KNOWLEDGE POLITICS
CONVERGING TECHNOLOGIES

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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.

The first part of the project dealt with the way in which the converging technologies agenda is impacting on science and research policy. The results of this work will be summarized in an upcoming report to the European Commission. In his contribution to this newsletter, *Steve Fuller* of the University of Warwick delivers a first insight into the findings of this report.

Currently the KNOWLEDGE NBIC team is researching the knowledge politics that are emerging around converging technologies. *Nico Stehr* of Zeppelin University illustrates the contemporary meaning of knowledge politics by reflecting on several debates and publications on science and ethics from 2007.

In May 2007, the KNOWLEDGE NBIC project held its first external workshop entitled 'Converging Science and Technologies: Research Trajectories and Institutional Settings'. A selection of the proceedings of that workshop were published in the fourth issue of the journal Innovation; The European Journal of Social Science Research (Volume 20). (see www.tandf.co.uk/journals/titles/13511610.asp)

The project's second workshop is being organized in Brussels, on 6-7 May 2008. This workshop deals with knowledge politics and converging technologies. The agenda of the workshop will become available in March, pre-registration is already open.

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

The Converging Technologies Agenda: The Stakes and the Prospects

Steve Fuller, University of Warwick

At the most general level, the 'converging technologies' (CT) agenda may be seen as a 'technological fix' for the second fiscal crisis of the welfare state. The first fiscal crisis occurred in 1970s, with the increasing tax burden on individuals and businesses to finance wider state coverage of welfare needs. Because this problem was predicted to escalate as more countries reached the standards of living enjoyed by the developed world, calls were made to restrict population growth, via mass contraception and perhaps even some reintroduction of eugenics, especially in the developing world (though 'zero population growth' was portrayed as an ideal in the developed world). What is of interest here is that this technologically oriented solution diagnosed the problem, in Malthusian fashion, as one of overconsumption. However, in retrospect the end of the first fiscal crisis came not from the proposed technological fix but the weakening of welfare state coverage, in the name of 'neo-liberalism'.

The second fiscal crisis of the welfare state, dating from the 1990s, pertains to the anticipated financial burden on the pension system of people living longer after retirement. CT is relevant to this development, as it promises – in both its US and EU guises – a longer period of labour productivity, expanding the economy in general and deferring the need for individuals to draw on pensions. Note that this problem arises in the context of relatively stable, or stabilizing, population growth rates. This second fiscal crisis is diagnosed, in Ricardian fashion, as one of underproduction. This shift from overconsumption to underproduction is interestingly reflected in the role played by ecological considerations in each: In the former case, nature provides an ultimate irreversible barrier, resulting in a precautionary principle; in the latter, nature is a constraint that can be strategically manipulated, resulting in a proactionary principle. Indicative of the latter position is the prospect that nano-machines might someday, and perhaps regularly, reverse the effects of industrial pollution in a 'cake and eat it' scenario. This helps to explain the attraction of the CT agenda in the rapidly industrializing economies of India and China.

There is an ongoing struggle between the US and EU to define the direction given to the idea of 'converging technologies for improving human performance', to recall the title of the influential 2002 report co-authored by Mihail Roco and William Sims Bainbridge, both at the National Science Foundation, the former an engineer in charge of nanotechnology research initiatives, the latter a sociologist in charge of the NSF social informatics unit. All indications are that the US is winning this struggle, at least at the level of ideology. In other words, the US spin on the meaning given to the CT agenda is influencing science and technology policy worldwide. However, it remains to be seen whether this palpable change in policy discourse results in long-term substantive changes in science and technology itself.

What is at stake in the difference between the US and EU perspectives? In a nutshell, the US strategy aims to leverage short-term practical breakthroughs in nanotechnology into a long-term basic research agenda in which nanotechnology would enable revolutions in biotechnology, information technology and, most ambitiously, cognitive science. Underwriting this vision is the idea that 'nano' (i.e. a billionth of a metre) is the smallest manipulable level of physical reality that does not incur quantum indeterminacy. Molecular interventions at this so-called 'edge of uncertainty' can be directed to, say, clear the arteries, repair nerves, etc. Seen in their own terms, as developments within chemistry, these interventions are merely incremental improvements. But what matters are the research opportunities these improvements open up in other fields once they are applied. The sense of 'convergence' in CT here clearly implicates a general history and philosophy of science in which developments in nanotechnology act as a tipping point for revolutionary change across all of science and technology.

