UNIVERSITAS ROSKILDENSIS · IN TRANQUILLO MORS · IN FLUCTU VITA ·

RESEARCH PAPERS

from the Department of Social Sciences

Institut for Samfundsvidenskab og Erhvervsøkonomi

Research Paper no. 12/00

Three perspectives in science, technology and society studies (STS) in the policy context

Lars Fuglsang

Roskilde University, Denmark

Research Paper no. 12/00

Three perspectives in science, technology and society studies (STS) in the policy context

Lars Fuglsang

Research Papers from the Department of Social Sciences, Roskilde University, Denmark.

Working paper series

The Department of Social Sciences is one of the largest at Roskilde University, with 43 permanent scientific personnel together with several Ph.Ds, and other teaching within staff. Most of the academic personnel have a background as economist, political science or sociology. It is a general goal of our department and the rest of Roskilde University to foster interdisciplinary teaching and research. The later can be seen from the four main research lines of the department, namely:

- Changes in the welfare state in a national and international perspective.
- Public organization and policy analysis.
- Innovation and technology development with special attention to service firms and information technologies.
- Institutions, actors and institutionalization.

The Research Papers from the Department of Social Sciences is edited by Associate Professor Susana Borrás.

Please note that:
The papers are on a 'work in progress' form, which means that comments and criticisms in the form of feed-back are welcomed. For this purpose, the address(es) of the author(s) is specified on the title page. Readers must also be aware that the material of the working papers might be printed later in journals or other means of scientific publication in a revised version.

© The author(s)
All rights reserved. No part of this working paper may be reprinted or reproduces or utilised in any from or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the author(s).

ISSN 1399-1396

TABLE OF CONTENTS

Abstract

In this essay I want to distinguish among what I view as three main perspectives in science, technology and society studies (STS) regarding science and technology and their relation to society. These three perspectives are: 1) Science and technology shape society; 2) society shapes science and technology; and 3) an interactive view of the science, technology, and society relationship. Each of these perspectives developed over the course of a ten to twenty year period after World War II, and each is tied to a specific policy context. However, they can also be seen as simultaneous perspectives that have been competing with one another during the past fifty years. For present purposes, however, I treat them historically in the policy context.

Keywords: Science, technology, society, policy, sociology of science.

Lars Fuglsang

Reprinted from "Three Perspectives in STS by Lars Fuglsang" in *Visions of STS: Counterpoints in Science, Technology, and Society Studies* by Stephen H. Cutcliffe and Carl Mitcham (Eds.) by permission of the State University of New York Press.
Forthcoming ©2001 State University of New York. All Rights Reserved.

Three perspectives in science, technology and society (STS) studies in the policy context

By Lars Fuglsang, Roskilde University, Denmark

1. Science and Technology Shape Society

This perspective evolved out of an atmosphere of science and technology optimism in the years after World War II. Science and technology were, for the first time in modern history, considered as forces of socio-economic change that made a difference for society and economy.

One important contribution to this perspective was made by Vannevar Bush, the U.S. President's advisor for scientific research and development. His 1945 report, "Science, the Endless Frontier," is a source of inspiration for the modern funding system for science. Bush argued for a "basic science" which would eventually have positive consequences for the economy. In his vision, science should not be targeted directly by government; rather, funding should be determined by scientists themselves through a system of peer review.

In this, Bush agreed with other authors of the time. During the 1930s, the British scientist John Desmond Bernal had already argued for science as a cornerstone in the building of modern society (cf. 1939). He also believed that science should be protected from direct external interference by society. Such considerations were important also for Derek de Solla Price (cf. 1963), one of the founding fathers of science studies. De Solla Price wanted to create a "science of science" that could lead to improvements of science institutions.

