisage the future. And there is a lot of talking but very little research on societal acceptance and societal requirement . There are almost no scenarios being done in this area in Europe.''

So even if the concept of CTEKS was only developed last year, the time has come to start moving so social needs can catch up with technology. ''The biggest thing we have to do right now is building bridges between the converging technology communities and the active agers _ building bridges between experts and public to foster a need-oriented

approach which CTEKS is advocating," Burgelman concluded. ''We have to find a way to get the stakeholders together so that we can develop an action that goes in the same direction rather than the impasse, if I can use a strong term, we have at this level now."

The Way Ahead

''The challenge is to be prospective and timely," said Berloznik. Confront it however with Burgelman's assessment of reality _ ''We, in Europe we are brilliant at hesitating. That is what we are doing. We are brilliantly hesitating about this field where we should be going, what we should be doing," he said. Burgelman juxtaposed it with a much more scientific daredevil approach in the United States, where they seem much happier to proceed without having all checks and balances fully in place. In Europe, Burgelman said in the sidelines of the conference, ''it is like arguing against the internet because it is only going to swamp us with spam anyway." Voorhamme too, warned that too often the doomsday scenarios were getting the upper hand when it comes to technology. ''We must beware of taking an overly negatively one-sided view of developments and of overemphasizing the dangers." Positive thinking also means proactive. The issue is simple enough, said Burgelman. ''If you hesitate too long, you get problems." Trees Merckx-Van Goey, member of the Flemish Parliament and vice-president of viWTA, who headed the EPTA Council discussion agreed on the threat of excessive waffling, arguing it could all turn into an abstract chicken-or-egg discussion which would hold progress back. Those problems are already more than visible, said Panke Majlene Westerlund of the Swedish parliament. ''Why is Europe great in hesitating? Is there a mistrust among our inhabitants?" she asked, echoing earlier comment from other member at the EPTA Council. ''We can look at southeast Asia and the United States where we cannot find this hesitating . It is very frustrating to read all reports that say we must be cautious. Of course we must be cautious. But we must not be too cautious in hesitating because time is not waiting for us." Chatzimarkakis said the whole issue had turned too much into a cackling debate about the supply and demand, needs and offers _ a debate without real progress. ''Whereas we here, in our mentality and culture in Europe, have a big reluctance in applying new forms of technology, in Asia they are running all the time ... With the big competitiveness issue, we are lagging behind if we talk too much, if we are talking about the hen and the egg problem. We should talk about this but come up with a clear

solution : if there is a market demand we should quickly try to find answers to that market demand.'' Jyrki Kasvi said there was even invisible planning ''only the markets can do for us.'' He cited the development of the internet, which was long seen as a hopeless venture by experts arguing media companies would never invest sufficiently in it.

For some, it begs the question whether guidance is needed at all to put science on the right track. Most however were seeking a proper framework to contain the possible excesses of the enabling technologies and keep the ethical issues at the heart of progress. ''I strongly reject any technocratic or arrogantly elitist vision of science and technology,'' said Norbert De Batselier, the Speaker of the Flemish parliament in the opening address of the conference. ''I believe the age of blind faith in progress belongs definitely to the past. You no longer need convincing of the importance of an immediate and thorough understanding of societal aspects _ favorable or not _ of all kinds of scientific and `technological developments.''

Berloznik said such a framework had to encompass all actors within the debate and needed to include science and technology assessment right up to the source. ''We have to be bridge builders between all the communities,'' he said, stressing it needed to go beyond technology assessment, Begleitforschung and parallel research. ''We have to use the dynamics that we can now see in the scientific community _ in the Human Genome Project for example.'' He said the study of the notion of the ethical, legal and social impacts (also known as ELSI) of the project came from within the research community. Up to 5 percent of the Human Genome Project budget was spent on ELSI issues. ''That is the trend we have to watch for. We have to mirror ourselves in this. we have to support these trends that come from within,'' Berloznik said, marking it as a good example of his ''inspire and be inspired'' philosophy. Within that framework ''we have to pay more attention to the knowledge process upstream,'' as close to the origins of science as possible, he said. Such a process stresses the necessity for additional information from the scientific community to assess the impact on society. ''Scientists themselves have to help lead the ethical debate,'' Berloznik said. The idea of ''upstream,'' however, has its limits and several speakers argued against containing the creativity and independence of the core scientists. ''We should not threaten the researcher in basic science,'' said Swiss Parliamentarian Johannes Randegger, adding political involvement was more acceptable in applied sciences. Business, however, already has a major stake and Cassiman said it already was directing the scope of research. ''You should not forget that a lot of research, and more and more in Europe, is being funded by companies, by contracts between university groups and companies and those will co-decide

what type of research will be done. Because researchers are dependent on the money they can get and they are very flexible in this. We should not underestimate particularly in this area the effect of the private companies in steering what research will be done in the applied sector."

Françoise Roure tried to lift some of the gloom, mentioning the development of the ISO 26000 notion. The International Organization for Standardization is in the process of setting up a benchmark to provide companies and organizations guidance on social responsibility and hopes to have completed the standard by late 2008. But, sometimes it is difficult to discuss the societal implications of technology, when so little of the science itself is known. Until recently, nanotechnology, for example, was as good as unknown even though its impact on society could be huge. ''Nanotechnology for me was a big eye-opener,'' said van Est. ''It showed the explosion of the potential societal implications. Science had advanced much farther than I expected.'' And he found that society _ be it scientists, politicians or NGOs in the Netherlands _ were ill prepared to deal with it. ''In 2003, I knew only one social scientist who was looking into social implications of nanotechnology. Greenpeace had not heard about it. The ministries had not heard about it. There was no societal process at all.'' Nanotechnology was quickly becoming a high-stakes economic sector and there was need for an overall ethical debate and structure bringing the cluster of stakeholders closer together. van Est's Rathenau institute has already done so in the Netherlands and is continuing its follow-up of the project.
How to bring everyone together in a worthwhile brainstorming huddle was seen as a key problem.

Tore Tennøe, director of the Norwegian Board of Technology comes from an open democratic society and said that when it comes to debate in full trust ''the key word is robustness. Our experience from Norway is that we had fierce debate over biotechnology. We went to the public and it had a positive effect. You need to have those discussions and it might be a good idea. We cannot throw these issues under the carpet. Nicole Dewandre of the European Commission said increasing efforts were being made to make such discussions all-inclusive. ''It is the aim of the European Commission to involve more and more of civil society and public debate."

With a more comprehensive debate also comes the question how the needs can be set out. ''To define what those needs are we cannot use the techniques and methodology of today that is used in the typical marketing area,'' said Jordi Más of the Catalan Foundation for Research and Innovation. ''So we have to define different kinds of methodologies in order

to find out what are those needs of the future or those unarticulated needs."
Leo Hennen from the German Büro für Technikfolgen-Abschätzung (TAB) called for a Leitbild assessment: ''a model or a vision to follow."

