

Newsletter Knowledge NBIC Project

www.converging-technologies.org

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The KNOWLEDGE NBIC newsletter aims to disseminate information on converging technologies among social scientists and become a platform for networking across disciplinary boundaries between natural and social scientists. Regular features will include an update on project and partner activities; reviews of interesting links; reports on events or publications; and short articles on relevant overarching themes. External contributions are welcome. Contact us at info@converging-technologies.org.

Editorial

The Knowledge NBIC project was launched in Spring 2006 with the support of the European Commission's Sixth Framework Programme. The project is a study of the patterns of knowledge production of four key S&T fields, namely nanotechnology, biotechnology, information technology and cognitive science. These fields, it is claimed, are converging, hence the term 'converging technologies' or NBIC to describe them.

The project team comprises researchers from Zeppelin University, the Universities of Warwick and Tel-Aviv, the Interdisciplinary Centre for Comparative Research in the Social Sciences in Vienna and Paris, the Polish Foundation for European Scientific Cooperation as well as the Institute of Technology Assessment and System Analysis.

During the past six months the project team has been busy conducting expert interviews with scientists and research managers in the converging technology fields about their views on the convergence paradigm and present-day technological progress, the role of research funding as well as actual trends in education and training. The contribution of *Emmanuel Brillet* of CIR in this newsletter reports about the preliminary findings of some of these interviews in France. A comparative report on this part of the research work is currently under preparation by *Steve Fuller* of the University

of Warwick and will be made available in the Fall of this year.

The second main research component of the project which began this month will look into the knowledge politics emerging around converging technologies. In her contribution to this newsletter, *Jacquelyne Luce* of Zeppelin University outlines what we mean by knowledge politics and policies and why this is an important research question.

Several countries have been launching converging technology research programmes or nanoscience and nanotechnology programmes with an interdisciplinary orientation. The Israeli CT research programmes promises to be one of the most extensive of these in the mid-term future. *Yair Sharan* of Tel-Aviv University previews this for the readers of the newsletter.

In May of this year, the KNOWLEDGE NBIC project held its first external workshop entitled 'Converging Science and Technologies: Research Trajectories and Institutional Settings'. The workshop attracted some 65 participants from several countries around Europe and abroad and provided an excellent opportunity to network and learn. In parallel to the workshop, a cyberconference was held involving a live internet chat. *Liana Giorgi* of the ICCR reports.

Information on the project, as well as this newsletter in electronic form, is available on the project's Web Site at www.converging-technologies.org.

Is the idea of nature old-fashioned? Cutting edge questions on borders
Emmanuel Brillet, CIR

One of the most effective 'sales pitches' for nanotechnology development relates to the still hypothetical creation of 'intelligent' and self-replicating nanomachines. These so-called 'nanobots' would not only be structurally adjusted to preset objectives, but also be able to take control of their own development (self-assemblers). The expected applications are to be found in a wide range of areas (including medicine).

Technically speaking, these machines are expected to be 'without defect', since they would be assembled 'piece by piece' from individual atoms. Compared to biotechnology, it would no longer be a question of manipulating a 'finished' product (the gene) but of assembling complex devices on a completely artificial base, starting from elementary matter, atom by atom. In a sense, this is about 're-creating' life or animating the inanimate.

Over the last few decades, the concept and practical realm of techno-science succeeded in removing barriers between science and fiction: the ambition was first to 'mimic' or 'simulate' biological systems (birth of artificial intelligence, human-machine interface), then to manipulate them (biomolecular engineering), and, last, to go beyond natural evolution (nano-engineering). This tendency is reinforced through the current integration of biotechnology and nanotechnology (or 'bionanotechnology').

As noted by Nico Stehr, 'the human ability to manipulate the nature of our nature as the result of new capacities of action originating from biogenetics' (Stehr 2003: 646) raises totally new questions. Nano-engineering might even go a step further. Jean-Pierre Dupuy, a philosopher of science, who is also a member of the Ethics and Safety Committee on Agricultural Research Applications (Comepra) of the French National Institute for Agricultural Research (INRA), claims that the change of paradigm induced by nano-engineering developments is equivalent to a 'Copernican revolution':

Bioengineering takes the products of biological evolution for given and intends to manipulate them at the service of human ends. Nano-engineering is much more radical. It takes for granted that natural evolution is a poor engineer, doing its work more or less randomly, on the basis of unstable foundations – in short, natural evolution sounds a bit like 'improvisation'. The human mind, relayed by computation and information technologies (which will exceed it soon in capacities of intelligence and imagination), will do much better (Dupuy 2002b).

