„Die Zeit ist reif.“, so schließt Sclove im Stile eines Manifests, reif für eine moderne experten- und partizipationsorientierte nationale TA-Kapazität und ihre Integration in die Zivilgesellschaft. Warum, das hat der Verfasser umfänglich und substanziell begründet. Uns bleibt, seinem Projekt Erfolg zu wünschen.

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Analysing the Janus Face of Nanotechnology

Two Recent Contributions from Germany

***J. Schummer*: Nanotechnologie. Spiele mit Grenzen. Frankfurt a. M.: Suhrkamp (edition unseld 23), 2009, 172 pp., ISBN 978-3-518-26023-4, € 10.00**

***J. Wullweber*: Hegemonie, Diskurs und Politische Ökonomie. Das Nanotechnologie-Projekt. Baden-Baden: Nomos, 2010, 357 pp., ISBN 978-3-8329-5180-1, € 34.00**

Omnibus review by Christopher Coenen, ITAS, and Camilo Fautz, University of Würzburg

1 The Janus Face of Nanotechnology and the Role of Accompanying Research

Nanotechnology has always shown a Janus face, even before it became established as a major area of publicly-funded research. One face represents a growing cluster of research fields whose initial rise was based, amongst other things, on technological advances achieved in the field of scanning probe microscopy in the 1980s and on various trends towards miniaturisation. Acknowledging the diversity of the research fields that in the late 1990s and early 2000s were politically grouped together under the label “nanotechnology”, many people now prefer to use terms such as “nanosciences and nanotechnologies” rather than “nanotechnology”. Its other face played its part in creating this variegated character of nanotechnology. This face, which has largely been shaped by Eric Drexler’s nanofuturism, has science-fiction-sque traits and reflects decades of far-reaching future visions of extreme progress which imagine, amongst other things, techno-scientific cornucopias, the transformation of humankind, and the expansion of a posthuman terrestrial civilisation into outer space. As “nanotechnology” has become established in systems of science and innovation around the world, the more “sober” face has in recent years become the public face of nanotechnology. In certain circles, however, its fantastical visage still exists and remains the most prominent face of nanotechnology, promising everything from a giant leap forward for terrestrial civilisation to human immortality on Earth.

The rise of nanotechnology to a politically acknowledged new key field of science and technology has also ushered in a new phase of “accompanying research”. As an umbrella term, this can designate all manner of scholarly research into new and emerging techno-scientific developments in such (partly overlapping) fields as science and technology studies, technology assessment, innovation research, and studies on environmental, health and safety issues or on ethical, legal and societal aspects of a given emerging field of science and technology. This new phase of accompanying research is characterized, amongst other things, by a dramatic increase in the funding of such research. It also tends to serve as a form of ‘preparatory research’ at a very early stage in a new field’s emergence, helping to pave the way for its governance and for public discourse on it. Such research has perpetuated the Janus face of nanotechnology and continues to do so: on the one hand, it appears to have contributed significantly to what has been termed a “normalisation” of the field, engaging in “boundary

work" and seeking to separate fact from fiction (with regard to both, hopes and risks) while at the same time disentangling genuinely relevant techno-scientific practices from the founding myths and future visions that surrounded them during nanotechnology's rise to prominence. In the course of this normalisation, large parts of the futuristic elements of discourse on nanotechnology migrated to other discourses such as the one on "converging technologies". On the other hand, accompanying research has also played a part in stabilising the futuristic, iridescent face of nanotechnology, for example by conducting far-reaching "nano-ethical" analyses of such things as a posthuman future.

At first glance, this latter aspect of the role played by accompanying research would appear to be due only to the relatively large flow of money into social science and humanist research into a field which claims to include elements at least of many important branches of modern science and technology – and thus allows social scientists and humanist scholars to pursue an overarching discussion of these branches or, alternatively, to focus on specific details of any of these branches, provided that such details can be deemed "nano" in some way.

There are at least two reasons, however, why the futuristic face of the field still deserves our attention: on the one hand, nanotechnology has not yet been separated from its visionary past. Even today, the field continues to be haunted by the spectres of nanotechnology's cultural past, especially – though not exclusively – in discourse on 'converging technologies' and human enhancement. When it comes to the distant future prospects of nanotechnology, the old visions even persist among political and scientific adherents of the field's "sober" face. On the other hand, the history of nanotechnology appears to serve as a "didactic play" for scholars analysing emerging technosciences whose lessons are not yet fully understood. Despite the publication of important contributions to the discourse which address both faces of nanotechnology, there is still a need for further analyses which bridge the gap between the "real nano" and the related techno-imaginaries by skirting the entire field and looking at both of its faces. In the following, we would like to draw attention to two recent books on the topic in German, namely Joachim Schummer's "Nanotechnology: Playing with Boundaries" and Joscha Wullweber's "Hegemony, Discourse and Political Economy. The Nanotechnology Project".

