

Dissolution of the Nature-Technology Dichotomy? Perspectives from an Everyday Understanding of Nature on Nanotechnology

Gregor SCHIEMANN

Department of Philosophy, University of Tübingen
gregor.schiemann@uni-tuebingen.de

Abstract: The topic of this contribution is the tension between the everyday dichotomy of nature and technology and the nanotechnological understanding of the world. It is essential to nanotechnology that nature and technology not be categorically opposed as the man-made and the non-man-made, but rather regarded as parts of a structurally identical whole. After the introduction, I will address three points: In a brief first section I will formulate a few questions and a thesis about the nanotechnological developments that can be expected to come. In the main section I will assess four aspects of everyday understanding of nature and technology that are used to legitimate nanotechnology. Finally I will discuss whether an everyday understanding of nature can be conceived as a critical authority with respect to the nanotechnology program.

Introduction

In everyday life, the dichotomy of nature and technology continues to play a significant role. That is to say, there is a clear distinction among the objects encountered in private life between, on the one hand, things that arise essentially of their own accord and undergo change irrespective of human intervention and, on the other hand, things produced by craftsmanship or by industry. Still, this traditional distinction has been rendered partially problematic by the increasing technological transformation of everyday life (cf. Schieman 1997, 2001, and 2005).

Everyday understanding of nature and technology takes as its point of reference the objects perceived with the senses. Plants and animals serve as exemplars of natural objects, while objects owing their form to human influence are exemplary technical objects. This distinction goes back to the ancient Greeks. Its paradigmatic formulation occurs in Aristotle's *Physics*, where Aristotle counts as natural whatever has "in itself a source of change and continuity" (Aristoteles 1987, chap. II.1, line 192b13-4). This criterion has remained applicable up until now because of a cross-cultural structural difference in the everyday modes of appearance of things that are produced and things that are not.

But the appeal to sense perception also sets a limit to the applicability of the everyday distinction between nature and technology. The distinction runs into trouble as soon as technological processes become partially concealed from the senses. It is already difficult to distinguish between a self-moving nature and technological processes driven by mechanisms like electric motors that are not immediately visible to the senses.

I would like to assume that there are multiple understandings of nature in everyday life. Nature could be identified with the material of which all objects consist, or with the

world untouched by culture. While the distinction between nature and technology is central to these understandings of nature in everyday life, in other areas of experience the distinction carries much less weight. I consider nanotechnology to be one of these areas. It is essential to nanotechnology that nature and technology not be categorically opposed as the man-made and the non-man-made, but rather regarded as parts of a structurally identical whole. Laws of nature hold within technology, and there are no laws in technology that are incompatible with the laws of nature. Natural phenomena are investigated through technological experiments and made fruitful for technology. But, above all, the nano-world lies beyond the reach of the senses and thus of everyday experience. Macroscopic characteristics produced by nanotechnology elude everyday classification unless some visible element betrays their origin. Nanotechnologically produced macroscopic self-movement would undermine or dissolve the everyday distinction between nature and technology.

The topic of my contribution is the tension between the everyday dichotomy of nature and technology and the nanotechnological understanding of the world.

I will address three separate points:

In a brief first section I will formulate a few questions and a thesis about the nanotechnological developments that can be expected to come.

In the main section I will assess four aspects of everyday understanding of nature and technology that are used to legitimate nanotechnology.

Finally I will discuss whether an everyday understanding of nature can be conceived as a critical authority with respect to the nanotechnology program.

1. Novel Relation with Nature?

I will begin with the developments that we can expect from nanotechnology. Since nanotechnology is application-oriented, one of its goals is the introduction of its products into everyday life. This is especially true of the planned applications for medical therapy. In other areas, envisioned nanotechnological developments – like improved or new material qualities – will find their way more or less directly into everyday life. We may expect, for example, nanotechnological means of building ultra-light vehicles or of increasing the capacity to store information electronically. Moreover, there are countless developments that will make innovations easier not in everyday life but in industrial production. Main points here include “bottom-up manufacturing” – which refers to changes in the means of production that do not affect the end product – and nanotechnological control of chemical reactions that are already applied today.

Will the planned nanotechnological artifacts, insofar as they are applied in everyday life, enter into some novel relation with nature, understood in the Aristotelian sense? Will they dissolve the dichotomy of nature and technology, thereby ushering in a new conception of nature? In response to these questions I would like to formulate a thesis that does justice to the fact that the everyday distinction is based on visible differences whereas nanotechnological objects do not appear to the senses. *The thesis is that the everyday criterion of natural self-movement will not necessarily be dissolved by applications of nanotechnology. Indeed, it could prove to be immune to them.*

This may well be valid for nanotechnological innovations that are limited to improving qualities of technological objects already applied in everyday life – for example, nanotechnological improvement of the media used to store information electronically. From the perspective of everyday life, the technological processes responsible for this improvement would be a matter of irrelevance. On the other hand, the traditional distinction would be dissolved if nature no longer appeared to the senses as that which is not produced by humans, if living objects no longer arose from natural growth, or if nature could no longer even be distinguished from nanotechnological artifacts.