He goes on to state that given these developments, humans will have 'the duty to help natural evolution to escape the "dead ends" where it could be locked up', yet this 'will

increasingly blur the border which, separating the World of Nature and Life from that of Machines, and the World of Spirit from that of Mechanisms, was essential to make sense of the human condition' (Dupuy 2002b).

Obviously, the underlying idea that the course of evolution could take the form of algorithms (i.e. that nature, life and spirit – could be treated as an artefact or a computational system) is very challenging for 'the place of Man in cosmos and his relation to nature' (Jonas 2000), and can be viewed with suspicion. According to Hans Jonas, this new situation of a 'highly technicized time' requires new ethics (Jonas 2000: 92). In the same way, for Jean-Pierre Dupuy, 'nano-engineering opens up an immense continent that human beings will have to codify and regulate if they want to give nanotechnologies sense and finality'. He adds that this will require 'a global ethics, much more demanding (and constraining) than that which is currently slowly set up to regulate bioengineering applications' (Dupuy 2002b).

In this context, might it be perhaps necessary, or at least desirable, to preach a 'heuristics of fear' (Jonas 2000: 73) or a 'new asceticism' (Jonas 2000: 13), considering possible medium or long-term damages induced by novel knowledge and novel technologies? Might it be better, asks Jonas, 'to give up research, even if expected outcomes would also be likely to alleviate/relieve present sufferings?' (Jonas 2000: 95)

According to some of the French scientists interviewed in the framework of the KNOWLEDGE NBIC project, this is highly improbable. For instance, Michel Aigle, a researcher in molecular genetics at the University of Lyon-1, observes that, today, there is an increasing propensity to consider what is not natural as not acceptable; in other words, we are observing a form of 'new naturalism' breaking with the 'technological futurism' of the post-war period. However, he personally feels uncomfortable with such cultural evolutions: in a world where food resources are scarce, he cannot agree with the claim made in the name of this new naturalism and the precautionary principle, that we must protect at any price our natural environment from the potentially noxious consequences related to the use of new technical processes (even when this risk is not easily measurable); and furthermore, that we must

do this at the risk of depriving humanity of the means of improving agricultural outputs.

When considering the question of the border between 'aliveness' and 'inertness', on the one hand, and 'naturalness' and 'artificialness', on the other hand, Michel Aigle (who had never heard of the concepts of converging technologies or NBIC prior to the interview) observes that, for biologists, the question does not even arise. These distinctions do not have any scientific base, but are rather culturally constructed: the human being has always been separated from its environment. But this is absolute nonsense from a cognitive point of view: for Michel Aigle, the human being is of a comparable nature to that of 'the last of the microbes'. In a similar manner, Louis Laurent, Chief Officer of the Information and Materials Department at the French National Research Agency ANR, underlines that, from time immemorial, the borders between 'naturalness' and 'artificialness' constantly moved. The idea of transgression is thus relative, both in time and space.

But even if such distinction is primarily cultural, Michel Aigle argues that it is very important for scientists (and even more for industrialists) to take this into consideration. As a matter of illustration, he recalls that anti-GMO mobilization. The latter illustrates how novel technologies, even if technically 'perfect', may encounter strong social resistances.

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Knowledge Policies and Knowledge Politics

