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Comment

Visioneering Assessment
On the Construction of Tunnel Visions for Technovisionary Research and Policy

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Visioneering is a type of engineering. Introduced and described by Patrick McCray, it involves a lot more than dreaming up a futuristic vision. Visioneers are a combination of "futurist, engineer, and promoter." Aside from developing a "broad and comprehensive vision of how the future might be radically changed by technology," they articulate designs for the future with considerable technical know-how and sometimes in astounding detail, and they build a coalition of supporters that provides "valuable and hard-won space in which other scientists and engineers could mobilize, explore, and push the limits of the possible" (McCray 2012: 10-14).

Visioneering thus mobilizes skills, expertise, and resources to forge something much stronger than a narrative thread that more or less plausibly leads from the present to the future. What visioneering aims for is to exhibit a compelling causal link between a state A (technological work-in-progress) and a state B (a future so desirable as to mandate its realization) such that A will actually lead to B while B necessitates A.[1] By tunneling from A to B, visioneering effects among other things "the marginalisation and mainstreaming of narratives" (Coenen and Simakova, in this issue). And though the visioneers in McCray's book are rare and eccentric individuals like Eric Drexler or Gerard O'Neill, visioneering can also be viewed as a widespread collective activity that is done by expert committee, that enters into policy advice, technology assessment, or so-called ELSA research, and that leads to constructions of socio-technical scenarios or roadmaps. As such, visioneering is not just a kind of engineering but a powerful technology that secures the space in which science, technology, and society probe limits and our prospects of overcoming them. This technology literally comes first in that it heralds technological change, prepares the ground for research and development, and announces the accom-

[1] In Aristotelian terms, visioneering establishes A as the effective cause of B and B as the final cause of A. It thereby first seeks to identify an actual causal chain of events leading from A to B, and then offers B as a teleological end that is productive of this causal pathway as its means.

plishment of a future that is radically changed by this research and development. In contrast to the technological feats that come in its wake, the work of visioneering is already done, it happens right in front of our eyes, ready to be scrutinized. Accordingly, it is this technology that has to be assessed first, that is, before one starts considering future technological changes that are precariously premised on it.

Though the three papers by Kathleen Vogel, Arie Rip and Jan-Peter Voß, and Armin Grunwald appear rather heterogeneous at first, what they have in common is the fact that they go beyond Grunwald and Grin's proposal to include vision assessment in the toolbox of technology assessment (Grunwald/Grin 2000). Without using the term, all three papers address visioneering, how it works and how it needs to become explicitly recognized as a subject for STS engagement, as a matter of governance, and as a technology that requires technology assessment.

Kathleen Vogel (in this issue) shows this most pointedly when she conceives of a necessary intervention in the visioneering practice that she finds to be at work in a Biosafety Engineering Group (BSEG). She first exposes the preconceptions that efficiently link A to B and that thereby function as a precondition for rationality. These appear to be simple enough, indeed, as Vogel points out, too simplistic: In order to judge whether there is a bioweapons threat, all we need to know is that certain people are hostile and that there is a technical capability which these might be able to acquire. If these conditions are satisfied, the capability serves as a causal avenue from the current state A to a future state B of the bioweapons threat, while the attitude of hostility renders B so desirable that it all but necessitates A. This visioneering construction solidifies a kind of tunnel vision, but even so, those who are committed to it are unlikely to question it: Why should we bring in further considerations to enrich this threat scenario while simultaneously rendering it implausible?

At first sight, Vogel's account of the construction of tunnel vision towards a "what can be done, will be done" threat-scenario appears limited by the special conditions of paranoia and secrecy that apply to her case. It applies equally, however, to many "what can be done, will be done" hope-scenarios: In order to judge whether there is any prospect of vastly improved diagnostic capabilities, all we need to know is that people want to know ever more about their physiological states and that there are new technical capabilities which can be incorporated into products for the wellness market. Again, the capabilities are said to lead to the products, whereas the desirability of improved diagnostics all but guarantees that this causal pathway will be taken.

Somewhat simple-minded yet amazingly robust visioneered constructions such as these inspire technovisionary research, and this includes social science research as much as it does engineering practices. But STS scholarship must not be content merely to identify this mechanism. Vogel proposes a form of engagement that seeks to contribute complementary expertise which renders visioneering more difficult, yet better informed. There are after all many cultural, strategic and technological factors that determine whether or not a country will actually develop or deploy bioweapons. And the desirability of new diagnostic tools is likely to be constrained by the availability of pertinent therapies or by data-security concerns. Moreover, such STS interventions are necessary not only when experts are blinded by somewhat paranoid preconceptions. They are equally necessary, for example, where tunnel visions are engineered that link technical capabilities to the needs of an ageing population. Often enough, these needs are narrowly construed in

terms of the presumed frailty, isolation and helplessness of older people. These constructions need to be complemented by geriatric, intergenerational, economic and philosophical perspectives that open up a set of wider considerations regarding the demands of a population of older, active and generally healthy people who want to be mobile in cities, who want to be helpful and productive, who want to be engaged in the arts and in politics and manage their lives.