In contrast, the EU strategy discusses CT in more modest terms, allowing for multiple convergences amongst different disciplines. Indeed, it is ultimately less concerned with the future direction of science than on what Joseph Schumpeter meant by 'innovation', that is, the conversion of an invention to a successful market product. The background assumption here is that the scientific community does not provide sufficient incentive to exploit the full social and economic benefit of its new ideas. Under the rubric of CT, the EU proposes incentives to break down cross-disciplinary barriers to enable new ideas to be brought to market more effectively. At the same time, the EU sees itself in a more regulatory role. Where the US initiative calls on both the state and business to reinforce already existing trends in nanotechnology, the EU initiative is much more explicitly about the reorientation of scientists' behaviour from their default patterns to what the 2004 EU report edited by philosopher Alfred Nordmann called 'shaping the future of human societies'.

The original 2002 NSF report has had a demonstrable impact on the scholarly literature, decisively shifting the default meaning of the phrase 'converging technologies'. The various EU responses, starting with Nordmann's 2004 report, have had much less impact, usually only as a critique of the original NSF report. A survey of the phrase in the titles, abstracts and keywords of publications included in the Web of Science and Google Scholar, revealed its pre-2002 occurrence mainly in two contexts. One was in the 'management information systems' and 'knowledge management' literatures, where CT pertained to the integration of information sources as a key to business efficiency in a time

when an increasingly dispersed and mobile labour force made it harder for companies to retain the knowledge they had accumulated. The other context was multi-modal educational delivery systems that encouraged 'interactive' and 'distributed' learning regimes centred on student needs and interests. However, after 2002, the use of CT shifted to the scientific project envisaged in the NSF report, though often retaining some of the pre-2002 connotations. Thus, bioinformatics is now often highlighted as a knowledge management strategy for achieving CT, while CT-driven breakthroughs may enable more effective educational delivery systems that reflect and facilitate the brain's capacity to process information.

Lurking beneath differences in formulation, the alternative US and EU formulations of CT tap into radically different sensibilities that are somewhat occluded by euphemisms. In the US case, the phrase 'improving human performance' can be sharpened up to refer more explicitly to a project of enhancing individuals by making them – and their offspring – smarter, stronger, etc. This project presumes a sense of biological evolution that might be expedited to the overall benefit of the species by interventions at the level of individual species members. In the EU case, the phrase 'shaping future societies' suggests a more holistic and less invasive approach that focuses on enabling people to live more sustainable lives, where the state or some inter-state authority like the EU is seen as the protector of social equilibrium. In terms of contemporary ecological politics discussed at the start of this report, the US approach is proactionary and the EU approach precautionary.

However, both approaches contain ambiguities. In the US case these centre on the meaning of a term like 'improvement' or 'enhancement'. Is one referring here simply to systematically induced changes in, say, genetically controlled behaviour or neural circuitry, regardless of their results? Or does one also wish to imply that these changes are always, or even largely, beneficial? After all, a likely long-term consequence of a US-style improvement policy is an increase in people's willingness to make risky interventions at the genomic or neurophysiological level. But given the complexity of the contexts in which such interventions would play themselves out, their exact efficacy, let alone relative benefit vis-à-vis non-intervention, would be difficult to assess. Under the circumstances, an implicit goal of the US approach must be for people to see their bodies as sites of experimentation.

In the EU case, the ambiguities centre on its attitude towards 'marketisation'. On the one hand, the EU clearly wants to remove barriers to the promotion of CT-related innovations that have been erected within but also imposed on academic research. The former refers to the legitimation of inquiry on narrowly disciplinary terms, the latter to legal restrictions on the pursuit of intellectual property rights by public institutions, a problem that the US resolved by enacting the Bayh-Dole Act in 1980. On the other hand, the EU clearly has a protective attitude towards the public destined to be exposed to the innovations unleashed in such a liberalised economic environment. It would seem then that increased openness to the marketing of innovative products is to be matched by increased monitoring and possibly control of their consumption. This is likely to result in conflicts in the legal system, as both producers and consumers each assert their enhanced sense of 'rights'. In that respect, unlike the US, the EU retains a response mode characteristic of the first crisis of the welfare state as it tries to deal with the second one.

The Governance of Knowledge

Nico Stehr, Zeppelin University

It has become part of the accepted wisdom, as Freeman Dyson (2007) observes in a recent feature essay "On our biotech future" in the New York Review of Books that the "twentieth century was the century of physics and the twenty-first century will be the century of biology." This implies that biology is not only more important in terms of its economic consequences than physics in our century but in its moral consequences and in its impact on human welfare. Yet, the economic consequences of the impact of parts of converging technologies are by no means marginal. Andrew Maynard (2007) estimates in only six years 15 percent of the global output of manufactured goods will use the research results of nanotechnology. Yet, our efforts in understanding the nature of the impact of converging technologies on human welfare and more specifically, the risk associated with the deployment of converging technologies, let alone ways of governing such consequences

is very limited if not absent altogether.