Excerpt from Converging Science and Technologies Workshop Presentation

Jacquelyne Luce, Zeppelin University

KNOWLEDGE NBIC comprises sets of activities designed to provide insight into the emergence of what could, and is, being referred to as 'converging sciences' or 'converging technologies', the various mechanisms by which converging technologies have been concretized, the support for the potential diversity of sciences and technologies that are understood to be included within the concept, and the very novel experiences of new knowledge productions and knowledge politics. In May 2007 we began the next phase of this project, in which we will concentrate on the emergence of, or call for, new forms of governance and regulation in the light of new combinatory approaches to scientific practice and technological development. Here I raise a few of the questions that we will be exploring. What new questions are raised through converging approaches, converging science and converging technologies? What are the social and cultural consequences of novel technologies, or materials with new functionalities, which transcend disciplinary borders of knowledge production and perhaps disciplinarily familiar 'codes of conduct' and best practice guidelines? What is, or would be, the potential shape of policies designed to restrict or promote novel knowledge emerging through the convergence of bio-info-cogno-nano and a host of other scientific, social scientific and humanities areas of research? In other words, what forms of knowledge politics will unfold? Thus far, one of the key questions associated with the concept of converging technologies has been the degree to which such developments might transform perceptions of what it means to be human, or potentially contribute to the concretization of expectations of enhancement and new normative images of health, ability, death. More recently, or perhaps in a more consistent fashion, questions voiced within the context of converging technologies are addressing issues of occupational safety, consumer awareness, privacy and environmental toxicity.

Under what existing frameworks will, or could, developments resulting from the convergence of science and technologies be regulated? Are these frameworks sufficient? Are there differing perceptions of the need for regulations, or the anticipation of consumer or public calls for transparency, among researchers working in industry or academic environments, or civil society organizations? Do different disciplinary biographies better lend themselves to dialogical processes about potential misuse of knowledge, or greater awareness of concepts such as 'public trust' in relation to science and the allocation of public funds?

In this second part of the project we will combine an examination of the textual documentation – of guidelines, policies and legislation viewed as currently applying to fields of converging science and technologies, and both practices and outcomes of convergence –with interviews designed to provide further insight into the practical effects of such forms of governance and the potential development of new initiatives. Which forums exist in which to attempt to address emerging issues? Who is participating in the discussion? Reports available in English which address the potential social and cultural impact or 'risks' of capacities enabled by the imbrication of bio-info-cogno-nano have been issued by Greenpeace, the insurance companies Swiss RE in Switzerland and Alliance in Germany, the ETC group based in Canada, and recently the European Group on Ethics (EGE). Interviews with representatives from politics, industry and civil society organizations will aim to extend the discussion of expectations at more immediate and local levels, and to track interventions potentially taking place through initiatives implemented by transnational organizations (OECD, UNESCO, etc.).

This phase of the project will be carried out between now and autumn 2008. If you would like to contribute reflections on the questions raised above, or are working on related issues, please do not hesitate to contact me (jacquelyne.luce@zeppelin-university.de) or one of the project partners.

Interesting Links

The 'links' section of the project's Web Site www.converging-technologies.org provides a regularly updated list of interesting links on converging technologies.

Our selection for this period:

- The protocol of the internet chat in the framework of the KNOWLEDGE NBIC cyberconference can be read at: <http://www.converging-technologies.org/cyberconference/Chat/tabid/55/Default.aspx> The chat was moderated by Steve Fuller of Warwick University and lasted two hours.
- Project on Emerging Nanotechnologies <http://nanotechproject.org/> The Project on Emerging Nanotechnologies was established in 2005 jointly by the Woodrow Wilson International Center for Scholars and the Pew Charitable Trusts. The project that runs open-ended aims to provide independent and objective knowledge and analysis to inform policy on the commercialization of nanotechnologies.
- Center for Nanotechnology in Society at Arizona State University, <http://cns.asu.edu/> The CNS-ASU is one of two centres funded by the National Science Foundation to study nanotechnology in society. Besides research and education it organizes consultations with relevant stakeholders.
- Vivagora, www.vivagora.org VivAgora was established as an association in 2003 with the objective of promoting active citizenship and public participation. It organizes public debates / enquires on scientific and technological subjects, including on nano-biotechnology.

Preview

Converging Technologies Programme Launched in Israel

Yair Sharan, ICTAF, Tel-Aviv University

A new national programme focusing on the advancement of converging sciences and technologies was launched recently by the National Science Foundation of the Israeli Academy in cooperation with the National Committee for Converging Technologies. The Israeli government assigned a budget of around 120-130 million USD to this programme for a period of five years. The programme has the following major objectives: (a) to assist in the development of technological infrastructure (labs, equipment); (b) advance interdisciplinary research; (c) educate and prepare the future generation of scientists for this emerging field.

