Ethics in Action

In reaction to a perceived decline of public trust in science, the Dutch Association of Universities have established a Code of Conduct for Scientific Practice. But the core of the public trust-issue lies deeper than holding scientific practitioners to a proper exercise of their duties. It is the very conception of those duties that is at stake. In a world that is pervaded by science and technology, public trust may well depend on a more open, reflective attitude to the value-commitments in technological innovations. Ethics needs to come to life within scientific practice, not after it. This requires a concerted effort from natural and social scientists alike: the time for armchair philosophers and cog-in-the machine scientists is over, Daan Schuurbiers argues.

D. Schuurbiers
Working Group on Biotechnology and Society
Delft University of Technology
Julianalaan 67, NL-2628 BC Delft
t: +31 15 278 6514
f: +31 15 278 2355
e: d.schuurbiers@tudelft.nl

Introduction - The impact of science and technology on everyday life

Life as we know it is pervaded by science and technology. Look around you: see the phone on your desk, the keyboard and computer screen and the electrical plugs they draw their power from? They are all witness to the ongoing technological revolution that is transforming our society. Technical devices shape our everyday experience in substantial ways. They make our lives easier. More effective. More enjoyable. They connect us to digital, communicative, energy and mobility networks in such fundamental ways, that it would be hard to imagine what life would be like without them. Ever experienced the chaos that ensues when email-traffic in the office fails for a couple of hours? Some colleagues panic. Others take the day off, because they wouldn't know what else to do with their time. When our digital connections break down, so does modern-day office life. Just imagine what would happen if your local hospital had to do without electricity for a day, or how the stock exchange would look if its digital infrastructure broke down. Technology is *ubiquitous.*[1]

Apart from making our lives more enjoyable, the omnipresence of science and technology is also making life more complicated. New developments often pose complex moral dilemmas. Medical technologies such as genetic testing for instance, force us to answer questions on the nature of disease, fair use of genetic data, confidentiality and the right not to know our chances of contracting a disease in the future. Only recently, the debate on embryo selection dominated the headlines of Dutch newspapers for weeks. The emergence of sophisticated monitoring technologies such as Radio Frequency Identification (RFID) challenges consumer privacy and security. Technological innovations can also have unintended negative consequences: products that were originally introduced as miracle materials like plastics, asbestos and DDT turned out to have drastic ecological effects. The power of technology can even be used with the intent to wreak havoc, as the atomic bomb, chemical warfare agents and, more recently, cluster bombs so painfully make clear. Technology can be used for better - or for worse.

This pervasiveness of science and technology has led to a certain ambivalence: we embrace technological innovations, but also feel uncomfortable by the way they engulf our daily lives. In fact, society seems to be increasingly concerned with new technological developments. From nuclear power to genetically modified crops, biofuels, mobile phone masts, stem cell research and cloning, the list of public controversies over new technological developments continues to grow. There has been resistance against technological innovations in the past as well: Edward Jenner's smallpox vaccinations were greeted with much scepticism in the 19th century, and the Luddites rebelled against the mechanisation of textile production brought on by the Industrial Revolution. But what makes matters more complicated in our time is that technology is no longer something which we can choose to embrace or stay away from. Never before has it played such a key role in everything we do. We live in a technological society. This is why concerns over technologies are all the more urgent, taking central stage in public and political debates. The question of what is technologically feasible is more and more intimately connected to questions of ownership and control. Who decides what research should be done, and for what purposes? Who is calling the shots? Are those that develop new technologies socially accountable? There is considerable uncertainty about these questions. Public trust in governments, science and industry is on the decline.

A Code of Conduct? - The story of the moral

[1] W. E. Bijker & J. Law (1992). Shaping technology / building society: Studies in sociotechnical change. Boston: MIT. p. 11.

Paul van der Heijden, former Rector Magnificus of the University of Amsterdam, noted in a lecture held in 2004 that universities are not top of the list where public trust in organisations is concerned, which he considered: *"astonishing, if one assumes that universities should perform independent, impartial and as far as possible, objective research"*. [2] As a response, he suggested that universities should try to convince society at large of the worth of their efforts by making the principles of scientific conduct explicit in a generally accepted Code of Conduct for universities: *"such a Code of conduct belongs to this age and can help to obtain and / or maintain public trust."*

The Dutch Association of Universities (Vereniging van Universiteiten, VSNU) subsequently established the Netherlands Code of Conduct for Scientific Practice which came into force as from 1 January 2005. The Code is intended to lay down the principles of good scientific conduct for the individual scientific practitioner. It: *"contains principles that all scientific practitioners allied with a university … should observe individually, among each other and towards society"*. [3] The principles, 'general notions of good scientific practice', are: scrupulousness, reliability, verifiability, impartiality and independence. As originally suggested by Van der Heijden, these principles reflect Robert Merton's four commandments of science which became known as CUDOS (Communism, Universalism, Disinterestedness and Organised Scepticism).[4]

The following questions spring to mind: what view of good scientific practice is expressed by these principles? And importantly, does the Code address the issue of public trust? I will argue that the view of science embodied in the Code no longer applies to modern-day science or technology, and that it is precisely the differentiation of science as an objective activity from its ethical, social and political dimensions that is at the heart of the public trust issue.

