European Experiments

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ABSTRACT

European science policy, as well as the creation of research agendas for converging technologies, functions as a testing ground for a transnational European identity. In light of competing conceptions of European identity formation, the European Commission's Sixth Framework Program (2002–2007) adopted an experimental mode. Given that the quest for European identity is already an open-ended experiment, the policy process invites experiments in governance, for example, by developing participatory schemes. Moreover, as European science studies scholars advance the notion of "real experiments" in the laboratory of society, one basis for identity formation among Europeans is to be the very fact that they all partake in "collective experiments" with new technologies. This analysis draws for its central cases on the creation in 2003/2004 of a "European vision" for converging technologies and a 2007 report on innovation processes in the "European knowledge society." It thereby highlights also the contribution of historians, sociologists, and philosophers of science and technology to the European quest for identity.

TRANSNATIONAL IDENTITY

In 1957, the Treaties of Rome laid some of the cornerstones for what is today known as the European Union. Fifty years later, European leaders gathered in Berlin to commemorate this founding moment and to sign another declaration. Two aspects are interesting about this brief, perhaps incidental, Berlin declaration.[1] In the shadow of the so-called Lisbon Agenda of 2000, with its ambitious economic goals, the Berlin Declaration advanced an idea of Europe that is not primarily a union defined by economics but one defined by shared values and "a unique way of living and working together." At the same time, however, a key phrase of the document got lost in translation. The German document proposed that "We, the citizens of the European Union, are united for our happiness," but the English version renders this "We, the citizens of the European Union, have united for the better."[2] The incantation of unity is thus

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[1] Council of the European Union, "Declaration on the Occasion of the Fiftieth Anniversary of the Signature of the Treaties of Rome," Brussels, 24–25 March 2007, http://www.consilium.europa.eu/cms3_applications/applications/newsroom/LoadDocument.asp?directory=en/misc/&filename=93282.pdf (English), and http://www.consilium.europa.eu/cms3_applications/applications/newsroom/LoadDocument.asp?directory=de/misc/&filename=93284.pdf (German).

[2] "Wir Bürgerinnen und Bürger der Europäischen Union sind zu unserem Glück vereint." Since this is an ambiguous sentence, it invites an alternative translation: "We citizens of the European Union are fortunate to be united." The fact that the official translations do not offer either of these readings has

deflated and has become a reminder of cultural and linguistic as well as political differences.

There is no mention in the Berlin Declaration of science and technology, but an implicit reference may be found in the following: "We are facing major challenges which do not stop at national borders. The European Union is our response to these challenges." This formulation harkens back to the October 2005 Hampton Court Summit, which produced a rather more substantive document on "European values in the globalised world." It defined Europe as "25 countries with shared values and strong institutions acting together" and declared that "[t]oday's policies are challenged by new technologies, ageing and globalisation."[3]

All of these apparently superficial political statements add a new dimension to the familiar ways in which science and technology are related to questions of identity. Science and technology participate in national aspirations, they belong to a specific cultural heritage, and they can be subservient to territorial and economic interests. But in the context of the European quest for transnational identity, they also become strategic sites for the formation of a uniquely European response. Accordingly, Maurizio Salvi of the Bureau of European Policy Advisers argues that the Berlin Declaration and the Hampton Court Summit demand the integration of ethics into European policy on research and development.[4] It is not enough, along this line of reasoning, for the European Commission to attend to economic goals that might belong to a classical national agenda that is merely scaled up to the European level. Instead, the Commission has to take on global challenges that call upon shared values of a community of nations. One such challenge might be the "responsible development of nanotechnology," and Salvi presented his views at a conference dedicated to the Commission's recommendation of a code of conduct for responsible research in the area of nanotechnology.[5]

But is it really possible to understand the European Commission's high-level interest in the low-level activity of laboratory research as a contribution to the formation of transnational European identity and citizenship? The question raises a host of methodological problems, if only in that it attributes to the Commission a certain understanding of scientific knowledge production and the social construction of technology. The very idea that shared European values can and ought to be inscribed into research practice presupposes notions of social shaping or of the co-construction of technology and society. And this presupposition, in turn, draws attention to the complicated relation between the realms of science studies and politics. As will become abundantly clear in the following pages, the language of analysis is inextricably bound up with political programs, and vice versa. Even an apparently analytic

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been taken to be a matter of politics; see Helena Spongenberg, "Berlin Declaration's 'Fortune' Is Lost in Translation," eu*observer*.com, 27 March 2007, http://euobserver.com/9/23786.

[3] Commission of the European Communities, "European Values in the Globalised World," Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions, Brussels, 20 Oct. 2005, 11–12, 5, http://ec.europa.eu/growthandjobs/pdf/COM2005_525_en.pdf.

[4] Bureau of European Policy Advisers (BEPA) European Commission, presentation at the Conference on Governance and Ethics of Nanotechnology, Brussels, 7–8 May 2008, http://ec.europa.eu/research/science-society/document_library/pdf_06/salvi-m-presentation-nano_en.pdf. On the role of the BEPA, see http://ec.europa.eu/dgs/policy_advisers/.

[5] Commission of the European Communities, "Commission Recommendation of 07/02/2008 on a Code of Conduct for Responsible Nanosciences and Nanotechnologies Research," Brussels, 2 Feb. 2008; see ftp://ftp.cordis.europa.eu/pub/fp7/docs/nanocode-recommendation.pdf.

term such as "experiment" serves not only to describe the multiplicity of tentative and open-ended approaches to research policy and identity formation but also to valorize a certain attitude and understanding that might be shared by all Europeans. A similar difficulty holds for texts and their authors: Commission Recommendations, the reports by various expert groups, proceedings from Commission-funded conferences and research projects, and finally seemingly independent academic scholarship such as the present essay all inform each other.[6] These inextricable relations are part of the phenomenon under investigation, and one cannot completely extricate oneself merely by acknowledging the situation or reflecting upon it.[7]

This is most evident in the multitude of studies on the question of European identity itself. Some of these are informed by specific European traditions in a way that allows them to mobilize the elusive idea of a transnational European citizenship and thereby to motivate a quest for European identity that takes the form of an experiment: "It mobilizes . . . the myth of a community of citizens brought into existence through the practice of citizens."[8] Accordingly, a substantive notion of identity might be giving way to multiple occasions and practices of identification, and national conceptions of citizenship might become reoriented toward a transnational order, for example, by focusing civic participation on the development of new technologies.

THE FRAMEWORK

The temporal frame for the following case study was set by the Sixth Framework Program (FP6) of the European Union. This program provided research funding during the five-year period beginning January 1, 2003. Its first year overlapped with FP5, and its last year, 2007, with FP7. Administered by the Directorate General Research of the European Commission, FP6 was introduced in the following terms: "Past FPs have helped to develop a culture of scientific and technological co-operation between different EU countries and they have been instrumental in achieving good research results. They have not, however, had a lasting impact on greater coherence at the European level."[9] With FP6, European research policy thus set out to go beyond its traditional brief to strengthen Europe as a civilian power that simultaneously competes and partners on an equal footing with U.S. research.[10] What may have been implicit before now became an explicit goal of FP6: European research policy takes on the task of helping to create an integrated European knowledge society and thus Europe itself. Three novel features, in particular, were to advance this goal.

The main aim of FP6 was to prepare and support the emergence of the European

[6] These remarks apply to the present contribution in that I served as rapporteur of a European expert group on converging technologies and will draw on this background for my main case study.

[7] For a proposal of how to deal with this difficulty, see Alfred Nordmann, "Knots and Strands: An Argument for Productive Disillusionment," *Journal of Medicine and Philosophy* 32 (2007): 217–36.

[8] Klaus Eder and Bernhard Giesen, "Citizenship and the Making of a European Society," in *European Citizenship between National Legacies and Postnational Projects*, ed. Klaus Eder and Bernhard Giesen (Oxford, 2001), 245–69, 263f.

[9] "Frequently Asked Questions" on the homepage of the Sixth Framework Programme, http://ec.europa.eu/research/fp6/.

[10] John Krige, "The Politics of European Scientific Collaboration," in *Science in the Twentieth Century*, ed. John Krige and Dominique Pestre (Amsterdam, 1997), 897–918; Krige, *American Hegemony and the Postwar Reconstruction of Science in Europe* (Cambridge, Mass., 2006); cf. Kalypso Nicolaidis and Robert Howse, "'This is my EUtopia . . .': Narrative as Power," *Journal of Common Market Studies* 40 (2002): 767–92.

Research Area (ERA), which included the creation of a European Research Council (ERC) and, subsequently, a European Institute of Technology (EIT). Since the framework programs are dedicated to research that supports industrial development, broadly conceived, they were set up to stimulate research above and beyond the various national research councils and funding agencies. The creation of the ERA, ERC, and EIT also allows for EC funding of so-called basic research, and it challenges the national agencies to coordinate on a European level and thereby to cede some of their autonomy. An April 2007 green paper provides an assessment of the ERA and adopts as its title the promising slogan "inventing our future together." It employs a programmatic singular by declaring that the "ERA is essential to making Europe a leading knowledge society."[11]

The integration of research is explicitly conceived of as a vanguard for the integration and expansion of Europe. A second main objective of FP6 was therefore to "use the scientific potential of candidate countries to prepare and assist their accession to the EU for the benefit of European science at large."[12] The research area is thus to provide a stage of sorts on which member and accession states can become European.