Michael Rader of the German Forschungszentrum Karlsruhe (ITAS) said there are already 2 Leitbilder in existence: the European and American models. He said it was however still unclear who would follow which one in the future. ''These imply very different approaches for achieving convergence in practical applications. It is by no means a foregone conclusion that all European research will follow the one model, leitbild, or the Americans will follow the other."

Because the sector can raise such expectations of making life better through technological improvement, several speakers argued it is important not to throw up unwarranted obstacles slowing their development. Even though brain chips are often seen as the darker side of a science fiction novel, who is to argue against a brain chip that can make a crippled child walk again? If sensors in clothing can continuously monitor bodily functions and transmit it to medical centers, the advantages are obvious. Such promises can be a warning against any move to stifle developments. ''We have to find a very good reason why enhancement of human beings would not be done. If this is an option the Europeans do not take, we have to have a very good reason," said Cassiman, adding ''we are talking about regulating something which is not there today."

It is within this context that politicians and other decision makers have to find a way forward. Is policy dictated by the prophecies of doom or the predictions of a brighter world based on science so complex it is only fully understood by a small minority in society? ''When we come to this complexity, we have to come to societal involvement and see which kind of answers we need," said Roure. It calls for smooth cooperation within the triangle of governance-population-science. ''The public debate has to start in the lab itself. Scientists themselves have to help lead the ethical debate," said Berloznik. The technology assessment community has to provide guidance. Once outside the lab, the actors of governance have to stimulate the value debate and strive for consensus. So far, the reaction of the public at large has been muted, largely because of ignorance. On some technological issues like Genetically Modified Organisms, with the threat of ''Frankenfood" ending up on one's plate, the public has taken notice, but on many others, the reaction has been lukewarm at best, as van Est noted. Joachim Schummer, a professor of philosophy at the University of South

Carolina, said the assessment of technology on human values should start earlier. Often, one technological development affects conflicting basic values, like security versus personal freedom. ''Many antagonistic values need to be analyzed. Technological assessment needs to prepare the final assessment in a democratic society," he said. Such an assessment should be based on society's needs, many argued. But despite all the hesitating, Europe has moved too, in clear prioritized directions, as the many research plans from the European Union show, said Lars Klüver, director of the Danish Board of Technology. ''We are prioritizing a lot of research funding. The interesting thing is where do the ideas of what we prioritize come from," he said. ''I definitely think technology assessment has a role there. It is one of the most important issues around research policy _ how we prioritize, how we grab certain ideas and suddenly say now we are going to put a lot of money there."

For democratic society to make thoughtful decisions though, it needs information, and for this information to get through, there needs to be a better communications network, many said. ''The key role is about communication. ''The internet would not have had the success it has if the media would not have transported the message so rapidly. Communication is the key. We have lots of technological developments that would be very needed but do not take place," said Chatzimarkakis. He took the example of renewable energy, an issue which had been languishing for all too long, before it was picked up again during the 2005 crisis on high oil prices. ''If communication starts, politicians come in because politicians anyhow have been marginalized in that process." Not only politicians have to know how to perform on the media stage. ''Communication means playing theater .... Science is not doing it enough. It only plays the scientific role, not the communicative role and in the end the question whether the hen or the egg is first is irrelevant because once you have a broad public debate about what to do, you will find the end."

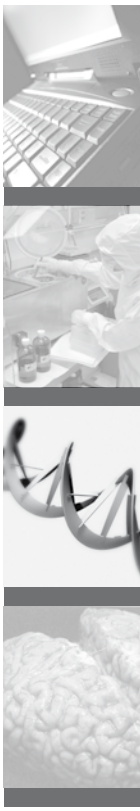
Randegger agreed. ''Because we need more taxpayers money for research in the future, they have a legitimate right to become better informed about what is done with taxpayers money in the research field. The researchers and universities have the obligations to communicate with the public." Unfortunately not all parliamentarians and politicians show the same kind of intensity as Randegger. Berloznik said it was one of the main goals to reach ever more legislators. The conference itself, held at the Flemish parliament, proved a case in point. ''Valorization is an issue _ how to reach politicians, he said. ''We have to reach farther." Flemish parliament Speaker De Batselier wanted to take that message further and reach out to the citizens, insisting a lack of communication was unforgivable under any circumstance.

''A modern democracy requires a well-informed and critical population. Not only prior to the policy debate, but also afterward. Therefore parliaments should give much attention to communication."

The conference showed the increasing importance of the European Parliamentary Technology Assessment network, which organized the Council meeting and held the round-table discussion during its Council meeting the subsequent day. EPTA seeks to advise parliamentarians throughout Europe on new sciences and technologies and the development of converging technologies which their potential fundamental impact on society has lent even greater urgency to their cause.

3 Abstracts of presentations

3.1 Abstract "Introduction to Converging Technologies" by Alfred Nordmann



Alfred NORDMANN is Professor of Philosophy and History of Science at Darmstadt Technical University, Germany. He served as rapporteur of the European Commission's High Level Expert Group Foresighting the New Technology Wave, for which he wrote the report Converging Technologies – Shaping the Future of European Societies (2004). Recent publications include "Noumenal Technology: Reflections on the Incredible Tininess of Nano" (Techné 8:3, 2005) and a book edited with Davis Baird and Joachim Schummer, Discovering the Nanoscale (Amsterdam, IOS Press, 2004).

This contribution set out to show that there is no fundamental difference between US and European definitions of "Converging Technologies". On both accounts, the convergence draws on the tools and capabilities acquired by the so-called "enabling technologies" (typically nanotechnology, biotech, information- and communication technologies). On both accounts, an agenda-setting process is required so as to orient basic capabilities to particular visions or problem-fields. On both accounts, research policy, technology assessment, and foresight face new challenges as they become agents of change that act in concert with the research community, societal and economic demands, and the interests of various publics.

When it comes to agenda-setting for Converging Technologies, however, one can proceed very differently. Drawing on a distinction suggested by Josephine Green, convergence can help humans achieve their true potential through technological innovation, or it can serve a process of social innovation and thereby draw out the true potential of the enabling technologies. The US-initiative "NBIC Convergence for Improving Human Performance" puts the realization of human potential first, the European approach to "Converging Technologies for European Knowledge Societies (CTEKS)" emphasizes that agenda-setting provides an opportunity to develop technologies in the context of social innovation. Thus, the US-initiative envisions engineering **of** the mind and **of** the body, while CTEKS encourages engineering **for** the mind and **for** the body. Accordingly, CTEKS places greater emphasis on the involvement of social sciences and humanities.