Arguments about the important role of science and technology were also, indirectly or directly, given by the Nobel Prize Laureates in economics Kenneth Arrow (cf. 1962) and Robert M. Solow (cf. 1956). Arrow argued that science needs public support because it is associated with economic risk (market failure). Thus, according to Arrow, science is characterised by fundamental "uncertainty" (its results cannot be predicted), its "indivisibility" among economic actors (it cannot be divided among them like a cake), and its difficult to be "appropriated" economically (since knowledge easily flows from one actor to another – the imitation problem). The existence of high economic risk, he argued, implies underinvestment in science by private firms, thus providing a rationale for public support.

Solow was investigating growth in output per worker in USA in the period from 1909 to 1949 and he found that 87.5 percent of the growth could not be explained by an increase in capital per worker as was usual, but had to be assigned a residual factor he called "technology." This was not very convenient, since economic theory had not generally treated technology in these models. Nonetheless, the argument suited the spirit of the time well – that science and technology were forces contributing to growth and prosperity.

Another variant of the "science and technology shape society" approach emerged from economic-historical theories. This variant has its origin in the work of the Russian economist N. D. Kondratiev (cf. 1935) who found statistical evidence for long term cycles of forty-five tosixty years in the economy in the period from the eighteenth century through to the 1920s in the U.S., U.K., and France. Building on Kondratiev's work, the Austrian economist Joseph Schumpeter attempted to explain the upswings and downswings in the economy with entrepreneurship and innovation. Entrepreneurs played, according to Schumpeter (1939), a creative-destructive role for economic recovery. Extending these arguments, Christopher Freeman and Carlotta Perez (1988) have put forward the idea that economic and institutional development is motivated by shifts in techno-economic paradigms, each containing a new key technology, such as the steam engine (late eighteenth century), railways (mid-nineteenth century), electricity (late nineteenth century), petrochemicals (early twentieth century) and information technology (mid-twentieth century).

This is a fairly broad, but attractive approach that nicely chains together economic analysis with sociology and history. Similar ideas have been developed by Giovanni Dosi (1982), who argues that technology within each techno-economic paradigm evolves along certain trajectories (defined as "the pattern of 'normal' problem solving activity [i.e. of progress]"). One example is the trajectory of semiconductors leading towards smaller, cheaper, more reliable, higher memory computer chips.

The "science and technology shape society" approach also comprises more pessimistic views, such as those proposed by the French sociologist/philosopher Jacques Ellul (1964) or the German philosopher Jürgen Habermas (1973). Here, in an emerging tradition of "philosophy of technology," focus is on the alienating effects of science and technology on human life or other philosophical aspects of science and technology. Science and technology inform an instrumental rationality or a technological regime that overshadows and represses other equally important aspects of human life, such as philosophical or religious thought. The approach can be seen as a sophisticated historical-philosophical critique of civilization – one which is also elaborated by authors more directly linked with STS, such as Lewis Mumford (1967, 1970) and Langdon Winner (Winner 1986).

The "science and technology shape society" perspective is sometimes labelled a "technological determinist approach." This can be misleading, however, since technology is seldom seen as an autonomous force of its own right, but more as a normative choice of Western society in a broad sense (cf. Habermas, 1973). Where and how one should apply the term technological determinism is discussed by Bruce Bimber (1995).

2. Society Shapes Science and Technology.

The "society shapes science and technology" perspective turns things around. Now, the determinant force is not technology but society. This approach has its origins in pressures from both business and academic discussions during the early 1970s. In business, there was a growing concern that science should be more directly connected to commercial purposes. The spill-over from basic research to business in general was perceived as poor. "Contracted research" instead of "basic research" was suggested (cf. the British report by Lord Rothschild on "The Organisation and Management of Government R&D" in Seal, 1971; cf. also Elzinga, 1988).

The academic discussions emphasized social forces external to science and technology. Science and technology were to be seen in the light of the social, economic, and political interests and the concerns of the wider population. There were two special lines of reasoning. One argued in strategic and political terms that science and technology should be more explicitly linked to social forces, while the other emphasized a sociological and academic approach, seeking to examine and conceptualize links between social forces and science/technology.