Finally, the program for integrating European research opened a major funding line for investigations of "social cohesion in the knowledge-based society" and of "citizenship, democracy and new forms of governance." In particular, this led to the creation of the Science and Society Directorate and the support not of self-reflective but of self-exemplifying projects. Research on ethical issues of nanotechnology, for example, can involve philosophers and social scientists from various European countries, whose methodologies often include public engagement exercises or deliberative forums that create experimental situations for the interaction between citizens, scientists, and policy makers. Aside from discovering how Europeans think about nanotechnology and what they consider to be relevant ethical issues, such research projects institute occasions for coming together as Europeans, and they testify to the Commission's commitment to involve citizens in science policy decisions.[13] Thus, research on "implications of European integration and enlargement for governance and the citizen" is often self-exemplifying in that it integrates researchers and citizens from the enlarged Europe and in that it tries out novel forms of interaction to represent the views of citizens. This accords with the recommendation that the integration of European researchers involves experiments in governance.[14] Accordingly, a fair number of FP6 projects directly took on the idea of European citizenship

[11] European Commission, *The European Research Area: New Perspectives,* Green Paper, 4 April 2007 (Brussels, 2007), 6, http://ec.europa.eu/research/era/consultation-era_en.html. See also Didier Buysse, "The Debate on Relaunching ERA," *Research EU: The Magazine of the European Research Area* 53 (2007): 18–19. The notion of the European knowledge society was prepared by the so-called Lisbon Strategy, which set out to transform Europe into "the most competitive and most dynamic knowledge-based economy" and referred repeatedly to life in "the knowledge society." See Lisbon European Council, "Presidency Conclusions [The Lisbon Strategy]," Lisbon, 23–24 March 2000, http://ue.eu.int/ueDocs/cms_Data/docs/pressData/en/ec/00100-r1.en0.htm. See also Council of the European Union, "Follow-up of Lisbon European Council Conclusions," Brussels, 19 April 2000, http://register.consilium.europa.eu/pdf/en/00/st07/07953en0.pdf.

[12] "Frequently Asked Questions" (cit. n. 9).

[13] The author of this essay contributes to two such projects: Deepening Ethical Engagement and Participation in Emerging Nanotechnologies (DEEPEN) (http://www.geography.dur.ac.uk/projects/deepen/), and Nanotechnology Capacity Building NGOs (NanoCap) (http://www.NanoCap.eu). Both projects began in fall 2006 and are to be completed by fall 2009.

[14] European Commission, *The Sixth Framework Programme in Brief* (Brussels, 2002), 10, http://ec.europa.eu/research/era/pdf/era-greenpaper_en.pdf.

and European identity—empirical studies of national attitudes toward the European Union complementing explorations of the kinds of narratives that might foster identification with "Europe."[15]

The time frame of FP6 coincided with the failed ambitions of integrating the European Union by giving it a political constitution and of acting as one of the superpowers to prevent the war in Iraq. Just as several books celebrated the emerging Europe as an alternative or corrective to the hegemony of the United States,[16] Europeans were reminded, once again, of the difficulties of constructing a meaningful political union that goes beyond economic expediencies. This highlights the poignancy of the FP6 goals: At a time when the "European Union" is still a political experiment that might succeed or fail,[17] research and research policy become arenas for advancing this political experiment by conducting experiments on European governance and identity—and, indeed, by suggesting that the European knowledge society is rooted in collective experimentation with emerging technologies. This suggestion may prove untenable in that it may just be too much to ask of European citizens to identify with Europe on the grounds that they are all part of and subject to somewhat risky experiments. However, this suggestion makes explicit what was already implicit in the FP6 goals. And finally, it aids the formation of a European identity by evoking a forceful contrast between the political values associated with Europe and those of the United States.

Accordingly, the following case study does not show how a notion of European identity is expressed by or imposed upon policies for the development of science and technology. This is not a story of European science heralding and propagating European ingenuity, virtues, and values. Instead, it shows how the organization of research is a testing ground on which the notion of European identity is articulated, even invented. It is a testing ground, quite literally: the implicit notion that Europeans are together engaged in a collective experiment to technologically shape and reshape their world is thought to be a means also of ascertaining the existence of this fragile collectivity.[18]

THE PARADOX

If research policy is a testing ground, laboratory, or arena for the invention of "Europe," it will reflect the ambivalence that attends all efforts to define the European Union during a time of European expansion. At one extreme, the Union can be seen as an ideal community that commands patriotic allegiance and displaces the affective bond to any particular member state ("I am European first, and German second"). At

[15] The "Eurobarometer"-projects are particularly visible. These investigations of public opinion across the EU include scientific and technological issues as well as the question of European citizenship. Gallup Organization Hungary, *European Union Citizenship*, Flash Eurobarometer no. 213 (European Commission, Brussels, 2008), http://ec.europa.eu/public_opinion/index_en.htm.

[16] Sheila Jasanoff, "Citizens at Risk: Cultures of Modernity in the US and the EU," *Science as Culture* 11 (2002): 363–80; Jasanoff, *Designs on Nature: Science and Democracy in Europe and the United States* (Princeton, N.J., 2005); Jeremy Rifkin, *The European Dream: How Europe's Vision of the Future is Quietly Eclipsing the American Dream* (New York, 2004); T. R. Reid, *The United States of Europe: The New Superpower and the End of American Supremacy* (New York, 2004).

[17] Stefan Aust, ed., *Experiment Europa: Ein Kontinent macht Geschichte* (Hamburg, 2002); Soledad Garcia, "Europe's Fragmented Identities and the Frontiers of Citizenship," in *European identity and the Search for Legitimacy,* ed. Soledad Garcia (New York, 1993), 18.

[18] This is not to claim, of course, that research policy is the only such testing ground.

the other extreme, the Union is constituted procedurally and can draw nothing but trust if it learns to involve European citizens in a transparent and effective manner.[19] The two extremes leave considerable room to maneuver and allow for considerable opportunism, as research policy refers, on the one hand, to specifically European traditions, virtues, and values and, on the other hand, to the job of strengthening competitiveness at a European level. It is in this space that the so-called European paradox arises, which prefigures the formulation of a "European vision" for the convergence of enabling technologies and prefigures also the suggestion that collective experimentation can lead us to take the singular European knowledge society seriously.

In 1994, the first *European Report on Science and Technology Indicators* identified the "European paradox." In a subtle but effective manner, this established research policy as the arena in which the pragmatic goal of economic competitiveness needs to be related to questions of identity. Overtly, the paradox is said to consist in the "gap between Europe's strong science base and its poor performance in terms of technological and industrial competitiveness"[20] and "refers to the fact that Europe plays a leading world role in terms of scientific excellence and the provision of highly skilled human capital. But it largely fails to convert science-based findings and inventions into wealth-generating innovations."[21] This is a failure, to be sure, but not one to be ashamed of. The rhetoric of the paradox suggests, after all, that Europe is perhaps not very good at capitalizing commercially on the ideas generated in Europe, but all the same it has been and continues to be the most fertile ground for the creative development of ideas. Even as it urgently identifies a desperate economic need, the paradox flatters Europe. And thus, the paradox reappears on another level as praising oneself by way of identifying shortcomings—it affords a process of identification. In light of the broadly accepted assumption that Europe is the cradle of science as well as capitalism and that Europe is therefore the place in which the modern world originated

[19] To be sure, these two views are not mutually exclusive. (See Jürgen Habermas's conception of a "constitutional patriotism" that suggests the possibility of strong ties to the procedural norms of democratically constituted society.) Moreover, these two views do not arise as merely theoretical possibilities. Each member state brings its own more or less troubled relation to its own national identity into the European Union and thus colors the debate about European identity. The present essay, for instance, brings German experiences and struggles to bear on the question (which explains the reference just now to Jürgen Habermas). Not surprisingly, a survey of research on European citizenship (from the FP6 time frame and partly financed through FP6) stresses multiple processes of identification with Europe over the articulation or discovery of a given identity and thereby stresses also the efficacy of numerous weak ties to Europe over few strong ties. Michael Keating, *Plurinational Democracy: Stateless Nations in a Post-Sovereignty Era* (New York, 2001), 142; Garcia, *European Identity* (cit. n. 17); Jürgen Habermas, "Ist die Herausbildung einer europäischen Identität nötig, und ist sie möglich?" in *Der gespaltene Westen* (Frankfurt, 2004), 68–82; Ireneusz Pawel Karolewski, "Citizenship and Collective Identity in Europe," in *European Identity: Theoretical Perspectives and Empirical Insights,* ed. Ireneusz Pawel Karolewski and Viktoria Kaina (Münster, Germany, 2006), 23–58; Yannis Stavrakakis, "Passions of Identification: Discourse, Enjoyment, and European Identity," *Discourse Theory in European Politics: Identity, Policy, and Governance*, ed. David Howarth and Jacob Torfing (New York, 2005), 68–92.

[20] European Commission, *Towards a European Research Area: Indicators on Science, Technology and Innovation; Key Figures 2003–2004* (Luxembourg, 2003), 422, http://cordis.europa.eu/indicators/publications.htm. The first extended discussion of the European paradox can be found in the European Commission's *Green Paper on Innovation*, Brussels, 20 Dec. 1995, http://europa.eu/documents/comm/green_papers/pdf/com95_688_en.pdf.

[21] European Commission, *Towards a European Research Area: Indicators on Science, Technology and Innovation; Snapshots, "Key Figures 2003–2004"—From "European Paradox" to Declining Competitiveness?* (2003), 1; ftp://ftp.cordis.europa.eu/pub/indicators/docs/pckfbd_snap4.pdf.

and subsequently spread to other continents, the paradox celebrates Europe as a producer of ideas, reminds Europe that its economic success depends on this tradition,[22] and challenges Europe to accept just one further challenge. Accordingly, the presentation of the European paradox has been prefaced by a lofty motto: "The ultimate limits to growth may lie not as much in our capacity to generate new ideas, so much as in our ability to process an abundance of potentially new seed ideas into usable forms."[23]

To be sure, the European paradox is a fragile occasion for identification with Europe in that it affords unambiguous identification only with Europe's past and thus with the "old Europe." To accept the challenge and turn one's attention to wealth-generating innovations might amount to an invitation to join the "new Europe"—in which the new Europe is identified with the aspirations of those member states that joined the European Union only recently.[24] After decades of communism, these member states are said to exhibit an unfettered enthusiasm for capitalism and therefore to be less encumbered by Western traditions. Thus, negotiations of the European paradox always involve the question of who the Europeans are and who they might wish to become, ranging from emphatic affirmations of the old Europe, with its tradition of free and creative inquiry, to calls for a radically reformed new Europe that enters a scientific and technological race with the United States and especially with countries in the Far East.[25]

A EUROPEAN VISION

Moving from the European paradox to specific developments within the FP6 time frame, two particular documents come to the center of attention.[26] Both carry the "European Knowledge Society" on their sleeves, and the first especially suggests a transition from many diverse member states to a single European knowledge society.[27] The report's title uses the plural and thus acknowledges the plurality of states:

[22] It is readily apparent that the formulation of the paradox presupposes the "linear model," according to which technological innovation and economic growth descend from basic research. This assumption will be challenged by the FP6 documents on converging technologies and collective experimentation.