3.2 Abstract "The Contribution of Converging Applications for Active Ageing" by Jean-Claude Burgelman

Jean-Claude BURGELMAN is Head of Unit at the ICT unit of the DG JRC-IPTS (on leave from his position as Professor of Communication Technology Policy at the Free University of Brussels, VUB).
He has degrees in social sciences (BA, Phd) and in science and technology policy (MA) from the Free University of Brussels. At the VUB, he directed the research centre Studies on Media, Information and Telecommunications, which is a Centre of Excellence in Belgium. He teached at the University of Antwerp and the University of South Africa. His main research activities concern the social and economic impacts of information society technologies (as seen from the point of view of innovation dynamics). At IPTS (http://fiste.jrc.es) he leads several projects on the future of the Information Society in Europe: Vision and Knowledge Base (see http://fistera.jrc.es), the potential of IST for the new entrants, the outlook for 3G and 4G in Europe, the impact of ambient intelligence technologies on health and e-governance, etc. Jean-Claude BURGELMAN is a member of the board of several scientific journals and has published widely (books and articles).

The Contribution of Converging Applications for Active Ageing (R Compañó, A-K Bock, JC Burgelman, M Cabrera, O. Da Costa, P Mattsson, N Malanowski, Institute for Prospective Technological Studies DG JRC – IPTS, European Commission)

By 2007, people aged 65+ will make up around 28% of the population in the EU in 2050. The reversing of our demographic pyramid raises a number of very serious questions for Europeans. How do we reduce health care costs while maintaining a high quality of life? How do we keep older Europeans socially networked and integrated? Or how do we avoid losing the hidden investment of economic and human capital when active Europeans retire?

In this context the combination of "Converging Applications" and "Active Ageing" is proposed as one of the answers to the above mentioned questions.

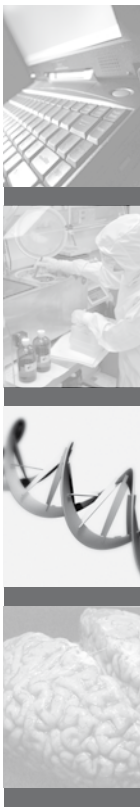
According to the World Health Organization, Active Ageing (AA) is the process of optimising opportunities for health, participation and security in order to enhance quality of life as people age.[3] It allows people to realise their potential for physical, social, and mental well-being throughout their lives and to participate in society according to their needs, desires and capacities, while providing them with adequate protection, security and care when they require assistance. "Active" refers to a continuous participation in social, economic, cultural, spiritual and civic affairs, not just the ability to be physically active or part of the labour force. Active Ageing is a central point of policy discussion at both Member State and European Union levels.

According to the US National Science Foundation, converging technologies usually refer to the cross-fertilisation between nanotechnology, biotechnology, information and communication technologies and cognitive sciences.[4] It is understood as a co-evolutionary process, where progress in one area accelerates progress in many others. Applications arising from this co-evolutionary process hold the promise of huge economic benefits.

In this article, the potential contribution of Converging Applications (CA) -rather than on the technologies themselves- with regard to Active Ageing policy is explored. AA and CA are seldom examined together. While the policy relevance and challenges of Active Ageing are widely discussed, there appears to be little literature on how technology can contribute to this field. Some studies seem to point to the emergence of a number of clusters of convergence with high potential, such as brain-machine interfaces, robotics or speech recognition. The most urgent needs of older people today may mostly be satisfied with state-of-the-art technologies. In the future, however, the more technology will progress and application will be deployed, the more quests for Converging Applications will rise.

In terms of economics, social benefits and industrial competitiveness, CA appears to be obvious candidates for the health area. The role of CA for Active Ageing Policy is less clear. Many believe that they will have major policy implications but there appears to be hardly any facts to quantify this statement.

The lack of scientific breakthroughs, missing expertise or inadequate financial resources may hamper the deployment of Converging Applications. In contrast to other high-technology domains, public authorities (in particular the social security systems) are important stakeholders as they are major customers of applications. As the development of many Converging Applications may be expensive and will pay off in the long term, the role of the governmental stakeholders and the public sector could be crucial.



[3] *"Active Ageing: A Policy Framework" World Health Organization, 2002. www.who.int/ageing/en/*

[4] *Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technologies and Cognitive Science (NBIC)," Roco and Brainbridge, National Science Foundation, June 2002 (see www.technology.gov/reports/2002/NBIC/Part1.pdf)*

3.3 Abstract "The Dutch Debate on nanotechnology" by Rinie van Est

Dr. ir. Rinie van Est is a physicist and a political scientist by training and works since 1997 for the Rathenau Institute. He also lectures Technology Assessment and Foresight at the Faculty Technology Management of the Eindhoven University of Technology. At the Rathenau Institute he currently manages projects in the field of nanotechnology, ambient intelligence and health, brain sciences, and convergent technologies.

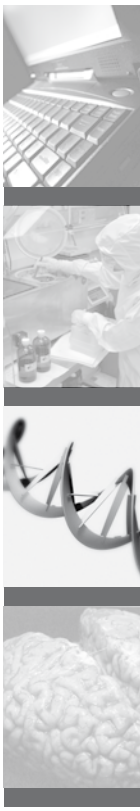
When the Rathenau Institute started its project on nanotechnology in 2003 there was little or no debate on nanotechnology in the Netherlands. Nanoscientists had organised themselves in the research program NanoImpuls. Its successor NanoNed was in the making. There was only one social scientist engaged in nanotechnology. Professor Arie Rip was asked by NanoImpuls to set up a TA program. Neither the ministries of environment and health nor Greenpeace Amsterdam, had even heard of the word. Nanotechnology was mentioned in a policy document of the ministry of environment document dealing with potential future environmental risks. It talked about the future risk of self-reproducing nanobots, but did not notice the more mundane and near-term risks related to nanoparticles. Some assistants of parliamentarians were interested in nanotechnology, in particular parties at the far left and right wing of the political spectrum.

Nanotechnology was part of the working program 2003-2004. The project received a sense of urgency, however, only after the ETC group had written the report The Big Down and had organised a meeting in the European Parliament in Spring 2003. This event signalled that the debate had landed in Europe, and that we had to move on. As indicated above, the debate on nanotechnology more or less had to build up in the Netherlands from scratch, both from a content and process point of view. With respect to the content, we decided to write a short and easy readable position paper that would give an overview of the applications and related potential societal aspects. Personally, exploring the broad nanotechnology development was a true eye-opener. It shows an explosion of potential applications and even more societal implications. It shows that what was science fiction sometimes has moved into the realm of science. This also means that the horizon of society's future has shifted. This leads to both hopes and worries and asks for public debate. What can of future can we expect, what kind of life do we want to achieve?

Various risk domains

In the orientation study a whole range of fields of application of nanotechnology were identified, as well as a whole range of ethical, legal and social aspects. These aspects could be grouped into three clusters:

- 'classical' risks: health and environmental effects. These types of risks normally get the most attention, and are accepted by most parties as being important;
- 'familiar' social aspects, like privacy, patents, sustainability and governance;
- 'new' social & ethical aspects, like self-reproduction of man-made systems, mixing living and non-living material, and engineering of human. These topics are fairly new and are put on the agenda by nanotechnology and even stronger by the notion of convergent technologies.