What is addressed is not necessarily what is at stake

The principles in this Code of Conduct no doubt address a number of ethical issues in scientific practice. Increasing pressure to publish has led scientists to publish unverified or unreliable data, and in some cases they have even made up experiments entirely. Peer review processes can be notoriously 'subjective'. But instances of unscrupulous, unreliable and downright fraudulent behaviour are as old as science itself, and there is no historical evidence that links the occurrence of misconduct with an increase or decline in public trust.

Van der Heijden encouraged the establishment of a Code of conduct because: *"Making these principles explicit, continuous discussion, adjusting and making more precise, communicating its importance and abiding by them will contribute to the precious commodity of public trust in scientific practice in universities."* Trust in science might however depend on more than scientists following the rules of scientific practice; when we consider the kinds of concerns that the public raises about science and technology, it looks to be more about the nature of those practices, the goals they serve, and the value-commitments embodied in them. They are about the political and ethical considerations *within* science. And these are issues that the Code does not address.

Principles of 'good' scientific conduct

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[2] P. F. van der Heijden (2004). *Publiek vertrouwen*. Lecture for the 372nd Dies Natalis of the University of Amsterdam. p. 10 (translation DS)

[3] VSNU (2005). The Netherlands Code of Conduct for Scientific Practice - Principles of good scientific teaching and research.

[4] R. K. Merton (1942). *The Normative Structure of Science.* In: R.K. Merton, The Sociology of Science: Theoretical and Empirical Investigations. Chicago, IL: University of Chicago Press, 1973

There is an important point to note about the principles within the Code. They express the view that science is a neutral, objective activity that should not concern itself with politics or ethics. This view is firmly embedded in the history and culture of science. Ever since Robert Hooke's proposal for the Statutes of the English Royal Society in 1663 that scientists shall not be: *"meddling with Divinity, Metaphysics, Moralls, Politicks, Grammar, Rhetorick, or Logick"*, moral and social considerations have been suppressed in scientific discourse. The acquisition of knowledge of nature has become separated from its social dimension. Science is seen as the acquisition of objective, reliable data about the world, independent of one's personality, beliefs or convictions. This perspective on science has become the general moral imperative: it places ethics as something that happens *after* science, but which is utterly distinct from scientific practice itself. This is precisely what Robert Merton found when he studied the principles according to which scientists operated. Merton's CUDOS signified the ideal of detached, objective, value-free science. But where Robert Merton intended to *describe* the normative structure of science, the principles have now become explicit *prescriptions* within the Code.

By establishing this specific set of principles of good scientific conduct, the Code thus reinforces the idea that there *is* such a thing as pure scientific conduct, that science *can be* objective, impartial and independent. The general picture is this: first we do the science, which is value-free and objective, and only then, when the facts are out on the table, do we leave society to decide what to do with it. This has also become the general perspective on which technology is based: as an autonomous process, largely independent of its social context, as an efficient means to achieve value-free goals. As John Ziman writes: *"the norm rules that all research should be conducted, presented and discussed quite impersonally, as if produced by androids or angels"*.[5] As a consequence, moral and social considerations are not *supposed* to enter the equation.

The separation of science, as an 'objective' discipline, from politics, ethics and philosophy has undoubtedly facilitated a leap in scientific knowledge. But things are very different from what they were in 1663. Science has become a different ball-game altogether. First of all, equipment, staff and budgets of research institutes have all increased enormously in the 20th century, leading to an explosive growth in knowledge production. Most modern-day science has become 'Big Science', performing large-scale research programmes that require considerable investments. Second, science and technology have become increasingly application-oriented. Especially in such new disciplines as genetics, biotechnology and nanotechnology, the development of new knowledge is intimately connected to the application of that knowledge in new tools, materials, products and devices. Third, government funding has decreased in recent years, while private funding has increased, leading to a more important role for industry in setting research policies and a further focus on knowledge production in a context of application. This shift in practices goes by many names like Mode 2 science, post-normal science, or post-academic science.[6] But however we cut the cake, it is clear that things have changed drastically. The point here is that while scientific practices have altered, the moral imperatives that guide them *haven't*.