Thus, the OECD "Brooks report" of 1971 (Brooks, 1971) pleaded for incorporation of "strategic choices" into science and technology, i.e., integration of the social concerns of civil groups. Furthermore, in 1972, the

Office of Technology Assessment was established under the auspices of the U.S. Congress. Its main function was to identify the impact of technological application and thereby to support political deliberations concerning science and technology.

The sociological/academic line was pursued, among others, in the so-called "strong programme" of "the sociology of scientific knowledge" (SSK) in the U.K. The idea was to study moments of alternative opportunity in science and thereby show how competing options were linked to priorities of different social forces. This type of argument was behind several valuable contributions – such as David Noble's *Forces of Production* (1984) – analyzing the development of the numerically controlled machine tool, and the publication edited by Donald MacKenzie and Judy Wajcman, *The Social Shaping of Technology* (1985).

In some Scandinavian variants of the perspective, such as the DEMOS and the UTOPIA projects, there were attempts to convert these insights into "action research." Relevant social forces were to be mobilized and empowered, especially in newspaper type-setting, to be able to influence technical change according to their interest. The Scandinavian approach was inspired by industrial sociology. For example, Harry Braverman (1974) argued that new technology was often applied by industrialists to control work, which also lead to labor deskilling. But the Scandinavian action research projects were far more pragmatic and constructive than Braverman's analysis would suggest. DEMOS and particularly UTOPIA sought to preserve and make use of workers' skill, and to improve the quality of work during technical change in a way that was operational on both sides of the table.

The main idea of the "society shapes science and technology" approach was thus to see technology as open to external forces and negotiation. Analysts stressed that technical change is not neutral but biased by social and economic forces. Civil groups could and should be empowered and integrated into decisions concerning science and technology. In business this perspective was reflected in greater pressure for more relevance in science.

3. The Interactive View of the Science, Technology and Society Relationship

The interactive perspective was presented, among others, by Wiebe Bijker (1987), Bruno Latour (1987) and Michel Callon (1986). The initial steps were taken during the 1980s, but the breakthrough for the approach came in the early 1990s under headings such as "the social construction of technology" (SCOT) and "actor-network-theory." SCOT is closely associated with SSK but shifts the focus from science to technology.

Here, technology is seen as having "interpretative flexibility," which implies that it does not develop in a linear way. Rather, technical change contains, like science in the SSK programme, moments of alternative possibilities. Which steps are taken in technology depends on the specific social constituencies that are involved with the technology.

The most cited example of this approach is "the social construction of the bicycle" by Trevor Pinch and Wiebe Bijker (1984; further developed in Pinch and Bijker 1987). The analysis goes like this: In the late nineteenth century, three competing bicycles were conceived, one made for macho-men (a risky bike to ride, with a high front wheel and a low back wheel), one for women (with pedals on the same side of the bike, for example, to solve the dressing problem and meet moral standards) and a practical bicycle, mostly for elderly men. Each bicycle was, in the beginning, equally important. (All this occurred despite the fact that Leonardo da Vinci had already designed the bicycle as we know it today in the fifteenth century). It was only when the rubber tire and improved brakes were created that the modern bicycle started to catch on. The reason was not necessarily that it was better, but, according to Pinch and Bijker, that a compromise could now be produced between the group of elderly men (in need of a practical bike) and the macho-men (who could now have a challenging "fast" bike instead of a risky bike).

From this case study, Pinch and Bijker try to "ground" a theory comprising several concepts such as "interpretative flexibility" and "the relevant social group" ("elderly men," "macho-men," etc.). "The relevant social group" is probably meant to be a more specific category than the hitherto dominant broad notions of society. They also make the argument that the relation between society and technology is not one between two distinct entities ("society" versus "technology") but is rather a "seamless web." In addition to these concepts, Bijker has tried to conceptualize institutional and other constraints on technologists by the term "technological frame" (cf. Bijker et al., 1987). How technological frame is related to concepts of institutions more generally, or to notions of social structure, is not so clear. Bijker, however, in his latest work (Bijker, 1995), has tried to go some steps further along these lines by examining the concept of power.