Project activities

Based on the position paper we set up various project activities. The goal of our project was to start up an open dialogue and build up a relevant network, in which natural and social scientist, and policy makers and societal organisations would be involved, in order to inform politicians about the current debate on nanotechnology. Various workshops were set up, e.g. on nanotoxicity, nano-applications in medical and food sector, nano-electronics. Also three focus groups with master students were organised to get a flavour of early public perceptions on nanotechnology. In the meantime we tried to get the Theme Commission for Technology Policy interested in nanotechnology. A theme commission is a new type of parliamentary commission, somewhat between a standing committee and a temporary committee, who's aim it is to take a broader, long-term perspective on the related theme. Initially, the commission was not particularly interested in any certain technology. It was interested in new types of ways to increase the interaction between the Parliament and the outside world. Accordingly we proposed to organise a novel type of method, around the topic of nanotechnology, which would serve as the final public meeting of our project on nanotechnology.

Instead of a classical hearing set-up, we organised an arena-type of meeting in the Parliament. In this setting each specific part of society, like business, nanoscientists, social scientists, NGOs, policy makers (government), citizens, and members of the Theme commission – have a clear position in the room, so it becomes directly clear which interests are talking. For example, if scientists state that they need more public funding. The mediator will directly walk towards the people from the government and ask them whether they want to respond to this. The members of the committee had

a so-called Socrates role, so they could introduce relevant questions that had not yet been treated in the debate to the fore.

After the public meeting the Theme commission directly picked up the issue of nanotoxicity, and asked the Rathenau institute to provide an overview of the issues and activities in that field. The Theme commission also picked up RFID as a topic. The Rathenau Institute has just finished a position paper on that. A clear conclusion from the meeting was that after a phase of studying the broad nature of nanotechnology and its possible impacts, in is important to start discussing concrete applications of nanotechnology.

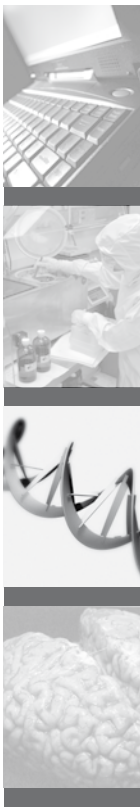
Project Nanotechnology in focus

We have taken that outcome and advice very seriously. In the current working program 2005-2006 we have set up the project Nanotechnology in focus to do that. By means of interviews with some 20 experts, we have identified some 15 applications that are expected to be on the market before 2015, so within 10 years. The reader of our electronic newsletter on nanotechnology were asked to select the three most relevant applications. They chose energy and water applications and drug delivery systems to be further studied and discussed in 2006.

Various risk domains, various projects

It is good to turn to concrete applications of nanotechnology and investigate and discuss the related classical risks and familiar societal aspects (see above). But if we would do only that we would miss an important part of the discussion. In particular the discussion on the so-called new social and ethical aspects that were introduced by nanotechnology. It is exactly these topics that come to the fore in he discussion on convergent technologies. That discussion is not only on concrete applications, but on the goals that society wants from science.

3.4 Abstract "Converging Technologies: Promises and Pitfalls (A German Perspective)" by Christopher Coenen



Christopher Coenen is a political scientist. Since 2002 he is a staff member of the Office of Technology Assessment at the German Parliament (Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag, TAB) in Berlin, run by ITAS/ Research Center Karlsruhe.
He is currently working primarily in the research fields ICT/New Media and Nanotechnologies/Converging Technologies

Tendencies of technological convergence and the growing importance of interdisciplinarity are not entirely new phenomena. The debates on nanotechnology, for example, already reflected an increased awareness of the opportunities and challenges arising from new techno-scientific synergies. Some of the ongoing conceptual reshuffles are also driven by changing relationships between business, government, science and engineering, particularly in the US.

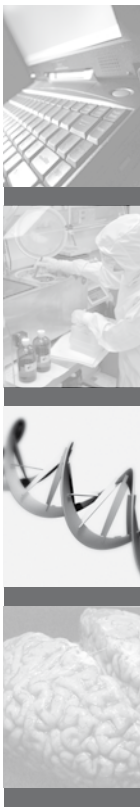
The upcoming concept of converging technologies (CT) further accentuates the coalescence of originally separate branches of science and technology. It is, therefore, often deemed to be the most "holistic" of all the concepts that reflect recent confluences of knowledge systems. Nanotechnology is the linchpin of the debates on CT. In our work at the Office of Technology Assessment at the German Parliament (TAB) we first took notice of the concept while conducting research on nanotechnology and reading the much-debated US NBIC report, published in the year 2002. The TAB report on nanotechnology, published in the following year, described and analysed real progress and tendencies of convergence in several fields, focussing on Europe and particularly on Germany. In the light of the findings the report argued that technological and scientific advances pose new challenges for education policy, that inter- and transdisciplinary cooperation and communication should be continuously and increasingly promoted and that more use should be made of technology studies and other liberal arts research. Additionally and separately the report discussed the visions of the US NBIC initiative and its history as well as some of the techno-futuristic dreams and nightmares that have been flourishing in US and European societies since the 1980s. We learned that the convergence of technologies goes hand in hand with a convergence of futuristic visions. It was interesting to see how the US initiative made use of utopian dreams and grand – albeit often technocratic – visions to pursue its goals. To sum up, the TAB report analysed tendencies of nano-convergence in the life sciences, ICT and other fields, but it used the term "convergence" reluctantly, because of

the visionary and political charging of the US concept. Nevertheless, then as today, we found it necessary to discuss futuristic visions of technological convergence.

At the core of many of the ethical debates are possible consequences of technological convergence for individual human identity and for the identity of mankind as a whole – although privacy, safety, ecological and security issues are more urgent problems. Advances in biotechnology and brain research seem to threaten traditional notions of humanity and human identity. The relationships between humans and machines and between nature and technology are expected to change fundamentally. Further focus is on possible future social divides caused by enhancement technologies. The perceived threats accompany great promises such as the restoration of bodily and mental functions, the efficient use of natural resources or new opportunities for individual and collective human enhancement. So, even the fulfilment of old utopian dreams seems to be finally at hand – with the consequence that dark fantasies such as that depicted in Aldous Huxley's Brave New World also appear as realistic future scenarios.

If we take a look at thematically relevant debates that have taken place in Germany within the past few years the ambiguity becomes apparent. At the moment the debate on CT in Germany is still mostly confined to academic and other specialist circles and political approaches are rather cautious. NGOs and the mass media play no significant roles. But other public debates that have been going on within the past few years, have not only referred to one or more of the technologies in question, but also to aspects of their convergence. In the political debate on nanotechnology the importance of public discourse and a critical examination of the futuristic visions have been emphasised. All parliamentary parties argued for curricular changes and for an adjustment to the new tendencies in research and development. Moreover, other topics relating to the CT have been broadly discussed since the end of the 1990s: Heated debates occurred, for example, on possible technocratic uses of genetic engineering, on the apocalyptic visions of Bill Joy and on a manifesto authored by leading German neuroscientists. From a German perspective, it is, therefore, very likely that some aspects of technological convergence, particularly in the bio and neuro fields, will also trigger heated debates as the concept becomes more widely known. Within the past few months growing academic interest in the topic of human enhancement could be observed, a topic so prominent in the US initiative on NBIC convergence. Possible social risks are also discussed, particularly the prospects of a hardening of social inequalities and a naturalisation of social hierarchies.