[23] European Commission, *Towards a European Research Area* (cit. n. 21), 1.

[24] Jan Ifversen, "It's About Time: Is Europe Old or New?" in *Discursive Constructions of Identity in European Politics*, ed. Richard C. M. Mole (New York, 2007), 170–89.

[25] This is especially true for the FP6 time frame, which included, on January 21, 2003, Donald Rumsfeld's infamous contrast of old and new Europe, considerably facilitating identification with old Europe. Anne Applebaum, "'Old Europe' versus 'New Europe,'" in *Beyond Paradise and Power: Europe, America, and the Future of a Troubled Partnership*, ed. Tod Lindberg (New York, 2005), 39–59; and Ifverson, "It's About Time" (cit. n. 24).

[26] HLEG (High Level Expert Group) on Foresighting the New Technology Wave, *Converging Technologies: Shaping the Future of European Societies*, rapporteur: Alfred Nordmann (Luxemburg, 2004), ftp://ftp.cordis.europa.eu/pub/foresight/docs/ntw_report_nordmann_final_en.pdf; Ulrike Felt (as rapporteur for the Expert Group on Science and Governance), *Taking European Knowledge Society Seriously* (Brussels, 2007).

[27] Since I drafted the report and served as its advocate on numerous occasions, the remarks about the HLEG *Converging Technologies* report (cit. n. 26) are those of a participant-observer even more so than the rest of this contribution. Accordingly, I do not pretend to deliver here a perfectly neutral account. However, since the entanglement of analysis and advocacy are part of the phenomenon under consideration, these obstacles to neutrality may prove to be heuristically useful and serve as a magnifying glass that brings to light the European dimension. In addition, the temporal remove of just a few years affords a more distanced view. One should not assume that all the features of the report

Converging Technologies—Shaping the Future of European Societies. However, the report's key concept suggests a convergence upon a singular common goal. CTEKS might be shorthand for *converging technologies* ("c-teks"), but it is also an acronym for Converging Technologies for the European Knowledge Society. This acronym expresses an implied contrast, namely that of converging technologies in Europe as opposed to converging technologies in the United States, with its so-called NBIC program. But the CTEKS designation also includes an ambiguous "for." It suggests, on the one hand, the existence of a single European knowledge society as a beneficiary of the convergence. Yet it suggests, on the other hand, that converging technologies might have as one of their goals to bring about the European knowledge society.

NBIC—CONVERGING TECHNOLOGIES FOR IMPROVING HUMAN PERFORMANCE

The history of CTEKS began with a volume of proceedings published in July 2002 by the U.S. National Science Foundation (NSF) and the U.S. Department of Commerce: *Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology, and Cognitive Science.*[28] Editors of the NBIC report were Mihail Roco and William Bainbridge, both from the NSF. Roco already had a high degree of visibility worldwide as architect and promoter of the National Nanotechnology Initiative. As such, he was perceived as a powerful actor who could set and fund a research agenda.[29] The report gathered approximately eighty

highlighted here were actually subject to explicit deliberation within the expert group or the staff of the European Commission. The telling plural in the title of the report and the teleological singular of the CTEKS conception are products of many forces (of commission and omission) at work simultaneously.

[28] This is not to say that the notion of converging technologies originates with this report. This notion has a long and varied history. The specific use of the term in the U.S. document has been traced to a 1999 report on research directions of nanotechnology in which James Canton wrote about a "convergence of nanotechnology with the other three power tools of the twenty-first century (computers, networks, and biotechnology)": James Canton, "The Social Impact of Nanotechnology: A Vision to the Future," in *Nanotechnology Research Directions,* ed. NSTC-IWGN, Workshop Report, The National Science and Technology Council's Interagency Working Group on Nano Science, Engineering, and Technology workshop, 27–29 January 1999, 178–80, http://www.wtec.org/loyola/nano/IWGN.Research.Directions/IWGN_d.pdf. See also Christopher Coenen, Torsten Fleischer, and Michael Rader, "Of Visions, Dreams, and Nightmares: The Debate on Converging Technologies," *Technikfolgenabschätzung—Theorie und Praxis* 13, no. 3 (2004): 118–25, http://www.itas.fzk.de/tatup/043/coua04a.pdf. Canton was later one of the contributors to the converging technologies workshops. In addition, William Sims Bainbridge, the coeditor of the U.S. report, has on various occasions referred to Manuel Castells's notion of technological convergence. Castells had argued that "technological convergence" is a characteristic of the information technology revolution. In Castells's view, the "ongoing convergence between different technological fields in the information paradigm" results from "their shared logic of information generation" and "increasingly extends to growing interdependence between the biological and microelectronics revolutions." Manuel Castells, *The Rise of the Network Society,* vol. 1 of *The Information Age: Economy, Society, and Culture* (Malden, Mass., 1997), 63f.

[29] William Bainbridge has gradually emerged as the driving force behind the reflections on converging technologies: As a certain understanding of the meaning of the report emerged, so did an image of its editor. See, e.g., William Bainbridge, "Converging Technologies and Human Destiny," *J. Med. & Phil.* 32 (2007): 197–216; Bainbridge, *Nanoconvergence: The Unity of Nanoscience, Biotechnology, Information Technology, and Cognitive Science* (Englewood Cliff, N.J., 2007); and George Khushf, "The Ethics of NBIC-Convergence," *J. Med. & Phil.* 32 (2007): 185–96. The difference between the two editors of the NBIC report corresponds to different interpretationsof the historical self-positioning of NBIC-convergence as a "new renaissance." Mihail Roco appears to use this term as a historical reference to a transdisciplinary culture of knowledge production, whereas William Bainbridge refers to the birth of the new human being.

contributors from a wide variety of agencies, companies, and academic disciplines, including the social sciences and humanities. Academic and popular discussions of NBIC convergence focus mostly on 26 of the report's 396 pages, namely the executive summary and overview that appear to speak for the entire group of authors.[30]

The scientific content of the report concerns the complementarity of nanotech, biotech, information technology, and cognitive science and was summed up by a "statement of workshop participant W. A. Wallace":

> 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.[31]

The major benefit foreseen from the convergence of the four fields is that of improving human performance. This program has since been discussed under the heading of human enhancement, lending visibility and credibility to a debate that had originated in the field of biomedical ethics.[32] Most striking in this program are visions of mind-machine and mind-mind communication without the cumbersome detour through the human body or language.[33] There are also programs for expanded physical strength. One article in the volume adds an "S" for "socio" to NBIC. Rather than bring in a social science perspective, it proposes a GULP (Giant UpLoad Process) sense: "the most valuable sixth sense for our species would be a sense that would allow us to quickly understand, in one big sensory gulp, vast quantities of written information (or even better, information encoded in other people's neural nets)."[34] Although most papers are concerned with individual humans, there is also a focus in the report on enhancing group performance and interpersonal communication, including a paper that focuses on the benefits of NBIC convergence for the environment.[35] The discussion of explicitly military applications is rather limited,[36] yet it would appear that many suggestions make sense primarily in a military context. Finally, the report envisions, especially in the overview, a reorganization of research, a "holistic" approach that

[30] The size and diversity of the group, the boldness of the claims and their unqualified presentation raises the question whether this introduction could have been jointly authored or an outcome of a genuine process of consensus formation. For example, the report's assuredly predictive voice is not easily reconciled with the presence in the group of careful intellectuals such as Sherry Turkle and Mike Gorman. Daniel Sarewitz published a brief memoir of his short-lived participation in the process: Daniel Sarewitz, "Will Enhancement Make Us Better?" *Los Angeles Times*, 9 Aug. 2005.

[31] Mihael Roco and William Bainbridge, eds., *Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology, and Cognitive Science*, NSF/DOC-sponsored report, Arlington, 2002, 11.

[32] See, e.g., Erik Parens, *Enhancing Human Traits: Ethical and Social Implications* (Washington, D.C., 1998).

[33] The third canonical human enhancement theme, life extension and immortality, plays only a marginal role in the report, but see Roco and Bainbridge, *Converging Technologies for Improving Human Performance* (cit. n. 31), 14, 162–69.

[34] Jim Spohrer, "NBICS (Nano-Bio-Info-Cogno-Socio) Convergence to Improve Human Performance: Opportunities and Challenges," in Roco and Bainbridge, *Converging Technologies for Improving Human Performance* (cit. n. 31), 95; cf. Gregor Wolbring, "Improving Quality of Life of Disabled People Using Converging Technologies," in ibid., 240–42.

[35] Roco and Bainbridge, *Converging Technologies for Improving Human Performance* (cit. n. 31), 242–86.