Perhaps even more remarkable is that Freeman Dyson does not simply celebrate the possible future accomplishments of biology, which he also does under the heading of the domestication biotechnology but that he asks questions about emerging knowledge not always heard from scientists in the past:

> "If domestication of biotechnology is the wave of the future, five important questions need to be answered. First, can it be stopped? Second, ought it to be stopped? Third, if stopping it is either impossible or undesirable, what are the appropriate limits that our society must impose on it? Fourth, how should the limits be decided? Fifth, how should the limits be enforced, nationally and internationally?"

Dyson does not even attempt to answer any of his own questions but assigns the responsibility of answering to the next generation. However, the issues Dyson enumerates but does not examine are at the heart of what I call knowledge politics. New knowledge and new tools generate new questions and new responsibilities.

My discussion of the Governance of New Knowledge or Knowledge Politics in modern societies has to be situated in a broader historical context. But such a discussion alone would take up the entire time allotted to me. Therefore, I will employ a harsh shortcut and simply point out that it is not so long ago that social scientists and many other observers stood united in the conviction that the relation between knowledge and society is a very simple, straightforward and productive linkage. The power of knowledge produces a more humane world.

Unless this sounds somewhat naïve and unbelievable today, I quote one of the early and influential American sociologists, namely Lester F. Ward ([1883] 1897:473). Ward observes "civilization consist in the wholesale and ruthless trampling down of natural laws, the complete subordination of the cosmical point of view to the human point of view...(and) the essential function of Knowledge is to aid him in accomplishing this revolution."

Therefore, the major problem of the day and within the context of such a world view was that we know too little in order to accomplish the desired feat of trampling down natural laws timely and effectively.

The major problem today appears to be exactly the opposite, namely that we know too much and that we should be careful if not highly circumspect to employ and deploy all that we know against "nature and its laws". Paradoxically, in order to be circumspect with what we know we seem to know too little.

Our research effort is therefore designed to shed some light on how contemporary societies come to grips with science and technology evolving at an unprecedented pace and, as many advocates and critics argue, at an unprecedented capacity to transform society and nature. The knowledge guiding interest that is part of our research design concerns the sites and construction of scientific knowledge and technologies that are seen to have such transformative power.

An article in the English Guardian (January 31, 2006) earlier this year offers a possible window on the near human future when it will be possible in principle to deploy "tools" that will us make cleverer and stronger. The so-called converging science fields, biotechnology, nanotechnology, information and cognitive science envision dramatic breakthroughs in the near term in how we can modify our physical and mental capabilities, perhaps more dramatically in how we exist and in how long we exist. From here on, the Guardian article concludes, we are about to have the scientific tools to engineer our own evolution. We have been doing this anyway, at least with respect to the cultural evolution of humankind but what therefore is new is that we are supposed to be able to engineer our physical evolution with -- obviously -- the attended fragile consequences for social and cultural evolution. Such a vision of what is just around the corner is also what horrifies other scholars, politicians, social movements and large scale social institutions, for example, religious organizations.

Let me give you one concrete example of what some of the visionaries of the converging technologies movement are discussing and expecting: One of these visions concerns the development of green technology, that is, the ways in which biotechnology for example will "move into the mainstream of economic development, [and] help us solve some of our urgent social problems and ameliorate the human condition all over the earth" (Dyson, 2007). More concretely, biotechnology could

be a powerful tool that gives us access to cheap and abundant solar energy. What would be required is the radical transformation of plants that now convert and collect sunlight at a very low level of efficiency, namely one percent of the sunlight is converted into chemical energy. Silicon solar cells do better. Thus, in the future we might engineer plants that have leaves (black leaves that is) made of silicon. As a result, "these artificial crop plants would reduce the area of land needed for biomass production by a factor of ten. They would allow solar energy to be used on a massive scale without taking up too much land" (Dyson, 2007).

But what exactly are converging technologies? The notion of converging technologies foretells a new phase in the development of science and technology that will result from the integration of biotechnology (and biomedicine), information technology, cognitive science and information technology. The converging technologies are manipulating structures that are between 1 and 100 nanometers in size or thousands of times smaller than a human hair. The convergence of these new technologies are supposed to usher in, as Mihail Roco, a senior advisor of the U.S. National Science Foundation and Carlo Montemagno, the chair of the Department of Bioengineering at the University of California at Los Angeles foresee, "entirely new categories of materials, devices, and systems for use in manufacturing, construction, transportation, medicine, emerging technologies and scientific research: (Roco and Montemagno, 2004: vii)

The outcome of these development in science and technology are astonishing, they will lead to a "tremendous improvement in human abilities, societal outcomes, the nations productivity, and the quality of life" (Roco and Montemagno, 2004:1-2).