The Bijker approach has had far reaching consequences for STS. Together with other similar approaches, such as the actor-network theory of Latour and Callon, it has informed a refreshing methodological discussion in STS. Criticisms have been raised from the "science-and-technology-shapes-society" perspective, most sharply by Langdon Winner (1993). Winner sees SCOT as voluntaristic, with a naive and relativist conception of reality (like "anything goes"). Another problem of the SCOT approach is its tendency to build up theory from single cases. Other relevant social science theory and method is hardly scrutinized or applied, and statistical analysis is absent. As a consequence, the concepts developed may not seem very solid. SCOT is as an intelligent and refreshing approach that has significantly improved the intellectual capability of STS, but it is not necessarily a basis for further investigations. Its long-term influence may be more indirect.

4. Policy, Power, and Method: The Three Perspectives Compared

A summary comparison of the three perspectives can be presented in the following table:

Table 1: Three perspectives on STS compared

	Science and technology shapes society	**Society shapes science and technology**	**Interactive approaches**
Time	1950s-60s	1970s-80s	1990s
Definition of technology	Cause	Consequence	Cause and consequence
Independent variable	Technology	Society	Social group
Relation of actor to technology	Beneficiaries (or victims)	Negotiate interests	Seamless web
Role of policy	Protect or reject science and technology	Empower actors, create networks	Democratize
Power structure	Technological regime	Negotiations	Frames, discourses
Method	Study impact of technology	Follow the artifact	Follow the actor

As indicated, the three perspectives on science, technology, and society can be connected to competing views of policy, power, and method. In the "science and technology shape society" perspective, policy is "for" or "against" science and technology. Policy can serve to protect science and technology from external interference, and seek to improve institutions of science and technology.

Alternatively, policy is seen in the Luddite tradition as coming from below, from critical social groups that want to slow down the pace of technical development (the Luddites were a British workers' movement that destroyed textile machinery from 1811 to 1817 in order to slow down technical change). Power is inherent to the "technical regime," through peer reviewed funding systems, for example. The preferred method of study is to examine the impact of science and technology on society, either the economic impact (its correlation with economic growth) or the social impact (its impact in the social context).

In the "society shapes science and technology" perspective, policy is understood as networking and strategic interaction among concerned social groups. From a practical point of view, the goal is to integrate actors, to empower them to formulate views on science and technology, and to involve them in the implementation process as well. This is intended not only from a "critical" point of view, in support of employees, for example, but also in policy. Most European technology policy programs of the 1980s, such as the ESPRIT programme of the European Union, were established through active involvement of concerned actors in the policy process. The twelve largest electronics firms in Europe created the ESPRIT programme, and these firms also received the major part of the ESPRIT funding in its early years. Hence, power is negotiated among concerned social and economic groups. The appropriate method is to follow the artifact, and from that perspective to identify relevant actors.

In the interactive perspective, one major concern is the democratization of science and technology. Science and technology are seen as social relations and thus open to discussions of all kinds. Power has to do with the social and civil discourses that surround technology in a much more radical and fundamental sense than in the strategic approach. However, any attempt to democratize these discursive processes is confronted by major practical problems. It requires the building of sophisticated and complicated new institutions that are legitimate as democratic institutions. These are problems which SCOT shares with other recent “mixed” approaches to democracy in political science, such as the “associative democracy” approach (Hirst 1993), for example, putting confidence in new forms of associations among public organisations, private firms and civil society. The interactive approach is much more precise when it comes to its primary methodological suggestion, to “follow the actor.”