[36] Ibid., 287–320.

harkens back to the Renaissance.[37] There are also in the overview some indications that systems theory may provide a paradigm for this new way of thinking, but only one paper in the volume is explicitly committed to this paradigm.[38] Many readers were more impressed by a kind of reductionism that is especially directed at the social sciences and humanities:

> Some partisans for independence of biology, psychology, and the social sciences have argued against "reductionism," asserting that their fields had discovered autonomous truths that should not be reduced to the laws of other sciences. But such a discipline-centric outlook is self-defeating, because as this report makes clear, through recognizing their connections with each other, all the sciences can progress more effectively. A trend towards unifying knowledge by combining natural sciences, social sciences, and humanities using cause-and-effect explanation has already begun, and it should be reflected in the coherence of science and engineering trends and in the integration of R&D funding programs.[39]

CTEKS—CONVERGING TECHNOLOGIES: SHAPING THE FUTURE OF EUROPEAN SOCIETIES

One of the first readers of the NBIC report was Mike Rogers, at the time program officer at the Foresight Unit of the Directorate General Research of the European Commission. In various memoranda, he made the case that the Commission should consider the technical issues raised by the report and frame them yet more comprehensively. Although a bit cryptic, Rogers suggests two ways in which the Commission ought to go beyond the U.S. report. The first way is to place a greater emphasis on the social sciences and humanities and take a more comprehensive approach to the cognitive sciences. The second way is to integrate this convergence within European values to allow for the acceptance of the emerging technologies.[40] This is motivated by the identification of specific deficits in the U.S. report. One of the texts that was eventually produced by the European expert group first presents the NBIC report and then confronts it with Rogers's comments:

> If the visions presented in this report are striking, the values underlying much of this work are strongly positivistic and individualistic. Science and Technology are out to be harnessed for our good, and given the right incitements, a "new Eden can be created on Earth". However, the emphasis is not so much, as one might have expected in view of the new Eden, on increasing the quality of life, social cohesion or on solving humankind's main challenges of access to safe water, sustainable development, peace etc. It was commented that "*it says nothing about the rest of the world, the issues of poverty and deprivation, of sharing, of any benefits to the global challenges facing the 95% of the world's population who are not US*." (Svanfeldt & Rogers 2003) The emphasis is among others on "*accelerating advancement of mental, physical and overall human performance*," that is to say to increase human efficiency and productivity.[41]

[37] Ibid., x, 1–3, 20, passim.

[38] Yaneer Bar-Yam, "Unifying Principles in Complex Systems," in ibid., 335–56.

[39] Roco and Bainbridge, *Converging Technologies for Improving Human Performance* (cit. n. 31), 11; cf. Jan Schmidt, "Unbounded Technologies," in *Discovering the Nanoscale*, ed. D. Baird, A. Nordmann, and J. Schummer (Amsterdam, 2004), 35–50.

[40] Mike Rogers, "ToR for a STRATA ETAN Group on Convergent Technologies," draft memo, 2003, Brussels.

[41] Wolfgang Bibel, Daniel Andler, Olivier da Costa et al., *Converging Technologies and the Natural, Social and Cultural World: A Report to the European Commission from an Expert Group on*

The initiative of Rogers and the Foresight Unit led to the establishment in December of 2003 of the High Level Expert Group (HLEG) on Foresighting the New Technology Wave. From the start, its mission relates to the uniqueness of Europe:

> The objective of the Group would be to assess the potential impact on the EU competitiveness and societal fabric, and the potential response of the EU and MS [Member States] to that, while examining what possibilities exist for a uniquely European approach to exploiting the potential synergies across these technologies.[42]

The wording "response of the EU" here refers to a response by Europe to the United States, suggesting that the European approach can be formulated only in contradistinction to that of the United States. However, the final statement of the group's mandate took care to avoid this interpretation:

> *In the broad, we want to find out what convergence is, how it will impact the future, and what Europe could do to meet its own policy objectives.* The starting point of this reflection was the US NSF report, which was analysed and discussed but does not constitute the focus point of reflection. It is a question of reflecting and proposing a European approach of the convergence of the sciences/technologies in relation to European cultural, ethical, socio-economic approaches; and European strengths and weaknesses in these technological fields. Cognitive sciences were considered as the most innovative research area for a European approach. Questions—sometimes profound reservations—need to be specified, often they express legitimate concern on the use of these technologies for ideological or military purposes. It is a priority to clarify the civil and societal benefits of this research to give them a new legitimacy and to put them firmly in a context of positive social dynamics. The principle of precaution should be taken into account to fix the framework of the research.[43]

Indeed, the group's final report hardly refers to the U.S. document at all but cites it as a background document and as one example among others for framing converging technologies. This was facilitated by the fact that in the meantime there had also appeared a Canadian document that outlined an approach to structure the convergence.

Foresighting the New Technology Wave (Brussels, 2004), 6f: ftp://ftp.cordis.europa.eu/pub/foresight/docs/ntw_sig4_en.pdf. The cited text is C. Svanfeldt, M. W. Rogers et al., "From the Human Genome to the Human Cognome?" Analysis and review of the U.S. report on *Converging Technologies for Improving Human Performance*, EC Internal Note (Brussels, 2003). In the context of German science policy, Susanne Giesecke elaborated the latter concern: "American visions are strongly oriented towards capabilities for optimizing the human being, and there is a danger that these visions diffuse into a Germany that lacks a developed science policy position of its own. Such a conception of the human being will find little acceptance in Germany. This might lead to a loss of the opportunities that can potentially arise from the convergence of advanced technologies. As an alternative to this, there must therefore be a broadly conceived public debate on a science policy which is compatible with the German mode of innovation and system of values and which clearly sets itself off from discussions in the US." Susanne Giesecke, "Verschläft Deutschland die Konvergenz der Spitzentechnologien?" *ips: innovation positioning system—Innovationspolitische Standpunkte*, newsletter of VDI/VDE Innovation+ Technik, 1 Nov. 2004, http://www.vdivde-it.de/ips/november2004.

[42] Rogers, "ToR for a STRATA ETAN Group on Convergent Technologies" (cit. n. 40).

[43] Foresight Unit, "Group Mandate," in HLEG, *Converging Technologies* (cit. n. 26), 56. The Foresight Unit provided the group with terms of reference that were updated as the group's work progressed. The final version of this document was published in September 2004 as an appendix to the final report. This passage is taken from its very beginning. The work of the group proceeded on the assumption that a European vision would emerge of itself once a group of Europeans joined together in reflection. Supposedly, the U.S. contrast was not necessary to articulate one's values.

This meaning of "converging technologies" was established in a December 2001 workshop organised by the US National Science Foundation and Department of Commerce.

- The title of the published workshop report suggests that converging technologies enable each other in the pursuit of a common goal: "Converging Technologies for Improving Human Performance—Nanotechnology, Biotechnology, Information Technology, and Cognitive Science."[6]
- A science and technology foresight report for the Canadian National Research Council soon followed the same pattern: Converging technologies for bio-health, eco and food system integrity, and disease mitigation—nanotechnology, ecological science, biotechnology, information technology, and cognitive sciences.[7]
- A third example was suggested by a Norwegian researcher. It repeats the pattern: "Converging technologies for salmon-productive aquatic environments—bioinformatics, environmental science, systems theory, salmon genomics, production biology, economics."[8]
- More examples of CT research were considered by the expert group. These include "Converging technologies for natural language processing—information and nanotechnology, linguistics, cognitive and social science," "Converging technologies for the treatment of obesity." and "Converging technologies for intelligent dwelling."

All these CTs agendas provide a list of enabling technologies and technology-enabling sciences, stating that these are converging technologies for the achievement of a more or less general goal. This shared pattern suggests the working definition of "Converging Technologies" that was adopted by the expert group.

Figure 1. *HLEG, Converging Technologies: Shaping the Future of European Societies (Luxembourg, 2004), 13–14.*

This Canadian document allowed the CTEKS report to define the U.S. NBIC vision as one among others.

From here, the CTEKS report took only a small step to establish its "uniquely European approach." Where the U.S. and Canadian reports wedded the convergence to a single overarching goal, the CTEKS report places the emphasis on the procedural aspect of agenda setting itself—and it thereby suggests that these agenda-setting processes would bring into being a politically transparent and participative Europe.

The report argues that the scheme "convergence for" can be completed in various ways. On this account, the mistake of the U.S. account is that it appears to be technology driven. It pretends to take NBIC convergence as a given starting point and apparently goes on to only articulate its meaning. And on the assumption that all technological development has always served to expand human powers, the converging powers of nano, bio, info, and cogno might clearly have a profound impact. In contrast, the CTEKS report draws on science and technology studies and posits a demand-based deliberative model: what might citizens want, and can this demand be matched by a convergence of basic capabilities from various fields of research?[44]

Converging technologies for salmon-productive aquatic environments, for natural

[44] With Daniel Andler, Kristine Bruland (the group's chair), Jean-Pierre Dupuy, Günter Küppers, Arie Rip, and myself, the Expert Group included numerous members from the field of science and technology studies, widely conceived. In total, there were twenty-three members, only seven of whom represented primarily the natural and engineering sciences. Several members (including Küppers and Rip) had "hybrid" careers.

DEFINING THE TERMS

"Enabling technologies" prepare the ground for a wide variety of technical solutions. Because they unlock vast potential and open the door to radically novel technological developments, they are also referred to as "key technologies." Nanotechnology is a prominent enabling technology. Biotechnology and information technology are also enabling, as is the knowledge base of cognitive, social, and other sciences.

"Converging Technologies (CTs)" refers to the convergence on a common goal by insights and techniques of basic science and technology: CTs are enabling technologies and scientific knowledge systems that enable each other for the achievement of a shared aim. Singly or together, NBIC-technologies (nano, bio, info, cogno) are likely to contribute to such convergence.

"NBIC-convergence for Improving Human Performance" is the name of a prominent agenda for CT research in the US. ***"Bio-Systemics Synthesis"*** suggests another agenda for CT research that was developed in Canada.

"Converging Technologies for the European Knowledge Society (CTEKS)" designates the European approach to CTs. It prioritizes the setting of a particular goal for CT research. This presents challenges and opportunities for research and governance alike, allowing for an integration of technological potential, recognition of limits, European needs, economic opportunities, and scientific interests.

Figure 2. *HLEG, Converging Technologies: Shaping the Future of European Societies (Luxembourg, 2004), 19.*

language processing, for the treatment of obesity, and for intelligent dwelling might meet such criteria.[45] In all of these cases, it is clear that nano, bio, info, and cogno may each play a role, although perhaps not a necessary one, and that other disciplines need to join in, including the social and human sciences and the humanities. Thus, whereas NBIC convergence is a convergence *of* enabling technologies, CTEKS calls for a convergence *upon* a set goal.