By reinforcing the image of science as an objective, independent and impartial activity, the Code in effect widens the gap between traditional moral imperatives and the realities of

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[5] J. Ziman (1998). *Why must Scientists become More Ethically Sensitive Than They Used to be?* Science 282(5395): 1813-1814.
[6] For a review, see: L. K. Hessels & H. van Lente (2008). *Re-thinking new knowledge production: A literature review and a research agenda*. Research Policy 37: 740-760.

modern-day scientific practice. But how independent can a researcher, who is largely dependent on private organisations for funding, actually be? Can we expect her to bite the hand that feeds her? And how to maintain impartiality if funding organisations will only fund proposals that are socially relevant? Perhaps we should not oblige scientific practitioners to follow a set of untenable set of principles; perhaps we should start reconsidering those principles themselves. In a world that is permeated by science and technology, the segregation of objective and subjective aspects of technological developments is most likely artificial and certainly inappropriate.

Beyond the Code - the moral of the story

Recalling the public concerns of ownership, control and accountability in scientific and technological knowledge production, a more radical approach may be required than holding scientific practitioners to a proper exercise of their duties. It is the very conflict of the principles with current scientific practices that is at stake. There is a large body of literature in social science that has dismantled the idea that scientific and technological practices are neutral or objective, from Kuhn and Latour to Bijker, Wynne and Rip.[7] These studies have shown that in designing technologies, scientists and engineers continuously base their decisions on social and moral as well as technical considerations. In doing so, choices are inevitably made as to what a good development for society is. But because the general principle still applies that science *should* be impartial and independent, these decisions are made implicitly; they recede into the background once final outcomes are produced.

The conclusion is that ethics is not something over and beyond science and technology: doing technology *is* doing ethics, albeit implicitly. Technologies may appear to us as impersonal, and neutral, and objective. But when we consider the history of their development, they turn out to be a result of choices based on a range of considerations. Technologies embody values. An alternative way of addressing the public trust issue could therefore be to render such decisions in technological design more explicit. It does make sense to openly question and reflect on social values at an early stage: in whose name is this technology being developed? What impact will this particular technology have on society? Will it lead to a reduction in the use of natural resources, or increase it? There may be questions of equity and justice involved: what effects will this new device have on the health, well-being and private life of individuals? Does it exclude certain user groups? Will it reduce global inequality, or increase it?

The challenge for research institutes therefore is to reflect on the value-commitments in the innovation process. But how to make those social considerations explicit in the way we do research? At what stages of the development process does it make sense to ask those questions? This is the challenge that lies before us. Researchers in the field of science and technology studies (STS) have recently started to move beyond the 'objective', distanced sociological lab studies that traditionally characterised the field. They have begun to engage with scientific practice, trying to identify relevant openings in the culture and practice of science, with some very interesting preliminary results.

[7] T. S. Kuhn (1962). The Structure of Scientific Revolutions. Chicago: University of Chicago Press.
B. Latour & S. Woolgar (1979). Laboratory Life: the Social Construction of Scientific Facts. Los Angeles, USA: Sage.
B. Wynne (1996). `May the Sheep Safely Graze? A Reflexive View of the Expert-Lay Knowledge Divide', in S. Lash, B. Szerszynski and B. Wynne (eds) Risk, Environment and Modernity: Towards a New Ecology, pp. 165-198. London: Sage.
A. Rip, J.T. Misa & J. W. Schot (eds.) (1995). Managing Technology in Society. The Approach of Constructive Technology Assessment. London: Pinter Publishers.

Interdisciplinary research

Erik Fisher, an STS-researcher from the Center for Nanotechnology in Society at Arizona State University, has recently developed the method of 'midstream modulation'. Fisher showed that specific interactions between nanotechnology researchers and an 'embedded humanist' can broaden the scope of considerations invoked in decision-making in the research laboratory and thereby induce changes in laboratory practices. This creates an opportunity: *"to build into the R&D enterprise itself a reflexive capacity that…allows modulation of innovation paths and outcomes in response to ongoing analysis and discourse"*.[8] His approach was to work with researchers in the lab and reflect with them on the decisions they were making, with the objective to 'perturb the system in research-tolerable ways'. It allowed Fisher to discuss ethical and social considerations at a point where they actually could still have an impact on research decisions. The research participants indicated that the collaboration actually enhanced the quality of the decisions made. Rather than seeing the ethical and social perspectives as imposing 'ethical speed bumps' to the progress of their research projects, they felt that the exposure to broader dimensions put the research in a different perspective. They realised that they were making choices, that these choices were based on a range of considerations, and by reflecting on them, found that things could have been otherwise. By considering social considerations at an early stage: 'what will happen when we scale up?' 'Should we think about using another solvent that is less corrosive?', the researchers discovered new inroads for their research.