The programme has two components. The research component is organized around calls for proposals and explicitly encourages interdisciplinary collaboration. The scholarship component funds undergraduate, graduate and post-graduate studies in converging technologies and targets individual researchers. It is especially tailored to those combining disciplines from exact sciences, engineering, life sciences and cognition. The budget for the programme is put together from different sources, notably with funds from universities, the Ministry of Trade and Industry and the Academy of Sciences.

Insofar as the NBIC discourse is concerned, two points are worth highlighting. Firstly, the programme tends to view 'convergence' as 'advanced interdisciplinarity'. Secondly, the programme is not limited to the four NBIC fields. In other words, any interdisciplinary effort is deemed eligible and worth pursuing. This includes the social sciences. Nevertheless, applicants must argue and demonstrate convincingly that their research can be expected to lead to a major breakthrough in S&T.

The Israeli CT programme is the result of a debate among leading scientists and science policy makers on what 'convergence' implies and the need to establish a special programme to explicitly promote related technological advances. This debate continues. The programme presently represents a middle-range, half-way, win-win compromise: those in

favour of converging technologies may continue to promote the CT programme and have now resources at their disposal; those against are consoled through the availability of new research funding for interdisciplinary research that is broadly defined (rather than strictly in relation to specific CT visions or programmes).

It should be stressed that such a big programme would not have been possible in the present times of heavy budgetary constraints without the consent and cooperation of the key political decision makers in the relevant ministries of Science, Trade and Industry, and Education as well as the Treasury and Prime Minister office; and without the support of key scientific establishments.

Review: workshop report

KNOWLEDGE NBIC Workshop, Vienna 14-15 May 2007

Converging Science and Technologies: Research Trajectories and Institutional Settings

Liana Giorgi, ICCR

The first of two external workshops to be organized by the KNOWLEDGE NBIC project took place in Vienna in May 14-15. The workshop organized by the ICCR and Zeppelin University was hosted by the Austrian Research Promotion Agency FFG and attracted some 65 participants. Participants came mainly from EU countries but we had also the pleasure to welcome guests from Brazil, the U.S. and Canada. Some fifteen papers were presented over the two days of the workshop. Below I give a first impression of the issues raised and discussed.

A recurring theme across several of the presentations was the meaning of convergence or of converging technologies (CT) and the latter's implications for research practice and the institutional settings for research, but also for science ethics.

Jan Schmid of Georgia Institute of Technology used interdisciplinarity to deconstruct the converging technologies paradigm. He argued that the objective of the NBIC vision entailed in the NSF report compiled by Roco and Bainbridge is not to achieve a combination of the nano-, bio-, info-technologies and cognitive sciences in terms of either theories or methods.

The goal of this specific vision is rather to explore and exploit a new object of study delineated, in turn, by the new constructed technologies. In other words, under this specific NBIC paradigm, the technology itself becomes the object of study and driver of change (hence also techno-science). In contrast, the European understanding of convergence is more problem-oriented seeking to combine knowledge and methods from different disciplines to solve societal problems (like that of the impacts of demographic ageing on welfare systems).

According to *Arianna Ferrari* of TU Darmstadt, by prioritizing technology and techno-science, the NBIC technological field adds new dimensions to the long-standing debate about the possibility and desirability of the 'enhancement of human nature'. Nevertheless, in the U.S., the debate on converging technologies is evolving along the more traditional cleavage lines between the 'techno-conservatives' and the 'techno-liberals'. The European approach to NBIC and to convergence is different in that it accepts, a priori, that technological development is embedded in politics and is itself a political process. This opens the possibility of avoiding to frame the debate alone in terms of human nature or the dichotomy between a utopian vs. dystopian future related to enhancement. The latter is problematic in terms of charting out a (science) policy approach.

Jim Whitman of Bradford University questioned the above often-made claim that there are significant differences between the American and EU approach to converging technologies. In his view, the two approaches are more similar than they are different. Even though the EU appears to place greater emphasis on the need to develop deliberative procedures and carry out ethical assessments, it tends to understand deliberation more as a consultation exercise designed to anticipate, but also, contain opposition. More specifically, the EU document on CT, like the NSF report, assumes an explicit CT advocacy position and does not question the actual fact or direction of technological development.