2 Boundaries, Empty Signifier and Successful Large-Scale Project

Schummer is well-known in discourse on philosophical and societal aspects of nanotechnology, having taken part in it since the early 2000s. Among his major contributions are his critical analyses of certain claims concerning the novelty and interdisciplinary nature of nanotechnology. He was also among those who early on criticised the influence exerted by transhumanists on nanotechnology discourse.

In his book, Schummer analyses the surprising success of nanotechnology from various perspectives, arguing that the unusual character of nanotechnology also necessitates an unconventional and pluralistic approach to its analysis. In his view, nanotechnology is best defined not as a single technology field or bunch of technologies, but rather as an idea of or about technology: he sees nanotechnology as a large-scale attempt to rearrange the fundamental distinctions and boundaries that define the place of science in society. The fact that nanotechnology plays with such boundaries makes it a new phenomenon at the interface between science and society. In order to pinpoint nanotechnology's character as an idea about science which draws on non-scientific sources, Schummer discusses some of the science-fictional and highly visionary roots of the field, drawing attention, for example, to the birth of Drexlerian nanofuturism within an American cultural milieu of space colonisa-

tion advocates, early transhumanists and other believers in transcendence of core elements of the human condition. In Schummer's view, certain elements of American religiosity are part and parcel of the mindset of these visionaries. Continuing some of his older work, he also describes how a "visionary alliance", forged mainly by actors in science policy, the military, the business world and various transhumanist subcultures, influenced the rise of nanotechnology, allowing it to become a publicly-funded and politically-praised new key field of science and technology.

In his philosophical analysis, Schummer investigates how nanotechnology plays with boundaries from an epistemological, metaphysical, ethical and aesthetical viewpoint, once again including social-scientific aspects in his analysis. He criticises that science and technology in nanotechnology discourse are metaphysically and normatively framed on the basis of a teleological worldview and that epistemological and aesthetic values are amalgamated in suggestive images. Furthermore, Schummer argues that the rise of nanotechnology brought about a renaissance of both technoscientific and social determinism; together with other factors, this meant that ethics was no longer a valid point of criticism in discourse on emerging sciences and technologies. In his view, significant parts of ethical accompanying research either affirm the 'nano hype' or contribute to the spread of fantastic nano-dystopias, avoiding any realistic critical analysis of the field and its related discourse.

Schummer believes that the futuristic cladding of nanotechnology disguises a huge restorative movement which veers towards a pre-modern concept of science and destroys core elements of the modern rational worldview. He concedes that the restorative movement can provide orientation in the short term by proclaiming simplistic, albeit often unrealistic, goals for science and technology and that it can generate interest in science and technology through aesthetic edification and utopian or dystopian visions. Soon, however, this would lead to disillusion, the restorative movement bringing about the opposite of what it intends, this time with regard to public acceptance of science and technology. In his view, three main tendencies have contributed to a broader retreat from reason, of which the rise of nanotechnology is but one example: postmodern social theory and science studies; the overemphasis placed on the market model and the majority rule principle in politics and society; and the self-inflicted societal irrelevance of the humanities, which often appear to prefer their ivory towers to any genuine intellectual and political engagement with the sort of new and emerging technoscientific developments which, ironically, are increasingly the subject of discussion in the context of core humanist issues.

In Schummer's view, the lack of reason manifest in the rise of nanotechnology is another symptom of the weak societal position of the social sciences and humanities, which were unwilling or unable to analyse and effectively communicate what is at stake in nanotechnology's playing with boundaries. He does see some recent tendencies in the opposite direction, however: an upsurge in critical analyses intelligible to all, strong interdisciplinary cooperation on science, technology and society issues (in which philosophers can play the role of mediators), and the increasing inclusion of social scientists and humanist scholars in science and engineering curricula.

The most outstanding feature of Schummer's book – its sweeping yet detailed analysis – is both its major strength and its major weakness. His essay puts forward strong opinions and his analysis is highly interdisciplinary, covering issues in such diverse fields as history of science, social theory, cultural studies, political science and even religious studies. It is no wonder then that he sometimes defends far-reaching claims in too cursory a manner – even for an essay – and that some of his views are questionable or too narrow. To give but one example: while it is true that nanofuturism, including the dream of a posthumanist civilisation expanding into outer space, is deeply indebted to visions

popularised in science fiction, these very same visions can be traced back to essays by leading natural scientists and science popularisers such as John Desmond Bernal, published in the UK in the early decades of the twentieth century. It is thus problematic to characterise the current techno-futurism revolving around nanotechnology – as Schummer does – as an outflow of extra-scientific literary imagination and a secularised manifestation of American millenarian religiosity.