Fisher's work is now being taken up by the Working Group on Biotechnology in Society at Delft University of Technology. Further interdisciplinary approaches are evolving in other places as well: Robert Doubleday has studied research projects in nanobiotechnology at the Nanoscience Centre at the University of Cambridge, enquiring how research on the social aspects of science and public engagement interact with science policy and practice.[9] Michael Gorman described the societal dimensions of nanotechnology as interdisciplinary 'trading zones' among scientists, engineers, ethicists and social scientists.[10] And Nano2Life, the European Network of Excellence in Nanobiotechnology, is working together with its ethics board to engage with the ethical and social dimensions of the research at an early stage.[11]

Interdisciplinary collaborations are a learning experience for both parties. The social scientists have to bring down their expectations to what is scientifically and practically feasible, which reduces 'moralistic'[12] or wildly idealistic critiques, and demands of them that they work within the margins of scientific realities. At the same time, the scientists and engineers involved are challenged to think about their research in different ways, to see that there are alternative views and approaches. Instead of pondering intangible concepts of sustainability, environmental justice or social equity over cigars and brandy, moral considerations are becoming visible within scientific practice: ethics comes to life within the context of research. To be sure, these are only preliminary steps towards the integration of broader societal concerns with scientific practice. A culture change does not occur overnight. Interdisciplinary research still offers many challenges: scientists and ethicists have very different ways of looking at the world. They approach problems differently and have different ways of finding a solution. Their interests and priorities do not necessarily converge. But however 'messy' the

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[8] E. Fisher. *Ethnographic Invention: Probing the Capacity of Laboratory Decisions*. Nanoethics 1 (2), p. 155-165.

[9] http://www.geog.cam.ac.uk/research/projects/sociallaboratories/

[10] M. E. Gorman, J.F. Groves & J. Shrager (2004). *Societal Dimensions of Nanotechnology as a Trading Zone: Results from a Pilot Project*. In D. Baird, A. Nordmann & J. Schummer (eds.). Discovering at the Nanoscale. Amsterdam: IOS Press.

[11] http://www.nano2life.org/

[12] T. Swierstra & K. Jelsma (2006). *Responsibility without moralism in technoscientific design practice*. Science Technology & Human Values 31(3): 309-332.

research may be, these initial projects do point in directions that continue to make both natural and social scientists enthusiastic. The fact that both sides are 'opening up' to cooperative schemes in research and education constitutes an exciting window of opportunity.

Interdisciplinary research is certainly not the answer to all our problems. But what these studies show is that ethical considerations are a substantial part of doing scientific and technological research: they recontextualise research from an impersonal, objective activity into a *human* activity. The interaction of scientists, engineers, ethicists and social scientists in the lab or at the design table opens up discussion of the goals and values that drive research. As such, they address the types of questions with which the public is concerned.

In conclusion - what we *can* do

A brief summary of the argument thus far: the Code of Conduct for Scientific Practice was established to maintain public trust in science. But by establishing science as a value-free activity, it simultaneously excludes the value-commitments in those scientific practices *themselves*. And these are what public concerns are about. An alternative way of addressing the public trust issue is to render such decisions in technological design more explicit. Technologies embody values. In a world that is pervaded by science and technology, public trust may well depend on a more open, reflective attitude to the value-commitments in technological innovations.

There is not one, inevitable, technologically determined path to progress. Things could have been otherwise. It is therefore legitimate to ask: how do we want science and technology to serve society? As engineering ethicists Cohen and Grace indicate,[13] the 'social rationale' for science and engineering is to develop and apply scientific knowledge to the public good. Notwithstanding the fact that innovation is not a linear process and we cannot accurately predict which research result will lead to which innovation, we *can* work towards a system in which human values, instead of principles of efficiency and objectivity, drive our thinking and behaviour. Rather than blindly developing the technology and simply waiting for the magical appearance of benefits to society, we should define social goals and determine how science and technology may help to reach them. Social and natural scientists should start working together to ensure that science is in the service of society. That is *our* responsibility, not simply our professional obligation as employees of a university, but our moral duty as citizens in a global society. This is an open-ended story: the segregation of ethics and science has deep historical roots, and will not be solved easily. But it is also a story of change, of hope, and one that should end with the three magical words that have been a symbol of hope and change in 2008: *"Yes we can"*.

[13] S. Cohen & D. Grace (1994). *Engineers and Social Responsibility: An Obligation to Do Good.* IEEE Technology and Society Magazine 13(3): 12-19.