Since the acronym CTEKS does not refer to any specific configuration of technologies, and since it does not single out any specific common goal upon which these technologies converge, it designates only the deliberative process through which the convergence is organized. According to the CTEKS designation, these deliberative processes have as their goal the European knowledge society—that is, a society of Europeans who are jointly embarked on the project of solving problems and reforming their world and who place knowledge production as well as technical innovation

[45] During the time frame of FP6, none of these suggested programs had been implemented, and only two small-scale explorative projects were launched. M. Van Lieshout, C. Enzing, A. Hoffknecht et al., "Converging Technologies for Enabling the Information Society," *Converging Applications for Enabling the Information Society and Prospects of the Convergence of ICT with Cognitive Science, Biotechnology, Nanotechnology, and Material Sciences,* ed. Roman Compañó (Seville, Spain, 2006); and Roman Compañó, A.-K. Bock, J. C. Burgelman et al., "Converging Applications for Active Ageing Policy," *Foresight* 8, no. 2 (2006): 30–42. There appears to be greater emphasis in FP7: for a survey see Christopher Coenen, TAB (Office of Technology Assessment at the German Parliament), *Konvergierende Technologien und Wissenschaften: Der Stand der Debatte und politischen Aktivitäten zu "Converging Technologies,"* (Berlin, 2008), http://www.tab.fzk.de/de/projekt/zusammenfassung/hp16.pdf. One FP7 call for proposals concerns "converging technologies for clean water."

in the service of this project.[46] A substantial part of the report and of its recommendations is therefore devoted to integrative procedures and mechanisms for this deliberative process. As such, the European document reads to members of the scientific community as a blueprint for democratizing technological development rather than as a catalog of technical challenges and visions.

A CLASH OF CULTURES

The CTEKS report constructs a series of contrasts between the U.S. approach and its own that, so far, sound innocent and stereotypical enough. Here is the substantive vision of a final frontier, and there are procedural norms. Here is technological determinism, and there the coconstruction of technology and society. Here is American individualism, and there societal welfare. Here is the subservience of social science and the humanities, and there is their leading role. The two reports thus provide fertile ground for a perpetual production of presumed differences between the United States and Europe—both at a rather more concrete or descriptive level and at a rather more philosophically abstract level.[47]

The contrasts continued. Aside from the overview, the U.S. report is structured like a conference proceeding. The European document has a single author with endorsement by the entire group; in addition, subgroups and individual group members

[46] Since the term "knowledge society" has the reputation of being trite, the report sought to provide a definition that was based on the contributions to the group by economist Emilio Fontela: "Increasing emphasis on nontradable goods is a hallmark of the Lisbon Agenda's so-called 'European knowledge society' and one reason for the label CTEKS (Converging Technologies for the European Knowledge Society). Pharmaceutical companies, for example, are shifting from the manufacture of drugs to the development of diagnostic tools. For steel manufacturers, too, the production of bulk material is becoming subsidiary to the creation of targeted solutions. Such knowledge-based solutions consider the entire life-cycle of technology-based responses to consumer-specific needs." HLEG, *Converging Technologies* (cit. n. 26), 24; cf. Lisbon European Council, "Presidency Conclusions" (cit. n. 11).

[47] If only for this reason, the differences between the NBIC and the CTEKS reports have been a popular subject of analysis. See, e.g., Davis Baird, "Converging Technologies, Diverging Values? European and American Perspectives on NBIC," presentation at the AAAS Forum on Science and Technology Policy, Washington, D.C., 22 April 2004; G. Berthoud, "The Techno-Utopia of Human Performance Enhancement," in *Utopie Heute: Zur aktuellen Bedeutung, Funktion und Kritik des utopischen Denkens und Vorstellens*, ed. Beat Sitter-Liver (Fribourg, Germany, 2007), 1:279ff; Nigel Cameron, "Convergence and Divergence: European Union Responses to US Converging Technology Policy," presentation to the Converging Technologies Conference (NBIC 2005), 24–25 Feb. 2005, Hawaii. Coenen, Fleischer, and Rader, "Of Visions, Dreams, and Nightmares" (cit. n. 28); Emilio Fontela, *Convergencia NBIC 2005: El Desafíol de la Convergencia de las Nuevas Tecnologías* (Madrid, 2006); Steve Fuller, "The Converging Technologies Agenda: The Stakes and the Prospects," *Knowledge Politics Converging Technologies Newsletter* no. 3 (2008): 1–3; Fuller, "Research Trajectories and Institutional Settings of New Converging Technologies," Deliverable 1 of *KNOWLEDGE NBIC Knowledge Politics and New Converging Technologies: A Social Science Perspective* (EC-funded project CIT6 no. 028334, 2008), http://www.converging-technologies.org/docs/Knowledge%20NBIC%20D1.pdf; Liana Giorgi and Jacquelyne Luce, eds., *Converging Science and Technologies: Research Trajectories and Institutional Settings,* special issue of *Innovation: The European Journal of Social Science Research* 20, no. 4 (2007); Armin Grunwald, "Nanotechnologie als Chiffre der Zukunft," in *Nanotechnologien im Kontext,* ed. A. Nordmann, J. Schummer, and A. Schwarz (Berlin, 2006), 49–80; Grunwald, "Converging Technologies: Visions, Increased Contingencies of the Conditio Humana, and Search for Orientation," *Futures* 39 (2007): 380–92; George Khushf; L. Laurent, and J.-C. Petit, "Nanosciences and Its Convergence with Other Technologies: New Golden Age or Apocalypse?" *HYLE—International Journal for Philosophy of Chemistry* 11 (2006): 45–76; Richard Saage, "Konvergenztechnologische Zukunftsvisionen und der klassische Utopiediskurs," in Nordmann, Schummer, and Schwarz, *Nanotechnologien im Kontext*, 179–94; World Council of Churches, *Convergent Technologies*, vol. 1 of *Science, Faith, and Human Life—Transforming Life*, (n.p., 2005). See below on ongoing research projects.

produced a variety of supporting documents. NBIC convergence had science policy managers recruit a wide diversity of scientists, engineers, and humanists. The European Expert Group included twenty-three members, it was chaired by a historian of technology, and its final report was drafted by a philosopher of science. The group met six times over a nine-month period, and during these meetings it received testimony from a variety of perspectives. Where the U.S. report employs a constative future tense ("this will happen"), the European report considers a conditional future ("this might happen").[48] Acknowledging that all technological development affects the mental and physical organization of individuals and collective bodies, the European report still urges that a distinction be maintained between the NBIC program of engineering *of* body and mind and the CTEKS endorsed engineering *for* body and mind. This would finally allow for a juxtaposition of major philosophical commitments that inform each of the reports. They, too, appear stereotypical in the context of a contrastive enumeration: The NBIC program looks to technological innovation as a mean of realizing human potential for better communication, teamwork, and decision making. In contrast, the CTEKS report encourages social innovation as a way to promote technical development and thus to realize technological potential.[49] Accordingly, NBIC visions take technology to be a means of overcoming limits to produce a Second Creation, a New Eden, or human salvation. While this view of technology is expressed elsewhere,[50] historians of technology have found it to have special cultural resonance in the United States: It marries the ideal of liberated, emancipated individuals with a conception of transcendence, if not manifest destiny.[51] In contrast, again, CTEKS holds to the notion that technology ingeniously adapts nature to human limits and adapts human desires to the limits of nature. This ingenuity consists in achieving ever more with always the same limited means.

This stark juxtaposition of the NBIC and CTEKS reports clearly owes as much to the work of their readers as it does to the brief of the CTEKS report that it develop an alternative vision of converging technologies, one more compatible with European values than the overtly American NBIC-vision. Significantly, however, the further development of NBIC convergence in Europe broke out of this simple dichotomy.

APPROPRIATIONS

When Mike Rogers and Susanne Giesecke advocated the formulation of a European vision for converging technologies, they were motivated by a sense of excitement about the convergence of enabling technologies and the prospect of a nano- and bio-

[48] Grunwald, "Nanotechnologie"; and Grunwald, "Converging Technologies." (Both cit. n. 47.)

[49] The latter slogan ("social innovation to realize technological potential") was suggested after completion of the CTEKS report at a follow-up Brussels conference on the report of a Key Technologies Expert Group. It was formulated by Josephine Green of Philips Design, explaining why Royal Philips Electronics believed in Europe as a place for creative innovation of consumer products. Josephine Green, "Sense Making and Making Sense of the Future," presentation at the Key Technologies for Europe conference, DG Research, Science, and Technology Foresight Unit, Brussels, 19–20 Sept. 2005, slide 21, ftp://ftp.cordis.europa.eu/pub/foresight/docs/conf_kte_j_green.pdf.

[50] Arnold Gehlen, "Anthropologische Ansicht der Technik," in *Technik im technischen Zeitalter: Stellungnahmen zur geschichtlichen Situation*, ed. H. Freyer, J. C. Papalekas, and G. Weippert (Düsseldorf, Germany,1965), 101–18; Gerd Binnig, preface to Nils Boeing, *Alles Nano? Eine neue Epoche für Wissenschaft und Technik* (Berlin, 2006).

[51] David Noble, *The Religion of Technology* (New York, 1999); Thomas Hughes, *Human-Built World* (Chicago, 2004).

technological reach all the way into cognitive processes. Accordingly, the mandate of the expert group included the emphatic formulation, "Convergence is the driver, Europe the context!"[52] In other words, the expert group was charged not to redefine NBIC convergence but to appropriate or Europeanize it.

Although the expert group sidestepped the emphatic formulation and broadened the notion of convergence,[53] it did manage to dissociate NBIC research from the particular American agenda of improving human performance. The notion that convergence is the driver was sidestepped by the CTEKS report in various ways. First, it rejected its inherent technological determinism by insisting that the convergence is instituted only through an agenda-setting process. Second, it suggested that each convergence requires its own constellation of research fields and that the nano-, bio-, info-, cogno-constellation is just one among many. It turned out to be quite sufficient, however, for the CTEKS report to demonstrate that NBIC research can be framed in a more benign, possibly European manner. To the extent that the reach from nano to cogno appeals not only to the popular imagination but also to that of visionary policy makers and engineers, all that was required was proof of the concept that NBIC convergence can be compatible with European values. The CTEKS report tried to do much more, but it appears to have succeeded at least in that.