The notion of the "ageing society" serves to legitimate technological research programs, but what programs it legitimates depends on how narrowly or widely the needs of the ageing society are conceived, and this in turn depends on the presumptions of those who put the "problem" of the ageing society on the public agenda. Such feedback loops figure centrally in Arie Rip and Jan-Peter Voß's discussion of "ageing research," "nanotechnology," and "sustainability science" as umbrella terms. These owe their designation as umbrella terms to the fact that they draw together and shelter a wide variety of actors who can gather, mobilize and become mobilized under such umbrellas (cf. Nordmann/ Schwarz 2010). This is not, however, what the authors mostly emphasize about these terms. Instead they consider them as terms that can be stretched to bridge the distance between A and B. And yet, though they refer to "umbrella terms" as a governance technology, they do so without showing how this technology has been engineered and without showing that the terms function as a governance technology because they effectively achieve a bridge between technological trajectories and desirable futures. In other words, Rip and Voß only hint at the ways in which their stretchable or pliable bridging terms are important elements in the tool set of visioneering (cf. Pörksen 2011; Wullweber 2008, 2010). If they were more explicit in this regard and considered the governance technology as a product of engineering, some of their observations and remarks would appear less puzzling and their account more compelling.

For example, their discussion of nanotechnology as a "grand challenge" for research is puzzling. At first sight, this appears to be a curious conflation – wouldn't it be more appropriate to conceive of nanotechnology not as a challenge but as the means to the end of meeting challenges that are defined as socially and perhaps globally relevant problems? And indeed, this is how research councils initially present the case for nanotechnology. Only as an effect of successful visioneering does it make sense to view nanotechnology itself as a grand challenge: Nano now designates the state A (technological work in progress: a technology push) as well as the state B (a society transformed by nanotechnology that constitutes a demand pull). Nanotechnology presents a grand challenge only when we see in it a promise so powerful and attractive that it demands to be realized, no matter what. This circular construction is a visioneering feat par excellence as "nanotechnology" now allows us to traverse back and forth across the bridge between the present and the future, between means and ends, between A and B. It is a significant feat in that it serves to institute innovation as an end in itself that can be justified without mentioning any particular societal problem or specific need.

Another puzzling claim figures centrally in their account, and again Rip and Voß take it for granted rather than exposing or explaining its strangeness. "Sustainability science" is offered as another umbrella term but one that has not been instituted as effectively as nanotechnology, even though sustainability science would appear to be required to pursue responsible research and development in the current day and age. Rip and Voß suggest that the struggles for the establishment of sustainability science are due to the exist-

ence of an alternative that goes by the name of earth systems science. But though there is some overlap between the two fields, it is a bit of a stretch to consider them rivals, if only because one seeks to describe the earth as a system whereas the other seeks to identify practices of managing the environment, locally and globally. Moreover, the need for a distinct sustainability science is not at all obvious when research and development becomes geared towards sustainability as a guiding principle for all fields of inquiry. In light of the general commitment to sustainability, it requires a special visioneering effort to establish sustainability science, that is, to establish the difference between innovation as a necessary means for the achievement of the most desirable end of sustainability (Brundlandt 1987), and the specific fortunes of an interdisciplinary research agenda dedicated to sustainability (Scholz 2011). Accordingly it is only against the backdrop of visioneering that Rip and Voß can identify the same process that is at work in rather dissimilar cases:

> "[N]anotechnology offers open-ended promises about what it might enable us to do, while sustainability science and global change research and earth system science reason back from global challenges to what scientific research should contribute. While the histories are different, the process is the same, with the two cases being at different phases: there are struggles linked to potential umbrella terms, a dominant term emerges and becomes established, at least for some time, as a conduit which allows protection of ongoing research as well orientation towards relevance to societal problems and challenges.
> [...] Thus there are two ways in which umbrella terms are a governance technology: they constitute an arena for struggles about definitions, access / exclusion and resources; and their eventual black-boxed use has effects precisely because the detailed struggles that went into them are eclipsed." (Rip/Voß, in this issue)