5. Phases of technology

Superficially, at least, the three STS perspectives appear to be in conflict, as they present incongruous views on the subject matter, methodology, and the purpose and relevance of theory. The first perspective has been accused of being determinist or “technocratic,” the second of being “radical” or “business-targeted,” and the third of being “voluntaristic” or “relativist.” Upon closer examination, however, the three different approaches are not really incongruous at all. They simply deal with different aspects of science and technology and may be combined, if we divide scientific development or technical change into different “phases.” By phases I mean the different stages of innovation of a technology (or piece of science), somewhat similar to the concept of the product-life cycle – though with emphasis on technological rather than commercial aspects of development. For the purpose of this essay, it is useful to distinguish between three such phases:

The phase of flexibility: This phase refers primarily to the initial stages of technological innovation. Here, the final form of the technology is not yet established. As in the cases of, for example, the creation of the railroad system, radio and television, the cassette tape, the video tapes and the computer, there were a number of competing technical solutions in circulation. The initial flexible stages of technical change is normally characterised by many failing experiments and moments of alternative possibilities. Public funding may, in some cases, be needed to bear the development costs, although large companies of the capital goods sector will often be the key players and will conduct the critical experiments and cover the costs.

The phase of momentum: This term refers to the phase when a particular technology has gained strength and widespread acceptance, while others have been excluded (cf., e.g., Hughes, 1969; Staudenmaier, 1986). Because modern technical systems are complex, and incorporated into the routines and practices of many employees and firms, they will, at this stage, be linked to “vested interests" as they start to gain momentum. Once the crucial decisions have been taken, the technology cannot be changed easily or without major costs. A trajectory of "normal" problem solving is starting to take form along which the technology is now further developed.

The phase of diffusion: In this phase, the artifact has matured and is diffused to consumer industries and applied by final users. At this stage, a "reversed product life cycle" may, however, take off in some industries, particularly in our present age of information technology. A reversed product life cycle will move from changes of process to changes of product rather than the other way round. Thus, according to a theory proposed by Richard Barras (1986), information technology applied in services first leads to rationalization of labor (cost-saving activity), then it eventually enables development of qualitative new production systems (using the information technology for new purposes), and finally, as a result of this, to the innovation of new products (when the final user starts to see new product characteristics). The cycle is reversed in a another sense also, since some of the new products may create higher flexibility in production and consumption. Hence, a new round of flexibility evolves, valid for some employees and customers at least – leaving space for further empirical investigation.

From this analysis we may draw a number of lessons about science, technology, and society:

First, science and technology are both flexible and inflexible, depending on the stage of development and the industry involved. Hence, the design of the computer was in the beginning "interpretatively flexible." Eventually, however, it became more standardized, due to network externalities and economics of scale. Standardized information technology is, however, the basis for new products in services and manufacturing industries of which some are relatively flexible. Computers, understood as materializing social relations, are therefore both shaping and – still – shaped by society.

Second, science and technology have an ambiguous role in economic development. Science and technology initiatives play, as Schumpeter said about entrepreneurs, a creative/destructive role. In the case of the computer, for example, it causes unemployment and de-industrialization but also new socioeconomic opportunities. Further down the line, the technology enables new services and new flexible relationships between service workers and customers.

Third, technical change can be "democratized" at many stages, from the creation of a capital good to the final diffusion of it to the service sector. But the issue of democracy is very complicated because many powerful actors are in play. They often operate on a global scale and interact in networks, although not clearly within the boundaries of a national legal framework, however. Therefore, actors are not easily submitted to national legislation. "Representative democracy," as we know it, seems to be a necessary – if unsatisfying – condition for technology and democracy.

The relationship of technology and democracy is a very complicated and important issue for the future. Below I offer a brief list of some mechanisms that, in my opinion, are essential for technology and democracy at national levels and that could be examined historically:

1) Each country may create mechanisms through which users of technology can express their dissatisfaction in early stage of technological development and diffusion. The Danish idea of consensus conferences may provide one example of this. The consensus conference is an organized discussion among lay people and experts under the auspices of the Danish parliament that leads to a consensus report. 2) Consumer movements can be stimulated to represent consumer interests at an aggregated level. 3) The population can be educated and empowered to take part in discussions of technical change at all possible levels.

Finally, services play a crucial role for applications of information and communication technology. This is an issue which until now has been under-researched. Because services often take the form of "relations" rather than "products," diffusion of technology to services and innovation in services becomes a focal point for studying the impact of technology on human interaction.