Along similar lines, *Gregor Wolbring* of Calgary University, criticized the converging technologies discourse – whether European or American in origin – as representing a carefully packaged

and made-up version of transhumanism. In its advocacy of human enhancement in the name of performance, transhumanism favours certain abilities over others; and, at the same time, labels the absence of these favoured abilities as a 'diminished' state. The distance from this implicit form of discrimination to an explicit discourse against disabled persons and other groups and individuals (who do not share in the desire to see themselves enhanced or changed in one or the other way) is not large. What is especially unfortunate, so Wolbring, is the way in which transhumanists have managed to abuse the hopes and concerns of some disabled persons (and organizations) to advance their cause.

In any case, the invitation alone to organize upstream consultation on converging technologies is itself no guarantee that the research agenda is either adequately 'socially and ethically shaped' or, indeed, that it can contain opposition. This was well illustrated by *Brice Laurent* of the Ecole de Mines of Paris who presented a case study about the reception of nanotechnologies in the Grenoble area which concentrates several emerging technologies research centres in France. Activism against nanotechnologies has developed along the lines of anti-nuclear and anti-GMO opposition, whereby nano-bio convergence is framed as a threat to life, nature and societal structures. The dialogue and 'mediation' process organized between the opposing sides (incidentally by social scientists) has not in any way contributed to decreasing the potential of contestation but might in fact have had the opposite effect. *Fionagh Thomson* of Newcastle University working on a project on new healthcare technology involving nanotechnology warned against the 'deficit' model of public engagement whereby the latter is conceptualized and applied as a means of enlightenment, the assumption being that if and when citizens are provided with knowledge (about technology) they will then see the light and change their negative attitudes.

But how real is convergence at the level of research practices and the institutional context of research? Can the claim of convergence be supplemented through empirical evidence with regard to organizational structures and career

paths? A number of papers addressed this topic, whereby the evidence produced is not entirely consistent.

Karen Kastenhofer studied the epistemic cultures of the disciplines engaged in agrobiotechnology research as well as research on the electro-magnetic fields of mobile phones. These are the disciplines of molecular biology, plant breeding science, physics, ecology, medicine and toxicology. In her presentation she argued that there is a general shift across scientific fields towards biological issues and objects, and a general tendency of the laboratory sciences to actively seek the translation of their results into technological applications. Technosciences, she argued, are leading to a reconfiguration of the science system towards a 'a new technology-centred paradigm'.

In order to test the convergence hypothesis, *Bernd Beckert* and *Michael Friedewald* of the Fraunhofer Institute explored the current state of research in seven key areas for CT, namely, neuro/brain enhancement, pattern recognition, computational modelling, robot and intelligent software design, sensors, human-machine interfaces and biomedicine. All these fields deal with one or several aspects of the mind-body interface and explicitly address enhancement. Beckert's and Friedewald's findings confirm the growing significance of technological applications in modern-day scientific research but suggest that the process of science reconfiguration might be less obvious and linear from the organizational and institutional perspective. The fields studied do not share the same vision or practice of convergence involving different scientific fields and technological areas. From this perspective it could almost be claimed, Beckert and Friedewald argued, that the convergence paradigm results in a divergence of research fields (of study), albeit across disciplinary boundaries.

This divergence of research fields across disciplinary boundaries can also be observed in the social science field. *Josephine Johnston* of the Hastings Centre compared the 'societal dimensions' research programme of the U.S. nanotechnology initiative with the 'ethical, legal and social implications' (ELSI) research programme linked to the human genome project. Despite significant thematic similarities –

explicitly intended by the programme developers – research in the two fields is carried out by two distinct communities within the social sciences that are furthermore keen to maintain their distinct identity. The STS community working on the societal implications of nanotechnologies focuses on environmental, health and safety impacts and maintains an explicit policy-relevant orientation. In contrast, the science ethics community working on the social implications of genetics research is more concerned with the normative aspects of science policy and research and, in that, perhaps also more critical of the whole scientific (and science policy) enterprise.