To avoid a conceptual pitfall the CT subject should be treated in a nuanced and discriminating way – to prevent one technology suffering from the ethical problems of others and from any resentment towards these. Existing visions of technological convergence should be assessed and positions be clarified. If "converging technologies" becomes a mere catchphrase, the concept will very probably do more harm than good. Ethically unproblematic research areas might be negatively affected by a generalised mistrust of CT.



There is, however, another way to avoid the pitfall: The establishment of an overarching, guiding vision for convergence also intended to counter technocratic visions such as the ones developed by the US NBIC initiative. When we take a look at the recent and ongoing debates, some outlines of such a vision become apparent. Specifically, the report of the European High-Level-Expert Group (HLEG) on "Foresighting the New Technology Wave" offers fruitful ground for the further development of a meaningful approach to technological convergence. The great promise, driving much of the CT debate, seems to be the potential for humanising our technologies in an all-encompassing way: The further development of CT should hence be human-centred and not driven by technocratic ideals or the desire to achieve a perfection of human bodies and minds. Instead of machines being the measure of man, social needs, the economical and ecological goals for a sustainable development and cultural values should determine the direction of technological progress. Accordingly, we have to look for ways to reconcile the technological prospects with our goals and values. By humanising the CT, these prospects will hopefully in the long run not be dependent on state funding or on the desires of techno-fanatics. (By creating intelligent environments, for example, fewer people would be willing or forced to improve their mental capabilities by pharmaceutical means or future enhancement technologies.) It is obviously of utmost importance to gather and disseminate ideas – wherever they are developed – that can help to create truly human knowledge societies in the 21st century. As a matter of course the further elaboration of such a guiding vision should be based on a solid and detailed knowledge of scientific advances and ongoing and emerging technological developments. Politicians in Germany who are interested in this topic want to know two things above all: In which areas does convergence take place and what are the real opportunities and challenges? But they also want to know how the debate on CT has developed in different frames and contexts. In our current work at TAB we are, therefore, trying to assess the relevance of technological convergence in various fields, for example, in brain research and in biomimetics, but we were also asked to examine the international debates on the concept. Such an examination is deemed to be a prerequisite for an informed elaboration of a guiding vision. The European HLEG characterised the CT as "enabling technologies and

knowledge systems that enable each other in the pursuit of a common goal". Because the concept is essentially goal-orientated, the future prospects of technological convergence for good or bad depend upon political and social shaping – and maybe more on that than on anything else.

3.5 Abstract "Implications of Converging Technologies for Military Applications" by Jürgen Altmann

Jürgen ALTMANN is a physicist and peace researcher at Universität Dortmund, Germany. Since 1985 he has studied scientific-technical problems of disarmament. One research area is automatic sensor systems for co-operative verification of disarmament and peace agreements, another is preventive arms control for new military technologies. Recent studies have analysed "non-lethal" weapons, micro-systems technology and nanotechnology. J. Altmann has been a member of the High Level Expert Group Foresighting the New Technology Wave of the European Commission.

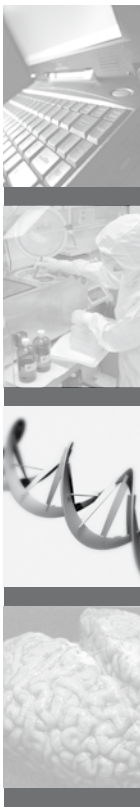
a) Military-Technology Assessment

Military use of technology is not the same as civilian use of technology. Civilian society tries hard to prevent bad and ugly things, and they come only about by accident or a few criminals. However, in the military the same applications are prepared in an organised way on a large scale by the state, justified by highest national interests – if need be, the armed forces are to overcome the will of an opponent by violent force. A central means of prevailing in armed conflict is new technology. The very task of the military produces a tendency to transcend civilian limits, and to keep things secret. Unfortunately, military uses are not often looked at in technology assessment.

b) Potential Military Applications of Nanotechnology and Converging Technologies

Potential future military applications of nanotechnology (NT) and converging technologies (CT) span a very wide range: immensely faster and smaller computers, software with everyday knowledge and natural-language capability, very small and cheap sensors, stronger but lighter materials, more efficient energy storage and propulsion, propellants and explosives. Improvements can be foreseen in

camouflage, light armour, penetrators, precision munitions and missiles. Miniature satellites and launchers will become possible, as will be macro- and micro-robots with and without weapons, including bio-technical hybrids (e.g., electrode-controlled insects or rats). Soldier systems will sense the body status, implants will allow manipulations of the body; envisaged is a brain-machine interface (non-invasive at first). Concerning chemical and biological weapons (CBW), NT will on the one hand allow capsules for safer enclosure and targeted release of agents, selective reaction with specific genetic or protein patterns, and measures to strongly reduce the risk to the own side. On the other hand, NT/CT will allow faster, smaller and cheaper detectors for chemical or biological agents as well as materials for better agent neutralisation.



c) Military Research & Development of NT/CT

In the USA, since the founding in 2000 of the National NT Initiative, 1/4 to 1/3 of Federal funding for NT has gone to defense research and development (R&D), in 2003, $ 243 out of $ 770 million. Much of this work is basic science and engineering, carried out at military laboratories and universities. In the context of CT, national-security goals include uninhabited combat vehicles, warfighter systems, enhanced human performance, a brain-machine interface. For faster transition to deployment, the U.S. Army has founded in 2002 the Institute for Soldier Nanotechnologies at the MIT, which is working on protective battle suits, sensors for body status, exoskeletons, and medical technologies. Other countries spend much less; a cautious estimate is that the USA expenditure is 4-10 times of the one of the combined rest of the world (in military R&D overall, the ratio is 2). However, this can change as other countries would follow the US role model. There is no doubt that, e.g., Russia and China are capable actors in NT and would be able to use NT/CT for all kinds of military applications.