6. Concluding remarks: opening the doors of STS

In this essay I have suggested that science, technology, and society (STS) consists of several seemingly competing, if not conflicting, perspectives, because they relate to different notions of power, policy, and method. Nevertheless, the perspectives can be combined. Combining the perspectives does not mean, however, that we create a unitary approach of STS. What I intend is rather a pluralistic and open approach. To open the doors among the different perspectives is a major challenge for STS, which may also require a thorough deliberation of the different related policy interests. It may be more comfortable to remain within one of the perspectives, but to move across their tresholds can lead to more fruitful scholarly interaction and a stronger role for STS, which, without such movement, may run the risk of being pulled apart by the competing policy interests.

7. References

Arrow, Kenneth (1962). "Economic Welfare and the Allocation of Resources for Invention." In *The Rate and Direction of Inventive Activity: Economic and Social Factors*. Princeton, NJ: Princeton University Press.

Barras, Richard (1986). "Towards a Theory of Innovation in Services." *Research Policy* vol. 15, no. 4 (August), pp. 161-173.

Bernal, John Desmond (1939). *The Social Function of Science*. New York: Macmillan

Bijker, Wiebe et al. (1987). *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge, MA: MIT Press.

Bijker, Wiebe E. (1995). *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*. Cambridge, MA: MIT Press.

Bimber, Bruce (1995). "Three Faces of Technological Determinism." In Smith, M. R. and Marx, L. (1995). *Does Technology Drive History? The Dilemma of Technological Determinism*. Cambridge, MA: MIT Press.

Braverman, Harry (1994). *Labor and Monopoly Capital: The Degradation of Work in the Twebtieth Century*. New York: Monthly Reviw Press.

Brooks, Harvey (1971). *Science, Growth and Society: A New Perspective*. Paris: OECD.

Bush, Vannevar (1945). *Science, the Endless Frontier. A Report to the President on a Program for Postwar Scientific Research*. Washington, D. C.: Office of Scientific Research and Development, U.S. Government Printing Office.

Callon, Michel (1986). "The Sociology of an Actor-Network: The Case of the Electric Vehicle." In Callon, M., Law, J. and Rip, A. (eds.). *Mapping the Dynamics of Science and Technology: Sociology of Science in the Real World*. Basingstoke: Macmillan, pp. 19-34.

De Solla Price, Derek J. (1963). *Little Science, Big Science.* New York: Columbia University Press.

Dosi, Giovanni (1982). "Technological Paradigms and Technological Trajectories: A Suggested Interpretation of the Determinants and Directions of Technical Change." *Research Policy* vol. 11, no. 3, pp. 147-162.

Ellul, Jacques (1964). *The Technological Society.* New York: Alfred A. Knopf. (French original, 1954).

Elzinga, Aant (1988). "From Criticism to Evaluation." In Jamison, A. (ed.). *Keeping Science Straight.* Gothenburg: Department of Theory of Science, University of Gothenburg. pp. 29-58

Freeman, Christopher and Perez, Carlotta (1988). "Structural Crises of Adjustment: Business Cycles and Investment Behaviour." In Dosi, G. et al. (eds.) (1988). *Technical Change and Economic Theory*. London: Pinter Publishers.

Habermas, Jürgen (1973). *Erkenntnis und Interesse*. Frankfurt: Suhrkamp.

Hirst, Paul (1993). *Associative Democracy: New Forms of Economic and Social Governance*. Oxford: Polity Press.

Hughes, Thomas P. (1969). "Technological Momentum in History: Hydrogeneration in Germany 1898-1933." *Past and Present* 44 (August), pp. 106-132.

Kondratiev, N. D. (1935). "The Long Waves in Economic Life." *Review of Economic Statistics* vol. 17, no. 6 (November), pp 105-115.

Latour, Bruno (1987). *Science in Action: How to Follow Scientists and Engineers Through Society*. Milton Keynes: Open University Press.