Ismael Rafols of the University of Sussex presented work on the modes of knowledge integration in a number of bionanotechnology laboratories in Japan. He found out that even though knowledge integration does indeed happen, it does not always – or even most frequently – occur through interdisciplinarity, flexible teams, joint research and in close linkage to (industrial and/or societal) stakeholders. Different laboratories adopt different strategies. Many opt for service collaboration whereby a part of the research is outsourced. Integrating knowledge by recruitment of new personnel (with different type of expertise) or through direct research collaboration is less frequently chosen as it entails higher costs than benefits in the early phase of a 'convergence-like' process. The same is the case with the in-house development of new fields of expertise. This is only used by well-established and big laboratories.

In the long term, however, the emergence of new scientific fields of research, and, especially, the emergence of industrial-relevant research agendas creates the need for re-organizational re-structuring within universities and a serious re-thinking of post-graduate education and training. How universities go about dealing with this re-structuring impacts on their subsequent development and claim to innovation. *Simcha Jong* of University College London, argued that this transition was more often successfully managed in the U.S. university environment (for instance, Berkeley) than in Europe (for instance, Cambridge).

A final set of papers dealt with the representations of converging technologies in the media and in literature. *Simone Araldi* of the Istituto Jacques Maritain presented evidence based on research on the Italian press that news stories about new and emerging technologies are predominantly framed as stories of progress and in terms of economic opportunities. Science fiction, in contrast, does not only present technology in positive terms. It is, however, much richer in imaginary. Thomas Michaud outlined how converging technologies and related visions have in fact been popularized through science fiction even if not under this specific term. The cyberpunk, biopunk and post-cyberpunk genres are especially interesting in this respect. Science fiction is inspired by technological innovation but it also contributes to technological innovation, at least in terms of providing imagery.

The two-day workshop was rich in both information and knowledge and provided the opportunity to network and link with other social scientists doing research in the field of converging technologies. A special issue of *Innovation*; the *European Journal of Social Science Research* (published by Taylor and Francis, UK) in the year 2008 will bring together a select number of the contributions to the workshop, thus further advancing the critical discussion and inquiry in this field.

Forthcoming own events

April or May 2008

The second external workshop of the KNOWLEDGE NBIC project will deal with the question of the knowledge politics emerging around converging technologies. Will there be explicit attempts to restrict or promote novel knowledge emerging through converging technologies? What will such policies look like? Will existing regulatory frameworks be used or altered for this purpose? How will different stakeholders react and inform this debate? These are some of the questions to be addressed by this second workshop. The Call for Papers will be published in October of this year. The deadline for submission of abstracts will be the end of December. Invited speakers will be notified in February 2008.

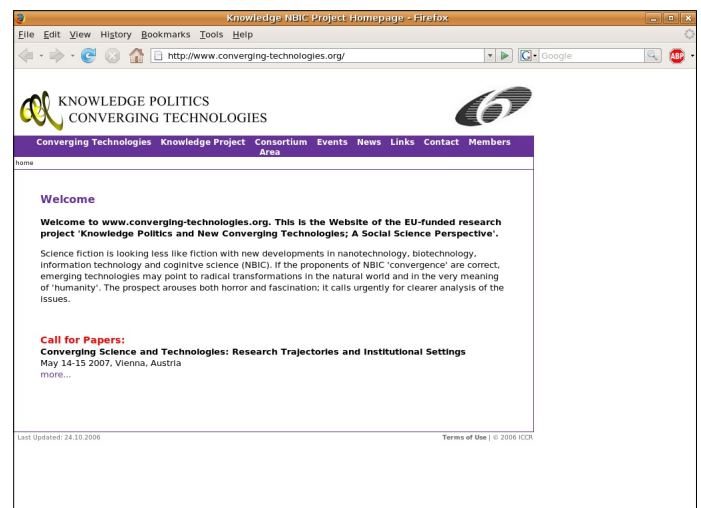
The next newsletter

The next newsletter of the KNOWLEDGE NBIC project will be published in November 2007 and will feature an article on the institutional research settings for converging technologies based on comparative research across several European countries; a review of deliberative procedures on converging technologies; the call for papers for the second NBIC workshop, and a review of recent publications in the field.

Comments and feedback

We are very happy to receive feedback on this newsletter. Do not hesitate to contact us if you have comments or ideas about what you would like to see covered by the newsletter, or indeed if you would like yourself to write a contribution.

Contact us at info@converging-technologies.org



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