Since the reception of NBIC and CTEKS programs continues beyond the time frame of FP6, only a sampling of evidence for the Europeanization of NBIC research can be provided here.[54] In this time frame, no major funding initiatives were designated to converging technologies research in the United States or in the European Union. In the United States, three further conferences continued the work of the first one, but it is not clear whether and how the NSF- and DOC-sponsored NBIC initiative has continued beyond the NBIC 2005 meeting in Hawaii. Although there is no major dedicated funding line for converging technologies at the European Commission, the administrative unit responsible for nanotechnology has been renamed Nano- and Converging Sciences and Technologies. While there are some EC-funded technological projects (converging technologies for active aging, for enabling the information society, for clean water, for environmental protection), these are minor in the larger picture of industrial research.[55] Significant for its persistence as a Europeanized research activity is the rather large presence of NBIC convergence in the areas of technology foresight, science and society, and ELSA (ethical, legal, societal aspects) research.[56] These projects and some academically based activities

[52] Foresight Unit, "Group Mandate" (cit. n. 43), 57

[53] The title page of the CTEKS report features as a running head an expansion of NBIC (nano-bio-info-cogno) convergence: "Nano-Bio-Info-Cogno-Socio-Anthro-Philo-Geo-Eco-Urbo-Orbo-Macro-Micro-Nano-."

[54] For more complete documentation, see Coenen, TAB, *Konvergierende Technologien und Wissenschaften* (cit. n. 45).

[55] But see ibid. for evidence of increased emphasis in FP7 calls for proposals on "converging sciences" and "converging technologies."

[56] The European Commission sponsored the Key Technologies for Europe Expert Group to elaborate and concretize the CTEKS program. Funded projects with a focus on converging technologies include "Knowledge NBIC," "Contecs," and "Ethics School"; see also R. Berloznik, R. Casert, C. Enzing et al., STOA (European Parliament Scientific and Technological Options Assessment), *Technology Assessment on Converging Technologies* (Brussels, 2006), http://www.europarl.europa.eu/stoa/publications/studies/stoa183_en.pdf; Coenen, TAB, *Konvergierende Technologien und Wissenschaften* (cit. n. 45); Erdyn Consultants, SKEP ERA-net: Scientific Knowledge for Environmental Protection, *Converging Technologies and Environmental Regulations: Literature Review* (Brussels, 2008), http://www.skep-era.net/site/files/WP6.2_final%20report.pdf.

recapitulate the dialogue between the NBIC and CTEKS reports and thus use the discussion of "converging technologies" to rehearse the question of European (and U.S.) identity.[57]

Arguably, then, the highly politicized and publicly visible discussion of NBIC research in Europe served to legitimize, even stabilize, the concept and may have extended its relevance for research policy. The successful Europeanization of NBIC research relied not only on overt discussions of the difference between U.S. and European approaches, it also found two other avenues motivated by the CTEKS report. It rejects engineering *of* the mind and the body and encourages instead engineering *for* the mind and body. Rather than reinforce the contrast of NBIC and CTEKS convergence, these engineering ideals cut across the distinction: Europeanized NBIC research engages in engineering *for* the mind. Closely related to this is another way of embracing NBIC research from the European perspective. In scientific and technical terms, the weakness of the U.S. report was seen to lie in its very impoverished conception of cognition and mind. The NBIC report took cognitive science to mean little more than a neuroscientific investigation of the physical basis of thought. The technological convergence was thus to interface straightforwardly with neurons or nerve cells and thus to facilitate mind-machine or mind-mind communication.[58] Here, a specific opportunity was seen for European research. If there is to be convergent NBIC research at all, one needs first to build on European traditions to compensate for the deficits of an all too narrowly conceived cognitive science. This would include studies on cognition and cognitive functioning that draw on neuropharmacology, sociolinguistics, and group psychology, among other areas. Once the proper knowledge base is acquired, so the story went, the nano-, bio-, or information-technologically informed engineering approaches will work to support and expand cognitive functioning and will thus turn out to be engineering *for* rather than *of* the mind.

Finally, the story of a failure of implementation provides poignant testimony to the Europeanization of NBIC research. One of the first European activities immediately inspired by the CTEKS report was an exploratory investigation of prospects for converging technologies for active aging.[59] It set out to clearly dissociate converging technologies from the program of improving the performance of individual humans. Charged with addressing a broadly accepted and socially relevant challenge, the project was thought to be sufficiently Europeanized to fully appropriate the original NBIC program. This attempt to have it both ways proved to be a dead end, however. The technical imagination remained fixated on nano, info, and cogno and thus on bringing cognitive processes into the realm of technical control. Content with the

[57] Among academic investigations devoted to this study of contrasts include the Practis group in Madrid (Javier Echeverría) and a project at the University of Bergen (Roger Strand). For other comparative projects see, e.g., Khushf, "The Ethics of NBIC-Convergence" (cit. n. 29).

[58] See Sarewitz, "Will Enhancement Make Us Better?" (cit. n. 30); or Andy Clark, "Re-Inventing Ourselves: The Plasticity of Embodiment, Sensing, and Mind," *J. Med. & Phil.* 32 (2007): 263–82. In the context of the CTEKS report and the Key Technologies for Europe Expert Group, it was especially Daniel Andler who pursued this line of argumentation: Daniel Andler, *Cognitive Science*, report contributed to the Key Technologies for Europe Expert Group (2005), ftp://ftp.cordis.europa.eu/pub/foresight/docs/kte_cognitive.pdf.

[59] See the statements of Jean-Claude Burgelman in *Summary Report of the Conference and Roundtable of EPTA on Converging Technologies,* ed. Raf Casert, Robby Berloznik, and Robby Deboelpaep (Brussels, 2005); cf. also *Information and Communication Technologies for Active Ageing: Opportunities and Challenges for the European Union*, ed. Marcelino Cabrera and Norbert Malanowski (Amsterdam, 2009).

social relevance of this narrowly technical vision, one of the exploratory workshops was dedicated to brain-machine technologies and yielded the negative result that these technologies may have some utility for seriously impaired patients but nothing to offer to an aging European population at large.

EXPERIMENTAL REIFICATION

Even if CTEKS did not displace NBIC,[60] its introduction placed NBIC research into a European context. The "European knowledge society" is implicitly at issue when the two reports are contrasted, when "engineering for the mind" is invoked, when a deeply embedded cognitive science is pursued, and when public interests are brought into the process of setting an agenda for some convergence.

This brief history of the CTEKS report has indicated that the European knowledge society served as its telos and that it sought to realize this goal by making the organization of research subservient to the dynamics of European decision making. On the one hand, there is no convergence without a European goal to converge upon. And inversely, there is no European knowledge society until there can be a public agenda-setting process that integrates research into strategies for the solution of recognized societal problems. This construction is based on an unproven hypothesis, however, namely the hypothesis of the social shaping of technology or of the coevolution of technology and society. According to the CTEKS proposal, to become European is to bet on this hypothesis and enter into the large-scale experiment that could render it true.

This section will show that the CTEKS report did not invent but merely reified this rather peculiar way of fostering identification with Europe. It originated in the science studies literature and, in particular, in accounts of European science policy.

According to the CTEKS proposal, the European knowledge society can prove itself in a collective experiment. This experiment assumes optimistically that technological development is open to social shaping and that societies can actually assume and exercise the power to shape technological trajectories. It is an experiment precisely in that there is no certainty or guarantee that the underlying assumptions are true. In particular, the experiment cannot rely on simple technical means by which to systematically exercise the in-principle power to socially shape technological trajectories. Instead, the optimistic assumptions about social shaping must be humbly submitted to the vagaries of politics. It is this uncertain ground on which the European knowledge society must prove itself by way of an experiment.

The interpretation so far suggests that the CTEKS report aims for "Europeanness" in a peculiar way: It does not refer to or mobilize a European identity that merely needs to be discovered, remembered, and affirmed. Instead, it offers a procedural experiment that involves opportunities for identification with Europe. In this experiment, Europe does not appear as a bureaucratic center of political and technical control, as it might be exerted to protect its citizens from harm.[61] Instead, "Europe"

[60] Cf. Fuller, "Converging Technologies Agenda"; and Fuller, "Research Trajectories." (Both cit. n. 47.)

[61] This is not to say that Europe is not perhaps just such a bureaucratic center of power and control. Indeed, the procedural and experimental image of Europe is meant to counter just this perception. And thus, even the regulatory scheme of REACh (Registration, Evaluation, Authorisation and Restriction of Chemicals) departs from classical regulatory measures in that it was created through stakeholder

emerges from submission to the vagaries of politics, stakeholder dialogues, and the like. And to this submission corresponds an attitude of humility and uncertainty, as opposed to the hubris of technical control that might commandeer public acceptance of new technologies as required by the nation's destiny or mission.