Thus, Novelty that had lost its pejorative sense in the seventeenth century and became a virtuous attribute in science in the 17th century, witness the titles of Johannes Kepler's New Astronomy or Galileo's Discourse Concerning Two New Sciences (Burke, 2000:111). The routinization of novelty in later centuries and especially in our times may possibly once more become associated with pejorative meanings and responses. But for the time being, new knowledge continues to be "sold" on the promise that is will effectively deal with fundamental human needs and desires. However, the needs and desires to which such promises appeal are no longer taken-for-granted and treated as a kind of black box.

Be that as it may, as many -- not only in the scientific community -- would argue the nature of the human future depends of what science and technology is deployed in society. Thus, what I take may well become one of the most significant and contentious issues for intellectual, legal, public, scientific and political discourse during the century that has just begun: the growing moral, political and economic pressure to regulate or police novel knowledge – or in other words, the emergence of a new field of political activity, namely knowledge politics and policies.

Of course, anxieties and concerns about the social consequences of new scientific knowledge and novel technologies are not of recent origin. Nor are elusive promises of the clear blessings of science for humankind, and the mitigation of human suffering that scientific advances entail. But what is now at stake is more than merely the vague feeling that a slowdown or a consolidation in the volume of the fabrication of new knowledge is in order.

The Good Friday meditations of Pope Benedict XVI in 2006 are a salient example of the vociferous response and blistering attack against some of the prospective techniques that are said to be about to emerge out of scientific laboratories around the world. The Pope warns against the destruction of humanity, and more specifically against a kind of "anti-Genesis": "Today we seem to be witnessing a kind of ant-Genesis, a counter-plan, a diabolical pride aimed at eliminating the family." What does he mean? Specific condemnation is directed against scientific knowledge that emerges from biotechnology in general and genetic engineering or manipulation in particular. Such developments amount, in the words of the Pope, to a modification of "the very grammar of life as planned and willed by God". Genetic engineering represents an "insane, risky and dangerous" venture in an effort "to take God's place without being God" (The Times, Times Online, April 14, 2006).

In other words, the prospect of anthropogenically engineered physical evolution based for instance on a horizontal transfer of genes (that is, across what are now seen as form boundaries among

species) promised by the visionaries of the converging technologies represent a fundamental violation of the conviction that humankind was put into this world in a complete and final physical state. A state for which a supernatural being is responsible.

Thus, the central interest of our inquiry into knowledge politics, or governance of knowledge in modern societies is about attempts to intervene in and channel the social role of new knowledge; that is, to generate rules and enforce sanctions pertaining to relevant actors and organization; to affix certain attributes (such as property restrictions) to knowledge; to ignore and suppress scientific findings, for example in the field of climate science as the Bush administration is suspected to have done and – likely the most controversial strategy – to generally restrict the application of new knowledge and technical tools and artifacts, for example in the case of the pre-implementation technique. Efforts to govern knowledge in this sense will be situated mainly but not only outside the immediate boundaries of the scientific community. The essence of modern knowledge politics consists of strategic efforts to move the social control of new scientific and technical knowledge, and thereby the future, into the center of the cultural, economic and political matrix of society. And, the spirit of enhancing public participation and input, discussions about the needs and desires served by science and technology will increasingly be accompanied by demands for and new forms of publican consultation and engagement that we have yet to image (cf. Priest, 2005:298).

I will finally add a few observations and delineate in somewhat greater detail the notion of knowledge politics as a new field of political activity. Although knowledge politics as conceived here is a new field of political activity, one recognize recognizes of course that various past efforts were also designed to promote or restrict novel knowledge claims. Thus, political, commercial and diplomatic activities designed to control knowledge is hardly a new activity. To render information or knowledge as private, as secrets of the state or a corporation is of course an age-old activity designed to control and shut in the use of knowledge.

Nonetheless, let me briefly enumerate a number of reasons why knowledge politics is a new field of political activity. The main reasons have to do with modern major societal transformations. Among the societal transformations I have in mind is, on the political place, (1) the shift from centralized, often authoritarian or elitist societies to much more broadly based participatory societies, on the cultural and distributive plane, there is (2) the shift from a monopoly control (for example, by the Church and the university) to a market-based control of knowledge (which does not mean that judgments about new knowledge exclusively rely on utilitarian considerations but on a broad range of cultural values that find their way into the market place), and there is (3) the institutional shift from a largely materially-based economy to a knowledge-based economy, (4) the decline in the power of large social institutions, the state, the economy or science to impose their will on society and the (5) the emergence of a new and much more influential public or civil society sector in modern societies.