2. Nanotechnology and the Public

With that I come to my second point: an assessment of the everyday content of arguments intended to legitimate nanotechnology. The example I will discuss is the brochure “Shaping the World Atom by Atom”, published under the direction of the US National Science and Technology Council (National Science and Technology Council 1999). The brochure seeks to justify state financing of nanotechnology to a broader public.

Since one of the goals of nanotechnology is the introduction of its products into everyday life, everyday life is also an important court of its legitimacy. Moreover, considerations of everyday life play a decisive role in the formation of public opinion. Since state funding of technology is largely dependant on public opinion, the presentation of nanotechnology is decisively framed in terms of an everyday understanding of nature and technology.

In the brochure “Shaping the World Atom by Atom” the nature/technology distinction is framed in this way, so that its extension overlaps with that of the respective everyday distinction. I mark this overlap as a *first point* of contact between the brochure and everyday life. Like our everyday understanding, the brochure conceives technology as the man-made and nature as the non-man-made. By virtue of its human origin, technology remains qualitatively distinct. The relationship between nature and technology finds its clearest expression in the image of nature being sensibly organized by human hands, as in the brochure’s representation of nanotechnologically produced letters. In the first picture of this representation one sees disorganized atoms, which are then technologically manipulated step by step until they come to form the IBM logo.

The point of the brochure, however, is not its similarity to everyday understanding, but its difference. It tries to shock the reader by contradicting what one takes for granted and weakening the dichotomy of nature and technology.

Thus nature itself is presented as engineering. It is suggested that nanotechnology is not uniquely human, but in fact occurs also in nature. This changed concept of technology fits in the context of a technologized understanding of nature. Although they are not produced by humans, the natural nano-processes discussed in the brochure resemble human technology and serve human purposes. According to the brochure, nature’s untouched forms and visible outgrowths conceal a universal atomic principle of construction. At the beginning of the brochure, we are told what would remain of a person broken down into his or her chemical components. We learn that nature builds from this worthless lump of material a living being that can even think and dream. So the human being appears to be composed mechanically out of simple parts. Complex phenomena that cannot be derived from the properties of their components remain unexplained, processes between system and environment remain unmentioned.

With these questionable simplifications, the brochure conceives nature only insofar as it is useful for humans and their technology. Seen from this perspective, nature assumes the character of a machine: Rotation in organic cells is compared to the rotation of a fan; the description of photosynthesis is intended to remind the reader of a device for producing domestic solar energy.

I’m not going to assess the appropriateness of such analogies. I merely want to demonstrate that they form a *second point* of contact with the everyday understanding of nature and technology. They apply elements of the everyday understanding of technology to natural processes that are inaccessible to sense perception. It’s worth mentioning that Aristotle made use of a similar analogy to explain the invisible processes involved in procreation. He compared procreation to the work of a carpenter. According to Aristotle, just as in procreation the passive material provided by the woman is shaped by the active form from the man,

in carpentry the passive wood is shaped by the active creative force of the carpenter (Aristoteles 1860, chap. I 21, line 729b14 et seq.).

But the modern form of this analogy is different from the ancient form in that it devalues everyday life. From the perspective of everyday life, objects perceived with the senses constitute a privileged human world. But by assuming a homogeneous structure of the real world and the universality of natural laws, nanotechnology contests the privileged status of this middle dimension of everyday life.

This devaluation of a particular area of experience goes hand in hand with elevating the human. On this view, nature should be rebuilt from the ground up, atom by atom, only to fulfill human needs. The brochure names no natural phenomena that have a value independent of human interests.

Support for the notion that only a completely artificial world is truly human can also be drawn from everyday understanding. Non-human phenomena have gradually lost their significance in the everyday life of cities since ancient times. Plants and animals have taken on the dispensable function of decoration. Technology is regarded positively in the modern everyday life that it created. This constitutes *a third point* of contact between efforts to justify nanotechnology and everyday understanding of nature and technology.

Finally, an assumption made in the presentation of the National Science and Technology Council is that the further development of nanotechnology will realize the present plans of a future world that will be a better one. The influences that nanotechnological innovation can have on the human mind are not taken into consideration here. This idea, too, echoes certain everyday notions. Everyday understanding conceives the human mind as an autonomous agent that uses technology to achieve the goals it sets for itself.

In summary, there are *four aspects* of everyday understanding that are invoked to legitimate nanotechnology:

First: The conceptual uniformity between the nature/technology distinction made in the brochure and the corresponding everyday distinction, *i.e.* technology as the man-made and nature as the non-man-made.

Second: The analogy between everyday technological devices and natural processes at the nano-level.

Third: The positive attitude towards technological innovations of the World.

Forth: The independence of mind from technology.