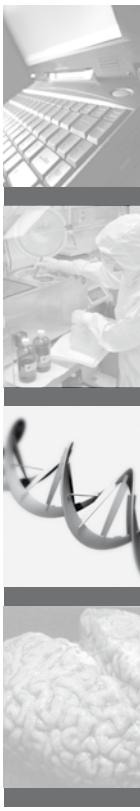
d) Dangers and Preventive Limitation

When judging potential military NT/CT uses under criteria of preventive arms control, several of the more generic areas pose no big problems or are too close to civilian uses to consider limitation (e.g.,

computers). Of the specifically military applications, very few could have positive effects (e.g., sensors for CBW verification). Most, however, raise serious concerns. The most dangerous applications and affected criteria area are:

Area of Concern Potential Application	Arms Control / International Humanitarian Law / Weapons of Mass Destruction	Military Stability / Arms Race / Proliferation	Humans / Environment / Society / Infrastructure
Distributed small sensors		X	X
Metal-free firearms		X	X
Small missiles		X	X
Implants and other body manipulation		X	X
Autonomous combat systems	X	X	
Small robots	X	X	X
Small satellites and launchers	X	X	
New chemical/ biological weapons	X	X	X

e) Recommendations



In order to prevent the most problematic military applications of NT/CT, the following measures should be negotiated and agreed upon internationally:
Ban on self-contained sensor systems below 3-5 cm;
Ban on small arms, light weapons and munitions that contain no metal;
Ban on missiles below 0.2-0.5 m;
Moratorium on non-medical body implants, body manipulation;
Ban on re-usable armed, mobile systems without crew
– at least no aiming and weapon release without human decision;
Ban on mobile (partly) artificial systems below 0.2-0.5 m;
Comprehensive ban on space weapons;
Uphold and strengthen the Chemical Weapons Convention and the Biological Weapons Convention. They would not unduly hamper beneficial civilian uses and can be verified by on-site inspections with auxiliary equipment.

f) Concluding Remarks

For the USA there is no serious military-technological challenge in NT/CT from a potential opponent. The USA is rather engaged in a virtual arms race with itself. Thus, unilateral restraint is principally possible without creating dangers to U.S. national security. This could buy time to agree internationally on preventive, verifiable limits. However, this would need a changed US attitude, in the direction of enlightened national interest.
NT and CT will be very powerful. Containing their risks will need far-reaching limits, intensive verification, and effective criminal prosecution as we accept them within civilian society (in workplace security, environment, accounting, law enforcement etc.), also in the international community. This does not fit well to a world where security is mainly built on the threat of armed force. Long-term security thus calls for strengthening of law and political institutions on the international level,

including international criminal law, while reducing the dependence on national armed forces. In such an international process, Europe and Belgium can play an active and constructive role.

Based on the research project „Preventive Arms Control and Nanotechnologies", which was funded 2002-03 by the German Foundation for Peace Research DSF.

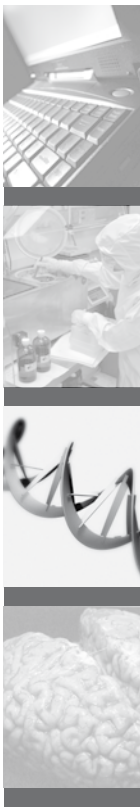
References:

J. Altmann, Military Nanotechnology: Potential Applications and Preventive Arms Control, London/New York: Routledge, 2006

J. Altmann, Military Uses of Nanotechnology: Perspectives and Concerns, Security Dialogue 35 (1), 61-79, March 2004

J. Altmann, M. Gubrud, Anticipating Military Nanotechnology, IEEE Technology and Society Magazine, 23 (4), 33-40, Winter 2004

3.6 Abstract "The smart environment: converging technologies and new business models" by Marc Van Rossum



Marc Van Rossum is Professor of Nanoelectronics at the Catholic University of Leuven, Belgium. He is responsible for strategic research planning at the Interuniversity Microelectronics Centre (IMEC). His main research interests are the physics and technology of nanoelectronics. He has over 300 publications in international journals. He is the founder of PHANTOMS, the first E.U. network for nanoelectronics research and has acted as the coordinator of several European projects in this area. Prof. Van Rossum is editor-in-chief of the journal Microelectronic Engineering (Elsevier).

Convergence processes are now widely recognized as basic modes of development in science and technology. The last decade of the 20th century has witnessed the emergence of a new major convergence platform, based on ICT, biotechnology and nanotechnology. The confluence of these three disciplines has been driven by their sharing some essential properties, in particular:

- Reductionism: the practice of operating on elementary constituents (bits, atoms, genes and proteins);
- Pervasiveness: spreading (often invisibly) throughout our environment and infiltrating everyday life;
- Personalisation: the ability to taylor interaction modes to the user's needs.

Due to these properties, the Info-Bio-Nano platform is now developing into a key substructure of the Smart Environment (SE), which is the new paradigm for a human environment able to actively support its inhabitants. Poles of development for the Smart Environment are already appearing in various domains of human activity, such as smart buildings, smart cars, smart textiles, wireless sensor networks, smart health systems and many others. The "smartness" arises from their global (often wireless) connectivity, as well as from their ability to display context awareness and proactive behaviour, and to interact unobstrusively with people.

Out of this convergence, new business models are likely to emerge[5]. They will complement, or even supersede, the current models based on cost reductions and margin improvements. Some models aim at boosting productivity, s.a. real-time paying, real-time billing and silent commerce; others, such as price personalisation, pay-for-use or pay-for-risk,

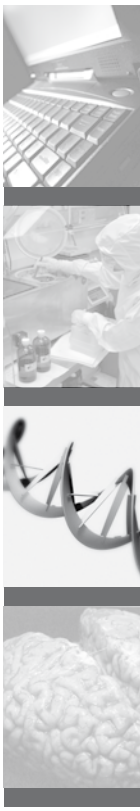
[5] *J. Bohn et al.: Living in a World of Smart Everyday Objects--Social, Economic, and Ethical Implications, Human and Ecological Risk Assessment, 10: 763-785, 2004*

tend towards a level playing field between service consumers and service providers.

However, the predicted impact of the smart environment on our daily lives has already turned into a source of societal concerns. Indeed, personalisation could lead to power abuse (leading e.g. to loss of privacy or the imposition of behavioural constraints) , pervasiveness may result in loss of control over the deployment of technology, whereas reductionism in technological practices has often given rise to suspicions of transgression of ethical boundaries. These concerns must be addressed at a very early stage, to prevent social tensions and technological derailments from undermining the positive potential of the SE.

Moreover, the transition from a multidisciplinary to an interdisciplinary technology environment will require major adjustments in education, R&D programmes and industrial strategy. The role of public authorities will be to define appropriate policies to optimize the impact of technology convergence on society at large and promote innovative approaches to address its major challenges.

3.7 Participants to the debate on human values and the next technology wave



Jean-Jacques CASSIMAN

Jean-Jacques Cassiman was born on April 25, 1943 in Brussels. After his training as an MD specialised in Paediatrics, he spent 5 years at the University of Stanford, CA. Since 1984 he is full Professor of Human Genetics and since 1999, Division Head of the Center for Human Genetics in Leuven, Belgium. He is Director of the Laboratory for Forensic Genetics and Molecular Archaeology and coordinator of EU projects on Cystic Fibrosis. From 1993-99 he was secretary general of the European Society of Human Genetics and from 2002 on he is liaison officer for the ESHG to the International Federation of Human Genetics Societies.
He is secretary of EPPOSI (European Platform for Patient Organizations, Science and Industry) and member of the board of vIWTA (the Flemish Institute for Science and Technology Assessment of the Flemish Parliament).
He is co-ordinator of the EU-funded Network of Excellence EUROGENTEST, that aims at harmonizing and improving the quality of genetic testing in the EU.