The contrast between humility and hubris, between political experimentation and technical control, between European and U.S. approaches to science policy, figures prominently in the work of Sheila Jasanoff, especially in her 2002 paper "Citizens at Risk: Cultures of Modernity in the US and the EU," which predated her book *Designs on Nature* (2005). Another science studies scholar, Hans Glimell, summarized Jasanoff's argument at a fall 2003 conference on nanotechnology in Darmstadt, Germany. By way of his paraphrase, Jasanoff's analysis insinuated itself into the CTEKS report:

> Sheila Jasanoff has recently discussed the dedication of producing consent in relation to risks (Jasanoff 2002). She notices that even in the adversarial US environment, there has been an eagerness for processes such as consensus conferences to foster cooperation among disparate parties—"Getting to yes" has become a paramount goal. But as uncertainties mount and as science impinges upon the most intimate, even sacred, aspects of human life, it is no longer wise to assume that societies will or should always agree upon the instruments of governance. Jasanoff argues that, instead, a diversity of approaches can acknowledge that within modernity's complex socio-technical formations, safety comes from the heterogeneity of our accommodations with risk. Rather than seeking consensus, it may be more fruitful for authorities to learn how to foster "informed dissent" about risk among knowledgeable publics.
>
> According to Jasanoff, much of the analytical ingenuity of science policy has been directed toward devising predictive methods like risk assessment, cost-benefit analysis or climate modeling. For her, these represent *'technologies of hubris*', achieving their power through claims of objectivity and by systematically overstating what is known about risks while downplaying uncertainty and conflict. There is instead a need for *'technologies of humility*', capable of incorporating unforeseen consequences, plural viewpoints and mutual learning.[62]

By associating technologies of hubris with the United States and technologies of humility with European approaches in her analysis, Jasanoff offers her European readers an opportunity for identification.[63] At least in Glimell's hands, her distinction offers a template for the construction of the list we encountered above of more and less stereotypical contrasts between CTEKS and NBIC convergence. By subscribing to the hitherto unarticulated program of technologies of humility, European science policy, risk governance, and public engagement exercises can reinscribe into Europe the analysis provided by Jasanoff. Among those listening to Glimell's presentation

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debates and is largely a collaborative reporting scheme that relies on quasi-voluntarily commitments. For a brief introduction, see http://www.chemicalspolicy.org/reachhistory.shtml.

[62] Hans Glimell, "Grand Visions and Lilliput Politics: Staging the Exploration of 'the Endless Frontier,'" in Baird, Nordmann, and Schummer, *Discovering the Nanoscale* (cit. n. 39), 242. Glimell refers to Jasanoff, "Citizens at Risk" (cit. n. 16), 3.

[63] Mariachiara Tallacchini, "Epistemology of the European Identity," *Journal of Biolaw and Business, Supplement Series Bioethix,* 2002, 60–66, describes the American model as "science-based regulation" (hubris) and the European model as "policy-related science." The latter term was proposed by Silvio Funtowicz, Iain Shepherd, David Wilkinson, and Jerry Ravetz , "Science and Governance in the European Union: A Contribution to the Debate," *Science and Public Policy* 27 (2000): 327–36; and Iain Shepherd, ed., *Science and Governance in the European Union: A Contribution to the Debate*, EC Joint Research Centre (EUR 19554 EN), Brussels, 9 March 2000, http://governance.jrc.it/scandg-eur.pdf, to improve European governance by humbly taking uncertainties as a point of departure.

were not only Mike Rogers and Elie Faroult, the EC program officers who shepherded the work of the converging technologies expert group, but also myself as the person who would be chosen to draft the CTEKS report. I subsequently offered as my personal contribution to the work of the expert group a reflection on "Technologies for Dealing with Technological Advance." In it I dealt with the possibility of appropriating technological developments within locally cultural, regional or national contexts, including the transnational context of Europe.

> Attention to technologies for dealing with technology foregrounds the dialectic between global and local effects. The ways of appropriating and contextualizing technologies localize the global forces that drive technological development. These local effects may serve as slight or profound resistance to the global drivers; they may serve to drastically alter or, more likely, cosmetically color future developments. (In some ways, the work of this HLEG negotiates precisely this dialectic as it seeks to identify European constraints and opportunities for the convergence of technologies.) . . . Sheila Jasanoff contrasts in ongoing work and a forthcoming book "technologies of hubris" and "technologies of humility" as different technologies for dealing with the risks posed by an uncertain technical future (Jasanoff 2002). Technologies of hubris bring an engineering attitude to the questions of forecasting, risk-assessment, and policy making. Their goal is consensus formation on the basis of a fundamental trust in our ability to always find yet another technological fix where things do not work according to plan. In contrast, technologies of humility modestly defer to our limits of knowledge and planning, they aim for an "informed dissent" regarding a variety of possible technological futures.[64]

Toward the beginning of the work of the expert group, the point was made that "Europeanness" must be sought in the mode of conceiving and appropriating technological developments. Jasanoff unwittingly provided a blueprint for this that would be reinforced by many of the themes of the CTEKS report—among them, collaborative agenda-setting processes, resistance as a social selection factor rather than an obstacle to development, CTEKS as a "tool for the development of local solutions that foster natural and cultural diversity," and the need to balance technological problem-solving approaches against low-tech or no-tech policy alternatives.[65]

This is but one example of how science studies helped identify an occasion for identification with Europe, creating in effect a self-fulfilling feedback loop.[66] A more or less distinctive feature of "Europe" becomes reinforced and reified. As with the

[64] Alfred Nordmann, "Technologies for Dealing with Technological Advance," in *Foresighting the New Technology Wave—Expert Group: State of the Art Reviews and Related Papers* (supporting material published with the HLEG's *Converging Technologies* report [cit. n. 26]), 14 June 2004, 223, http://ec.europa.eu/research/conferences/2004/ntw/pdf/soa_en.pdf.

[65] Cf. HLEG, *Converging Technologies* (cit. n. 26), 8.

[66] And it is the simplest, most straightforward example at that. Another example informs the next section: The notion of the society as a laboratory has been articulated by various European theorists and implicitly reflects conditions that, for geopolitical reasons, are especially pronounced in Europe. (Its paradigm example is the Chernobyl disaster that united all European scientists, citizens, and policy makers who lived downwind from the Chernobyl site.) See Matthias Groß, Holger Hoffmann-Riem, and Wolfgang Krohn, *Realexperimente: Ökologische Gestaltungsprozesse in der Wissensgesellschaft* (Bielefeld, Germany, 2005); Wolfgang Krohn and J. Weyer, "Society as a Laboratory: The Social Risks of Experimental Research," *Sci. Pub. Pol.* 21 (1994): 173–83; or Ulrich Beck, *Ecological Enlightenment: Essays on the Politics of the Risk Society* (Atlantic Highlands, N.J., 1995). Again, a weak notion of "Europeanness" ("we are all part of the experiments conducted in the European knowledge society") emerges as an occasion for identification. A third example was suggested to me by Kristine Bruland, the historian of technology who chaired the HLEG: the strong reliance on participative mechanisms reflects specific knowledge regarding the role of institutions in the development of science and technology and thus on a shared and understood history of European institutions.

European paradox, this identification of features follows the pattern "in weakness lies strength" and offers an argument that humility may just be good enough not only to usher new technologies into competitive knowledge societies but also to promote identification with Europe. The humble approach may appear risky at first, but it appears to be full of opportunity in that it promises a more sustainable integration of technology and society. In the CTEKS report, this uncertain promise was couched in the language of challenges. For example, CTEKS is said to present "challenges and opportunities for research and governance alike, allowing for an integration of technological potential, recognition of limits, European needs, economic opportunities, and scientific interests."[67]

COLLECTIVE EXPERIMENTATION

Three major dimensions have been identified so far that show how the CTEKS report works in support of Europe. First, the report was considered as an element of FP6 and thus of the Lisbon Agenda and the larger program of strengthening the European knowledge society in the research policy arena. Second, the report was considered in its more immediate context of providing a European vision for converging technologies. Third, the report was interpreted to suggest a particular experimental mechanism for the identification with Europe, and this was seen as the reinforcement of certain preexisting analyses of "Europeanness" in regard to the development of science and technology. This final section will show how the further development of the CTEKS ideas leads back to and generalizes again the notion that "Europeanness" is to be constructed upon the precarious and, indeed, dangerous terrain of collective experimentation.

TAKING EUROPEAN KNOWLEDGE SOCIETY SERIOUSLY

In many ways, the CTEKS report fulfilled its job to provide a European vision and thus to offer occasions for identification with Europe. In one respect, however, it rejected its brief. Rather than consider converging technologies as the driver and Europe as the context, it put Europeans in the driver's seat and tied the very fact of a convergence to an agenda-setting process. Following the science studies doctrine of a "co-production of science and society,"[68] the report viewed Europe as a product of this agenda-setting process, along with the convergence of technological trajectories. However, according to the original charge, Europe is a preexisting context, if only by way of the European institutions that will promote and regulate the convergence. And though the CTEKS report resonated with various strategies to produce identifications with Europe, it contested more robust and perhaps less humble ways to conceptualize Europe. By their very existence, the European Commission and other European institutions are set to articulate political and cultural values, produce economic benefits, celebrate diverse European traditions, and offer protections to consumers, thereby creating a European Union that citizens can identify with. In contrast, the CTEKS report promotes an experiment by which the European Knowledge Society is yet to invent itself—if the experiment succeeds. For the experiment to succeed, the chal-

[67] HLEG, *Converging Technologies* (cit. n. 26), 19.

[68] Sheila Jasanoff, ed., *States of Knowledge: The Co-Production of Science and Social Order* (London, 2002).

lenge posed by the idea of a technological convergence upon a common goal must be met.[69]

By recommending this experiment, the European expert group provided opportunities for identification but refrained from providing knowledge that anyone could act on. It withheld from European decision makers the illusion of control that—armed with proper knowledge of what is coming their way—they might then usher it into the European context.

> How credible are certain predictions about the state of technology in 2020? Will nanotechnology prove to be essential to CT research? Can the social and natural sciences come together in the formulation and evaluation of research programs? . . . only time can provide the answers. For the time being, the expert group adopted a proactive stance that does not foreclose future debate. The report's aim to outline the opportunities and challenges of CTs has to be distinguished from a study of their impacts. This report is not focused on existing or imminent products and processes that will impact European societies in one way or another. Instead, it considers CTs in terms of their specific potential to generate in the medium and long term new kinds of technological applications. Though it is too early to speak of their likely impacts, it is not too early to consider how the creative development of CTs might address and solve societal problems, how they can build on existing strengths in Europe, orient themselves to social and environmental needs and prompt ethical debate. It is also not too early to assess the promises that are made on behalf of CTs and to address concerns regarding their risks.[70]

This approach was taken a step further and expressed in a far more explicit and general manner by another European expert group on science and governance.[71] Asked to "provide insights which might improve the treatment" of governance challenges posed by "public unease with science," the group decided "to step back" and expand its mandate "beyond the range of immediate instrumental analysis."[72] Instead of providing decision makers with tools for a technology of hubris, the group tried to impress upon the European Commission the need for humility in light of contingencies and complexities.