Taken together these societal transformations alter the social role of knowledge in fundamental ways. The up-shot of these transformations in society is that the regulation of the relation between science and society today is filtered through processes that are more democratic (scientists alone should not make the decisions about the social implications of their work) than was the case in any past conflicts between science and society and that there were far fewer rationales (for instance, values that are demanded to be taken into account) and complicated opportunities for the regulation of novel scientific knowledge (the latter also applies to a rapid an extension in regulations and rationales such as informed consent that pertain to science and research policies, that is, as I will define it, the production of scientific knowledge and technologies).

The concern we know too much is no longer as was the case in much of the twentieth century that we are amassing a large store of trivial and practically irrelevant knowledge at a high price that promises no useful gains. But in contrast to past disputes, when discussions about the societal consequences of science were driven by complaints about its lack of social and economic utility in tackling major social problems of the day, today concern is focused on a surplus of effects – especially with respect to traditional world views, the established life-worlds and the limits to what can be manipulated in nature and society.

Knowledge politics will be a strongly contested form of regulative politics. But that there will be knowledge politics is a certainty. We should not have any excessive hopes, however, that our ability to anticipate (in any robust sense) the social impact of the use of novel capacities to act (knowledge) will be very impressive. Knowledge politics will have to contest and reckon -- mentioning but a few major transformative processes in contemporary societies -- with globalization processes, the loss of sovereignty of the nation-state, and the persistence of cultural conflicts within and among societies.

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Interesting Reading

Issue 20(4) of the journal Innovation; The European Journal of Social Science Research features a selection of the contributions to the first workshop of the KNOWLEDGE NBIC project. Below the table of contents.

INNOVATION

THE EUROPEAN JOURNAL OF SOCIAL SCIENCE RESEARCH

CONVERGING SCIENCE AND TECHNOLOGIES: RESEARCH TRAJECTORIES AND INSTITUTIONAL SETTINGS

VOLUME 20 NUMBER 4 OCTOBER 2007

Workshop Announcement

Knowledge Politics and Converging Technologies

Brussels, 6-7 May 2008

Knowledge politics delineates the field of activities designed and implemented for the purpose of monitoring, regulating or even controlling the production and application of new knowledge gained through science and technology. Such activities are not new but have gained importance in the course of the 1990s with the rise of biotechnology and life sciences more generally. In view of its promise to enhance human performance through even greater interventions in the body, mind, and environment, converging technologies promises to become another virulent field of knowledge politics.

Knowledge politics with respect to converging technologies is evidently one of those fields that is difficult to engage in – even as a researcher – without becoming enthralled in normative argumentation. The argument in favour of knowledge politics is that contemporary (and future) knowledge is intrinsically different from knowledge of earlier times because it will enable us to manipulate not only the human and built environment but also ourselves and fellow human beings. Therefore, new knowledge entails a potential for physical and social engineering that can be neither dismissed nor relayed to ad-hoc regulatory procedures, but rather calls for the development of new processes and tools. Those arguing against knowledge politics point to the latter's inextricable tendency towards the policing of science and research, thus threatening to arrest progress, discovery and learning. At the symbolic level, knowledge politics represents the modern version of an existentialist quest for the meaning of life. As a social fact, it represents the contemporary edition of the conflict about the role, extent and scope of social regulation.

The aim of this workshop is twofold: to reflect on the meaning and implications of knowledge politics in general; and to draw out theoretical conclusions about how knowledge politics in the field of life sciences and converging technologies can be expected to impact on science and research, on the one hand, and on democratic deliberative institutional practices, on the other hand. Some of the thematic areas to be explored are:

- Forms of governance and regulation for converging technologies (principles of governance; regulatory frameworks; deliberative processes)
- Social and political contexts of knowledge politics (social, economic and political conditions; anticipatory governance; scope of influence; ethical considerations)
- Science, industry and political interfaces (knowledge transfer; public-private ventures; economic infrastructure)
- Practicing knowledge politics (risk assessment of converging technologies; the role of expert committees; engaging civil society; democratizing science)

The precise location of the workshop and the agenda will be announced at the end of March. To pre-register please contact Rudolfine Gamboa of the ICCR at r.gamboa@iccr-international.org

The next newsletter

The next newsletter of the KNOWLEDGE NBIC project will be published in July 2008 and will feature a report on the results of the May 2008 workshop in addition to a preview of the findings of the second phase of the project on knowledge politics and converging technologies.

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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