Françoise ROURE

Françoise ROURE is Docteur d'état in Economic Sciences. Ms Roure is the French representative to the International Dialogue on Responsible Nanotechnology, initiated on invitation of the NSF. As Senior Advisor, member of the National Advisory Board on Information Technologies (Conseil général des technologies de l'information) and Deputy-Chair of the economic and legal section, she wrote a report on Nanotechnologies, Ethics and Industrial Foresight, together with Professor Jean-Pierre Dupuy. She was a member of the European Commission High Level Expert Group Foresighting the New Technology Wave.

Joachim SCHUMMER

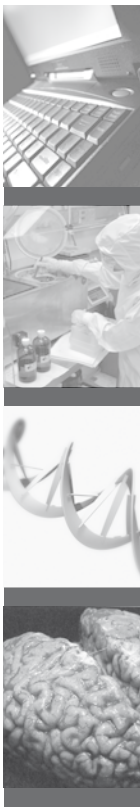
Joachim SCHUMMER is Heisenberg Fellow at Darmstadt Technical University (Germany) and Adjunct Professor of Philosophy at the University of South Carolina (USA). His research interests are the history, philosophy, ethics, and sociology of science and technology, with currently a focus on nanotechnology, about which he has published numerous articles and edited three volumes. He serves on various international committees, including the UNESCO expert group on Nanotechnology and Ethics.

Jan LEYERS (moderator)

Jan Leyers, musician, author-composer, producer, program maker, writer and television host, was born in Wilrijk, on 16 May 1958. He studied philosophy, and in 1986, after a few musical adventures with personalities such as Bart Peeters and Hugo Matthysen, he founded SOULSISTER together with Paul Michiels. Their hit 'The Way to Your Heart' reached the top of the charts in almost every part of the world. After Soulsister split, Jan was asked to work for television. For the television channel 'CANVAS' for instance, he made travel documentaries such as 'DE SCHADUW VAN HET KRUIS' and 'DE DROOM VAN LUDWIG' and hosted over a hundred times the discussion programme NACHTWACHT. On another channel, 'ÉÉN' he presented a daily talk show 'ZOMER 2005' and from the end of October 2005 on, he will be hosting a new discussion programme on CANVAS. In September 2005, In the Virgin Dark, his second solo CD, was released.

4 About the organization

4.1 About EPTA (European Parliamentary Technology Assessment)



Objectives

The EPTA Partners advise parliaments on the possible social, economic and environmental impact of new sciences and technologies. The common aim is to provide impartial and high quality accounts and reports of developments in issues such as bioethics and biotechnology, public health, environment and energy, ICTs, and R&D policy. Such work is seen as an aid to the democratic control of scientific and technological innovations, and was pioneered in the 1970s by the Office of Technology Assessment (OTA) of the US Congress. EPTA aims to advance the establishment of technology assessment as an integral part of policy consulting in parliamentary decision making processes in Europe, and to strengthen the links between TA units in Europe.

Organisation

The EPTA network was formally established in 1990 under the patronage of the President of the European Parliament, Mr Enrique Baron Crespo. The network has a light structure, guided by the EPTA Council and by meetings of the Directors of the EPTA partner organisations.

The EPTA Council is the steering committee of the EPTA network, and consists of members of Parliament or representatives of the advisory boards for the respective EPTA organisation. The council decides on organisational matters such as co-operation within the network and the status of members and associates.

The presidency of EPTA moves each year. The tasks of the EPTA member organisation holding the presidency are to coordinate the EPTA network activities and to host the annual EPTA Conference, Council Meeting and Directors' meeting.

Members

The members of the EPTA network are European organisations which carry out TA studies on behalf of parliaments. Parliamentary TA is institutionalised in different ways, ranging from permanent parliamentary committees for TA; separate TA units as part of the parliamentary administration; to independent institutions with a mandate to serve as

a permanent consulting institution for the parliament. Salient TA units with only informal connections to the national parliaments are involved in the EPTA network as associates. Associates are involved in all EPTA activities but are not represented in the EPTA council.

Member Organisations of the EPTA Council

Scientific and Technological Options Assessment (STOA), European Parliament

Teknologirådet - Danish Board of Technology (DBT)

Committee for the Future, Finnish Parliament - Tulevaisuusvaliokunta

Vlaams Instituut voor Wetenschappelijk en technologisch apectenonderzoek (viWTA) - Flemish Institute for Science and Technology Assessment, Flemish Parliament, Belgium

Office Parlementaire d'evaluation des choix scientifiques et technologiques (OPECST) - Parliamentary Office for Evaluation of Scientific and Technological Options, French Parliament

Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag (TAB) - Office of Technology Assessment at the German Parliament

Committee on Technology Assessment, Greek Parliament

Comitato per la Valutazione delle Scelte Scientifiche e Tecnologiche (VAST) - Committee for Science and Technology Assessment, Italian Parliament

Rathenau Institute, the Netherlands

Teknologirådet - Norwegian Board of Technology (NBT)

Zentrum für Technologiefolgen-Abschätzung - Centre for Technology Assessment at the Swiss Science and Technology Council (TA-Swiss)

Parliamentary Office of Science and Technology (POST), UK

Comissió Assessora de Ciències i Tecnologia - Catalan Science and Technology Assessment Committee (CACIT)

Associate members

Sub-Committee on Science and Ethics of the Parliamentary Assembly of the Council of Europe, Strassbourg

Institut für Technikfolgenabschätzung (ITA), Austria

RIFO, Swedish Parliament

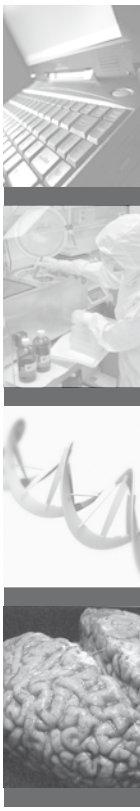
Belgian Federal Office for Scientific, Technological and Cultural Affairs (OSTC), Belgium

Website

http://www.eptanetwork.org

Presidency 2005

The presidency of EPTA moves each year. In 2005 the 'Vlaams Instituut voor Wetenschappelijk en Technologisch Aspectenonderzoek' (Flemish Institute for Science and Technology Assessment), abbreviated viWTA, was the president of the network.



4.2 About VIWTA

viWTA was founded by decree on July 17, 2000 as an autonomous institution within the Flemish Parliament. The Parliament defined its mission: to study the features and consequences of developments in science and technology, focusing on their impact on society. viWTA informs the Flemish Parliament about the public debate and the controversies involving science and technology. The role of viWTA in the public debate is to clarify arguments and positions, to interpret the subjects in their context, to elucidate the debate and to see to it that in addition to experts the general public can be heard as well.