> In the end, there are no simple answers to the pressing and apparently contradictory demands placed on European science and governance. Global economic imperatives to pursue science-led innovation as quickly and efficiently as possible conflict with the inevitable frictions and temporal demands of democratic governance. In response, we suggest that the main guide lies in trusting Europe's rich democratic and scientific traditions. It is in the realisation of diversity and multiplicity, and in the robust and distributed character of publics and their imaginations, that we may justly conceive different pathways of technoscientific development, and so achieve more mature and robust outcomes.
>
> In the perceived pressing need to encourage innovation, democratic governance has become dislocated in ways that cannot be remedied by technical methods and tools alone. Policy making should not stop at simple or mechanical solutions; it should address the complex issues of science and governance honestly, thoroughly, patiently and

[69] Cf., e.g., HLEG, *Converging Technologies* (cit. n. 26), 7f.

[70] Ibid., 12.

[71] The group included prominent European science studies scholars and one who is known for her sympathies for European science policy: Michel Callon, Maria Eduarda Gonçalves, Sheila Jasanoff, Maria Jepsen, Pierre-Benoît Joly, Zdenek Konopasek, Stefan May, Claudia Neubauer, Arie Rip, Karen Siune, Andy Stirling, and Mariachiara Tallacchini. The group was chaired by Brian Wynne; Ulrike Felt acted as rapporteur and drafted the report. Another member of the group was Isabelle Stengers, who did not sign on to the final document.

[72] Felt, *Taking European Knowledge Society Seriously* (cit. n. 26), 9, 14.

> with humility. Only then will European policy take 'knowledge society' seriously—and fulfil its abundant promise.[73]

This call for honesty and humility culminates in the discussion of "collective experimentation" as the basic condition of European societies and as a hitherto unacknowledged starting point for public debate and governance. Two chapters, in particular, stress this notion. One chapter describes experimentation as one of two regimes of innovation. While the "regime of technoscientific promises" refers to future solutions of current problems to the vast potential of, say, nanotechnology, the "regime of collective experimentation" is modeled on the open-source movement and develops technical trajectories from a multitude of local interactions. While both regimes are said to be complementary rather than mutually exclusive, the expert group thinks "a vibrant European knowledge society must in the long-term be built on collective experimentation." To support this point and to provide an example of collective experimentation, the group refers to the CTEKS report.[74]

Significantly, however, this celebratory description of collective experimentation is based on a rather sobering view of a predicament for the governance of new technologies.

> Two generally accepted insights shape our view of the importance of experimental idioms of thought and practice for social learning for European science and governance. These are:
> - first, the *contingency* of scientific knowledge as considered for potential use in public arenas of all sorts, whether innovation and technologies, or regulatory policies, or combinations; and
> - second, the recognized [obsolescence][75] of the traditional framework which supposed that all technological innovations introduced into society were first tested under the controlled and isolated conditions of a laboratory, which left society protected from premature release of uncertain entities. Thanks to the incessant intensification and growing scale of technologies and technosciences, as Krohn and Weyer first put it in 1988, nowadays "society [and the larger environment] is the laboratory."[76]

The report points out that neither of these conditions is new but that they have become pervasive, especially in regard to the disappearance of the laboratory as a protected space in which the safety of products and processes can be tested before they enter society. With that disappearance, society has become the laboratory in which experiments with new technologies are conducted and observed:

> [I]f society is indeed now the experimental laboratory without walls, and by implication therefore, social subjects are also the subjects (guinea-pigs) of such open-ended techno-social-environmental experiments, it is necessary to begin discussion of the implications

[73] Ibid., 12.

[74] Ibid., 27f. The following passage from the CTEKS report is quoted as a call to collective experimentation: "Since enabling technologies are not dedicated to a specific goal or limited to a particular set of applications, they tend to be judged by the visions that go into them rather than the results they produce. Since these visions reach far beyond disciplinary perspectives, scientists and engineers, policy makers and philosophers, business and citizens are called upon to develop social imagination for CTEKS applications." HLEG, *Converging Technologies* (cit. n. 26), 42.

[75] In the place of "obsolescence," the report speaks somewhat misleadingly of "redundancy."

[76] Felt, *Taking European Knowledge Society Seriously* (cit. n. 26), 68.

> for governance, science, publics and technology. What is meant by experiment here? And if everyone is in principle a guinea-pig, then who is participant in the experimental design, and interpretation—and who has right to its veto?[77]

To take "European Knowledge Society seriously" would be to openly confront what is anxiously described and to turn it into an exhilarating opportunity for genuine collectivity, that is, for the collective exercise of responsible experimental design.[78] Where human test subjects enter into traditional (laboratory-) controlled experiments by giving their informed consent, European knowledge societies should foster "informed dissent" for a vigilant pursuit of their collective experiments.

> If society is now the laboratory, then everyone is an experimental guinea-pig, but also a potential experimental designer and practitioner. Whose experiments we are involved in, and what is being tested, are mostly confused, blind and inadvertent, and open-ended. We have not yet even acknowledged that this is the state we are in, as a prelude to defining what kinds of experiment, to what ends, under what conditions, are acceptable. Basic democratic principles require that this new realization be acknowledged, and acted-upon. We suggest that in early 21st century conditions this societally distributed capacity is in need of deliberate development, in the face of intensifying techno-scientific demands on our trust and credulity.[79]

LIMITS OF ARTICULATION

Taking European Knowledge Society Seriously heeds its own lessons when it introduces its recommendation to acknowledge the condition of society as a laboratory under the heading Risking Collective Experimentation.[80] After all, the concession that Europeans ought to openly deal with the uncertainties of collective experimentation carries with it its own risks. Who wants to tell the European public that they are guinea pigs in experiments, even when these are, to some extent, experiments of their own design? Is collective experimentation a foundation upon which to build a sense of identity—even if the European Union is a political experiment, and even if according to thinkers like Dewey and Popper, democratically open societies are always engaged in collective experimentation?[81] And in particular, even if collective experimentation holds the promise of an integration of science, society, and technology and thus of robust technological development, will this solve or aggravate the European paradox? Here, the report of the Science and Governance expert group offers a display of true daring. After rejecting the dubious rhetoric regarding a "competitive race for economic advantage," it changes gear entirely:

[77] Ibid.

[78] One criticism of the report notes: "The human being, the population and its life disappear as 'objects' of governance—and a world of participating citizens appears." Petra Gehring, "Biopolitik: Eine 'Regierungskunst'" (unpublished typescript, Technische Universität Darmstadt, 2007), 28.

[79] Felt, *Taking European Knowledge Society Seriously* (cit. n. 26), 71.

[80] Ibid., 67.

[81] The Science and Governance Expert Group refers to Dewey but not to Popper (ibid., 26). To be sure, various authors refer to the fears associated with modernization processes as a tenuous basis for European identity: Robert Picht, "Disturbed Identities: Social and Cultural Mutations in Contempory Europe," in Garcia, *European Identity* (cit. n. 17), 82–94; Ralph Grillo, "European Identity in a Transnational Era," in *The European Puzzle: The Political Structuring of Cultural Identities at a Time of Transition*, ed. Marion Demossier (New York, 2007), 79.

> The regime of collective experimentation faces challenges because such embedded innovation is laborious, typically loosely-coordinated and slow; as it should be, because users and other stakeholders have their own contexts and logics to consider. Inspired by the "slow food" movement, one can now proclaim a "slow innovation" program.[82]

It is here, at the latest, that science policy as a testing ground for European identity becomes a dangerous terrain. It would appear that Europe can endure this notion of collective experimentation only just as long as it can endure the European paradox: for the sake of economic competitiveness, the paradox needs to be overcome, and Europe must move from its position of producer of ideas to that of efficient industrial implementation. For purposes of identity formation, however, Europe might as well remain old-fashioned and slow, if that means that ideas, technologies, traditions, and cultural values are well integrated.

In respect to a particular European institution (the European Environment Agency), Claire Waterton and Brian Wynne have described how this tension plays out. They showed that it corresponds to "different notions of society and the European polity." Where ignorance and uncertainty are acknowledged, where the deliberation of technologies moves from downstream considerations of calculable and manageable risks to upstream negotiations of societal needs, and where integrative precautionary approaches displace expert rulings, "civil society is called upon to play a much larger role in articulating public values, supplementing the formal representative (and administrative) institutions of parliamentary democracy."[83]

> This more upstream focus was the preferred idiom of the EEA [of the CTEKS and Science and Governance reports], against Commission disapproval because it more directly identified and implied possible policy initiatives and needs. It also happened to be at this more upstream level that a non-universalistic, non-standardized and non-unified Europe became more visible.[84]

Since the tension described by Waterton and Wynne was deeply inscribed into the European Commission's own Sixth Framework Programme for research funding, there was no longer a question simply of Commission approval and disapproval. Pushing the boundaries meant simply to run up against certain limits of articulation. In the terms of FP6, the CTEKS report succeeded by Europeanizing NBIC convergence and by opening avenues for further research, allowing at the same time a liberal disregard of some of its suggestions. Although the CTEKS report and that of the Science and Governance expert group adopt very similar views on the European Knowledge Society, the latter articulates the European experiment with an all too painful clarity, forcing Europeans to acknowledge and embrace their manifold but rather weak ties to Europe, ties that also originate in uncertainty and ignorance regarding the outcome of the experiment that holds them together.

[82] Felt, *Taking European Knowledge Society Seriously* (cit. n. 26), 27.

[83] Claire Waterton and Brian Wynne, "Knowledge and Political Order in the European Environment Agency," in Jasanoff, *States of Knowledge* (cit. n. 68), 104, 100.

[84] Ibid., 97.