Surprisingly, nanotechnology can be thus legitimated on the basis of an everyday understanding of technology without denying its conceptually distinct understanding of technology. To repeat, nanotechnology assumes no categorical opposition of nature and technology. Nanotechnology has no problem conceiving nature on the model of technology. There is a long tradition which is in line with the report's choice to take everyday technological devices as models. The seamless comparison of processes at different orders of magnitude demonstrates that nanotechnology – in contrast to everyday understanding – does not favor one dimension over the others.

3. Leaving no Stone Unturned?

It seems that proponents of nanotechnology utilize everyday notions of technology in their efforts to legitimate nanotechnology. If this is correct, then the question arises whether an everyday understanding of nature can nevertheless be conceived as a critical authority with respect to the nanotechnology program. With this question I come to the third aspect of my discussion of the relationship between everyday life and nanotechnology.

The nanotechnology program is predicated on instrumental reasoning that banks on technology as a solution to problems. But it is doubtful that the solution of everyday problems – especially those arising in developing countries – requires technological innovation.

It is true that developing countries are in need of technological improvements, but what they need even more is fair participation in the technology we already have.

Nanotechnology is supposed to re-shape the world in a fundamental way. To quote from the report “Shaping the World Atom by Atom”, “Nanotechnology advocates say their field will leave no stone unturned.” But this goal is a long way off. To stick with this image, nanotechnology has managed to turn just a few stones so far. In terms of everyday life, turning a few stones is not comparable to building a house, not to mention the emergence of complex organic creatures.

Unlike technology, everyday life assumes – rightly, I think – that organic creatures have their own dynamics. Whereas organisms have a right to life that cannot be violated without justification, everyday technological devices – like computers, television, sources of light – can be turned off at will. In everyday life we concede to technological processes only dynamics – uncontrollable by everyday means and hidden from the lay observer – that can be ended or reversed at any time.

But the same is true of everyday attitudes towards natural processes. It is expected that there should always be protection from the elements and certainly from natural disasters. Illnesses should not occur at all, we feel; and when they do, they should be immediately eliminated. This stance towards nature calls into question the critical competence of everyday understanding with respect to technology.

Itself essentially an artificial world, everyday life may express only qualified doubt about the supposed need to improve nature. As a local world it does not offer a sufficient foundation alone to pass judgment on nanotechnology’s claim to universality and the human responsibility stemming from it.

References

- Aristoteles: 1860, *Fünf Bücher von der Zeugung und Entwicklung der Thiere* (de gen. an), üb. und erl. von H. Aubert und F. Wimmer, Leipzig.
- Aristoteles: 1987, *Physik* (Phys.) (griechisch-deutsch), üb. H.G. Zekl, Hamburg: Meiner.
- National Science and Technology Council: 1999, *Nanotechnology: Shaping the World Atom by Atom*, Washington (online: wtec.org/loyola/lbrarian.htm).
- Schiemann, G.: 1997, ‘Natur auf dem Rückzug. Zur Relevanz der aristotelischen Unterscheidung von Natur und Technik’, in: M. Hauskeller, C. Rehmann-Sutter & G. Schiemann (eds.), *Naturerkenntnis und Natursein*, Frankfurt a.M.: Suhrkamp, pp. 145-160.
- Schiemann, G.: 2001, ‘Common Sense und wissenschaftlicher Naturbegriff’, in: Heike Franz *et al.* (eds.): *Wissensgesellschaft: Transformationen im Verhältnis von Wissenschaft und Alltag*, IWT-Papers 25, Bielefeld (<http://archiv.ub.uni-bielefeld.de/wissensgesellschaft>).
- Schiemann, G.: 2005, *Natur, Technik, Geist. Kontexte der Natur nach Aristoteles und Descartes in lebensweltlicher und subjektiver Erfahrung*, Berlin/New York: de Gruyter (forthcoming).

Discovering the Nanoscale

Edited by

Davis Baird

Department of Philosophy, University of South Carolina, USA

Alfred Nordmann

Department of Philosophy, Technical University of Darmstadt, Germany

and

Joachim Schummer

Department of Philosophy, Technical University of Darmstadt, Germany

and

Department of Philosophy, University of South Carolina, USA

IOS
Press

Amsterdam • Berlin • Oxford • Tokyo • Washington, DC

© 2004, The authors mentioned in the table of contents

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without prior written permission from the publisher.

ISBN 1 58603 467 7

Library of Congress Control Number: 2004115609

Publisher

IOS Press

Nieuwe Hemweg 6B

1013 BG Amsterdam

The Netherlands

fax: +31 20 620 3419

e-mail: order@iospress.nl

Distributor in the UK and Ireland

IOS Press/Lavis Marketing

73 Lime Walk

Headington

Oxford OX3 7AD

England

fax: +44 1865 750079

Distributor in the USA and Canada

IOS Press, Inc.

4502 Rachael Manor Drive

Fairfax, VA 22032

USA

fax: +1 703 323 3668

e-mail: iosbooks@iospress.com

LEGAL NOTICE

The publisher is not responsible for the use which might be made of the following information.

PRINTED IN THE NETHERLANDS