Mr Robert Voorhamme is the president of the Board of Directors of viWTA. Ms Trees Merckx-Van Goey and Mr Jean-Jacques Cassiman are vice-presidents of the Board.

The members of the Board of Directors are:
Ms Patricia Ceysens; Mr Eloi Glorieux; Ms Kathleen Helsen; Ms Trees Merckx-Van Goey; Mr Jan Peumans; Mr Erik Tack; Ms Marleen Van den Eynde; Mr Robert Voorhamme
as Members of the Flemish Parliament;

Mr Paul Berckmans; Mr Jean-Jacques Cassiman; Mr Stefan Gijssels; Ms Ilse Loots; Mr Harry Martens; Mr Freddy Mortier; Mr Nicolas van Larebeke-Arschodt; Ms Iréna Veretennicoff as representatives of the Flemish scientific, ecological and socio-economic community.

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Director: Robby Berloznik. Vlaams Parlement, B 1011 Brussel, Belgium
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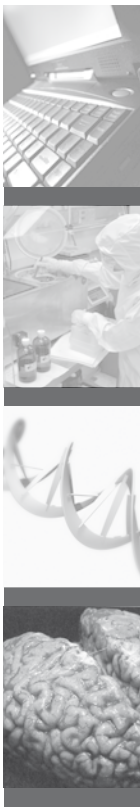
Website: http://www.viwta.be

4.3 About the Conference: background



The yearly EPTA Conference, organized by viWTA, took place on October 17, 2006 at the Flemish Parliament in Brussels. The Conference was followed on October 18, 2006 by a closed meeting of the TA-practitioners and the attendant members of Parliament of the EPTA-members. The same day a joint meeting of EPTA and the STOA-panel of the European Parliament on the same subject was also held.

Title of the Conference

The next technology wave: can policy keep pace with progress? The case of converging technologies.

The challenge[6]

"The stage has been set for "Converging Technologies" (CTs). Information and communication technology, biotechnology and nanotechnology are among the last major technology initiatives of the 20th century. Information technology prepared the ground for the computer, cell phones and the internet. Biotechnological developments gave us in vitro fertilisation, genetic screening, more targeted pharmaceuticals and genetically modified crops. Nanotechnology researchers manipulate individual atoms, develop improved materials and aim to miniaturise just about everything.
The first major research initiative of the 21st century is the convergence of these enabling technologies. Info-, bio- and nanotechnologies complement each other and have begun to join forces with cognitive science, social psychology and other social sciences. This convergence promises to transform every aspect of life. (...)
To the extent that CTs participate in the continuing trend towards miniaturisation, they will blend into the environment and become pervasive. To the extent that they interact with one another, they can form an invisible technical infrastructure for human action – analogous to the visible infrastructure provided by buildings and cities. Such an artificial environment holds the promise for greater and more equal access to knowledge and information, new therapeutic interventions, improved environmental monitoring, greater safety and security, expanded communicative capacities.
However, the potential benefits of this convergence come with a variety of risks. These could include adverse health effects from novel materials and devices, invasions of privacy, social disruption resulting from profound transformations

[6] *from: Converging Technologies – Shaping the Future of European Societies, Report of the High Level Expert Group on Foresighting the New Technology Wave, European Commission, EUR 21357 (http://europa.eu.int/comm/research/conferences/2004/ntw/index_en.html)*

of work and leisure, the displacement of nature as we know it by an artificial environment and damage to human integrity, autonomy and morality."

The purpose

This Conference aimed to create awareness about NBIC convergence in Europe. It offered a concise but comprehensive introduction to the subject, and stimulated policy makers and society in general to take the societal aspects of converging technologies into consideration. The subtitle of the conference reflected some of the pressing questions. Do policy makers want to guide the evolution of converging technologies, and to what extent? Will they be able to do so? Can Technology Assessment enable them to do so?

The audience

As the members of EPTA are in the first place parliamentary institutes for science and technology assessment, the primary audience target were policy makers in general and more specifically members of parliament. Beside their members of parliaments, EPTA members were represented by the directors of the TA-institutes, accompanied by one or more researchers or project-leaders.

The conference was open to the public (and announced in such a way).

Some 100 people of several nationalities attended the Conference.

Brief overview of the agenda

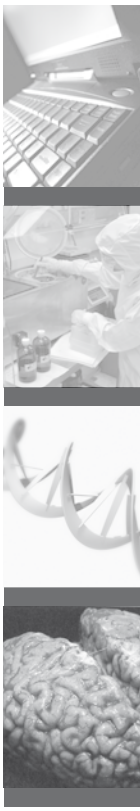
October 17, 2005

Conference (chair: Robby Berloznik, director viWTA)

- Welcome statement by Norbert De Batselier, President of the Flemish Parliament
- Opening of the Conference by Robert Voorhamme, Member of the Flemish Parliament, President of the Board of viWTA
- Keynote speech: Introduction to convergent technologies by Alfred Nordmann (Technische Universität Darmstadt), rapporteur of the 'High Level Expertise Group Foresighting the New technology Wave' of the European Commission.

- Technology assessment in Europe on convergent technologies
    - The intelligent environment: convergent technologies and a new business model by Marc Van Rossum (IMEC and Katholieke Universiteit Leuven, Belgium)
    - Implications of converging technologies for military applications by Jürgen Altmann (Universität Dortmund and "Ruhr-Universität Bochum", Germany)
    - Converging Technologies for Active Ageing by Jean-Claude Burgelman (IPTS-EU, Europe)
    - The debate on nanotechnologies in the Netherlands by Rinie Van Est (Rathenau instituut, The Netherlands)
    - Converging Technologies: Promises and Pitfalls (A German Perspective) by Christopher Coenen (TAB, Germany)
- Intermezzo: science theatre (fragments from 'Project Mens') by the company Pandemonia (The Netherlands)
- Debate: Human values and the next technology wave with the participation of Jean-Jacques Cassiman (Katholieke Universiteit Leuven, Belgium), Françoise Roure (Conseil Général des Technologies de l'Information, France), Joachim Schummer (Technische Universität Darmstadt, Germany). The debate was moderated by Jan Leyers (Belgium)

- Closing statement by Robby Berloznik (viWTA, Belgium)



October 18, 2006

Roundtable of attending parlementarians, TA-directors and TA-practitioners of the EPTA-network (closed meeting) and Council of EPTA (chair: Mrs. Trees Merckx-Van Goey)

Colophon

Editors: Raf Casert, Robby Berloznik, Robby Deboelpaep

Abstracts: Alfred Nordman, Jean-Claude Burgelman, Rinie van Est, Christopher Coenen, Jürgen Altmann, Marc Van Rossum

Design: B.ad

Responsible Publisher: Robby Berloznik, director viWTA, 1011 Brussel

Speeches (introductory): Norbert De Batselier, Robert Voorhamme

viWTA SAMENLEVING & TECHNOLOGIE

*vlaams instituut voor **wetenschappelijk** en **technologisch** aspectenonderzoek*

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