Schummer's book can profitably be read alongside Joscha Wullweber's book about the "nanotechnology project". The former writes that both Wullweber's and his own approach analyse nanotechnology not as a technology, but as an idea about technology. This neatly sums up what both publications have in common. There are major differences, however, some of which can be explained by the fact that Schummer's work takes the form of an essay, while Wullweber's book is a PhD thesis. His elaborate study includes a large theoretical section in which he develops a poststructuralist theory of hegemonic discourse on the basis of works by Antonio Gramsci, Ernesto Laclau and Chantal Mouffe. Operationalising this theory in an analysis of discourse on nanotechnology, Wullweber emphasises the social, political and economic impacts of this discourse: in his view, it becomes a medium of struggles for social hegemony. In this context, policy – notably in democracies – must be understood as a fight over hegemonic stabilisation and the institutionalisation of social order.

In the empirical section of his book, in which he presents the results of his desktop and interview-based research, Wullweber describes in great detail how a wide variety of relevant societal actors have intentionally joined or been involved in the hegemonic project of nanotechnology. He emphasises that Drexler has played the key role in creating the basis for this hegemonic project. Wullweber refutes the founding myths of nanotechnology, which trace the field back to a visionary speech by Richard Feynman in the late 1950s, arguing that it was Drexler who shaped a specific notion of nanotechnology which was still prevalent at the end of the 1990s. At the heart of the empirical section of the book, however, is his detailed and convincing analysis of nanotechnology's rise from the second half on the 1990s on. From his discourse-theoretical perspective, nanotechnology is not a definite technology but rather a notion that has been used as an "empty signifier". In his narrative, the surprising global career of nanotechnology takes off when U.S. science policy actors turn Drexler's particular signifier 'nanotechnology' into an empty one. He argues that this empty signifier provided the basis for a comprehensive socio-economic and political project that is held together only by the signifier itself. According to him, nanotechnology is mainly presented in hegemonic discourse as a technology that creates wealth and leads to resource-saving methods of production and a sustainable society. By successfully tying "nanotechnology" to such widely-shared goals, the notion of nanotechnology now subsumes extremely different technical developments under a constructed collective identity.

Emphasising the relevance of the political and socio-economic context, Wullweber argues that the rise of nanotechnology was not determined by techno-scientific developments, but rather by a political process and a large-scale "innovation project". Promising to resolve global problems such as unsustainable production and consumption patterns, the nanotechnology project is linked to hopes of a new industrial revolution and competitive advantages. At the same time, he warns against viewing the nanotechnology project as consistent and politically-steered: the surprising "jump" of governments all over the world "on the nano-train" and the rise of nanotechnology as a whole was only possible because the innovation project was previously tied to an empty signifier and positioned vis-à-vis Drexlerian purism and futurism. Based also on an analysis of activities of groups critical to, and of crises of the nanotechnology project, he argues that discourse on nanotechnology is currently structured in

such an efficient hegemonic manner that there are hardly any groups that are fundamentally hostile towards nanotechnology. The strategies underlying the project have proven to be both flexible and robust enough to establish nanotechnology worldwide as the first techno-political project in which a set of new governance tools has been tested on a large scale. In this sense, he also sees nanotechnology as a "trial balloon" for other major technology projects in the future.

3 Concluding Remarks

Both authors essentially view nanotechnology as an idea about technology; an idea that has visionary roots and was subsequently turned into a political project by a broad alliance of societal actors. While Schummer highlights continuities between the early history of 'nanotechnology' and its rise to political prominence, however, Wullweber emphasises the characteristics of the political project. In general, Schummer tends towards a more actor-centred and micro perspective, while Wullweber favours a more structural one; nonetheless, both books are similar in the way they combine a broad approach with very detailed analyses. Both authors regard nanotechnology as a very successful project so far, but both also think that it is highly probable or even inevitable that it will soon lose its stability. As regards visions, Wullweber sees nanotechnology as the final punch line in technological evolution, since it promises to be able to create anything imaginable. The nanotechnological imaginary thus announces the dawn of an all-encompassing universality that makes it possible to play with boundaries, as analysed by Schummer. Another common feature of both books is that they tend to downplay the relevance of techno-scientific practices to the rise of the field; while Schummer sometimes exaggerates the relevance of shortcomings of the humanities to discourse on nanotechnology and overemphasises cultural factors, Wullweber does the same with political aspects.

On the other hand, Schummer's essay and Wullweber's thesis are impressive testimony, each in their own way, that analyses and assessments of future visions can be core elements of theoretically and empirically fruitful research into emerging technologies. Both authors have successfully tackled the difficult task of describing and analysing the Janus face of nanotechnology in one monograph. Their thought-provoking and well-researched books deserve to be widely read and can be highly recommended to anyone interested in the current dynamics of emerging technologies in general and in discourse on nanotechnology in particular.

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