In their editorial, Christopher Coenen and Elena Simakova worry about the success of visioneering, be it the success of the intelligence community in defining security threats or the success of nanotechnology promoters in establishing technoscientific innovation as an end in itself for sustainable development. Is there any room left for "thinking in alternatives," they ask, or do we need to surrender "the ideal of a democratic shaping of science and technology" in light of "the proclaimed inevitability of the nano, transhumanist and similar futures"? "Fighting fire with fire," they suggest, might allow us to defend the democratic ideal and to open up spaces for imagining alternative trajectories of technological development. Kathleen Vogel proposed fighting fire with fire when she suggested that STS scholars engage the intelligence community in their visioneering efforts. More explicitly, Armin Grunwald (in this issue) opens a new chapter for technology assessment.

Though it may appear to be a subtle shift at first sight, one should not underestimate its significance: There is a kind of technology assessment that focuses not primarily on expected outcomes, consequences, side-effects or implications of an emerging technology but on its attendant visions. Here, the visions are seen as a given entailed by the funding programs and proposals for technological research. So-called vision assessment considers the peculiar qualities of these visions, questioning their plausibility, for example, or their implicit conceptions of the good life. A strong advocate of vision assessment himself, Grunwald moves on from there when, in effect, he calls for visioneering assessment. Now, he is no longer looking at visions as representations of an emerging technology but is shifting attention from the emerging technology to quite another technology, namely to the institution of the causal relations between A (technological work currently-in-progress) and B (a desirable future that will be produced by this techno-

logical development).[2] Visioneering assessment looks at the engineering process that has produced a compelling vision of a technological future.[3] It thereby not only determines whether we really have to take this compelling vision seriously, but also opens the black box of umbrella terms by exposing our struggles over visions of the future.

In particular, Grunwald suggests that the creation of technovisionary futures needs to be rendered transparent by employing an empirically grounded methodology that serves to counteract the apparent displacement of politics and the apparent absence of alternatives that require public deliberation. In particular, he recommends a research program dedicated to the biographies of techno-visionary futures, to their deconstruction and hermeneutic reconstruction. This research will result in an understanding of the elements that make up the various visioneering constructs – elements that range from appeals to history to normative conceptions of human-machine relations; from technological achievements as proofs of concept to ideas of what might, can, or should be possible in the near and distant future; from a diagnosis of unsolved problems in the present to anticipations of their technological solutions.

Missing from this list and only implied by Grunwald's proposal is research dedicated to past debates about techno-visionary futures. Often enough, the biography of a visioneering feat will reveal that it addresses familiar themes and dreams. Nanomedical visions hark back to those of "rational drug design," for example, and contemporary visions of synthetic biology, the hydrogen economy, or human enhancement can be traced back even further, sometimes to their premodern fairytale origins. This is of interest in its own right since it challenges contemporary visioneers to detail why they believe that the realization of a perennial dream is finally becoming a real possibility just now. While this qualifies as well as sharpens the techno-visionary futures under consideration, it does not yet open the space for "thinking in alternatives." This can be done however, when one steps away even further from the particular visioneering construction by considering not just its genealogy but also the reception of its previous incarnations. It is those who in the past rejected certain techno-visionary ideas who are most likely to point us to alternative conceptions of technological and human development. Instead of considering nanomedicine, for example, as yet another claim of transformative novelty, one might consider it as yet another chapter in the ongoing history of medical research strictly according to the natural science mode. This history has been accompanied throughout by alternative conceptions regarding the origins and treatments of disease, regarding medicine as an art, regarding limits of reductionism, regarding the nexus of biography and physiology, regarding public health and personalized medicine (Kohl/Nordmann 2010). These past debates are a resource not so much for the visioneers themselves but for democratic deliberation that cannot proceed freely

[2] What I am informally employing here is a definition of technology according to which it consists in the institution of causal relations or of ways of making things work together. According to this definition, a visioneering construction of policy expectations, coalitions of actors and funding schemes is a "technology" (that institutes effective and final causes as described in footnote 1) just as much as the physical institution of causal relations in a mechanical device.

[3] For a related proposal see von Schomberg et al. (2005) on foresight knowledge assessment. Since the quality of foresight knowledge cannot be determined by checking against the facts but only by considering its pedigree, what needs to be assessed is the process that produced this knowledge, including the people and the information that went into this process.

under visioneering assumptions of technological inevitability.[4]

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[4] And thus, even a novel like *Lady Chatterley's Lover* can contribute to debates about human enhancement and human flourishing, about nature and artifice, and the non-technical construction of a "new woman" (Nordmann 2010).