MacKenzie, Donald and Wajcman, Judy (eds.) (1985). *The Social Shaping of Technology: How the Refrigerator Got its Hum*. Milton Keynes, England: Open University Press.

Mumford, Lewis (1967). *The Myth of the Machin*, vol 1*: Technics and Human Development*. New York: Harcourt Brace Jovanovich.

Mumford, Lewis (1970). *The Myth of the Machine,* vol 2*: The Pentagon of Power*. New York: Harcourt Brace Jovanovich.

Noble, David (1984). *Forces of Production: a Social History of Industrial Automation*. New York: Alfred A. Knopf.

Pinch, Trevor J. & Bijker, Wiebe E. (1984). "The Social Construction of Facts and Artefacts, or How the Sociology of Science and the Sociology of Technology might Benefit from Each Other." *Social Studies of Science* vol. 14, no. 3 (August), pp. 399-441.

Pinch, Trevor J. & Bijker, Wiebe E. (1987). "The Social Construction of Facts and Artefacts, or How the Sociology of Science and the Sociology of Technology might Benefit from Each Other." Pp. 17-50 in Bijker, et al. (1987).

Schumpeter, Joseph (1939).*Business Cycles*. New York: Mcgraw-Hill

Seal, Lord Privy (1971). *A Framework for Government Research and Development*. London: H.M.S.O. (Contains a report by Lord Rothschild on "The Organisation and Management of Government R&D").

Solow, Robert M. (1956). "A Contribution to the Theory of Economic Growth." *Quarterly Journal of Economics* vol. 70, no. 1 (February, pp. 65-94.

Staudenmaier, John (1986). *Technology's Storytellers: Reweaving the Human Fabric*. Cambridge MA: MIT Press.

Winner, Langdon (1993). "Upon Opening the Black Box and Finding it Empty: Social Constructivism and the Philosophy of Technology." *Science, Technology & Human Values* vol 18, no. 318 (Summer), pp. 372-378.

RESEARCH PAPERS from the Department of Social Sciences

To obtain a copy:

The papers can be downloaded free from the following address:

http://www.ssc.ruc.dk/

Paper-ready copies can also be obtained at a price of 40 DKK

Request and order for paper-ready copies can be made to the following address:

Secretary Janni Villadsen

Department of Social Sciences

Roskilde University

P.O box 260

4000 Roskilde

Phone +45 4674 2597

Fax + 45 4674 3080

Research Paper no. 1/99

Jesper Jespersen, Jørgen Birk Mortensen and Rasmus Rummel:
Bæredygtig energianvendelse og
økonomisk vækst 'Hvad skal der til? – Hvad koster det? '
Nogle konsekvensberegninger gennemført ved hjælp af Makro og miljømodellerne Adam og Emma.

Research Paper no. 2/99

Jakob Torfing:
Velfærdstatens ideologisering

Research Paper no. 3/99

Eva Sørensen:
Democratic governance and the changing role of users of public services

Research Paper no. 4/99

Gunnar Skogmar:
The United States, Euratom and European Integration 1955-1957.

Research Paper no. 5/99

Peter Bogason:
Public Administration and the Unspeakable:
American Postmodernism as an Academic Trail of the 1990s.

Research Paper no. 6/99

Susana Borrás
The Cognitive Turn(s) in EU Studies

Research Paper no. 7/99

Helle Sundgaard Andersen, Lotte Jensen, Birgit Jæger, Karina Sehested, Eva Sørensen
Roles in transition! Politicians and Administrators between hierarchy and network.

Research Paper no. 8/99

Catharina Juul Kristensen & Søren Voxted
Hvorfor tager faglærte ufaglært arbejde?

Research Paper no. 1/00

Birgit Jæger
SCOT in Action

Research Paper no. 2/00

Leopold Galicki
Det Sociologiske Værksted

Research Paper no. 3/00

Anders Mathiesen
Nyliberalismen – og de ´stærke´ ledere

Research Paper no. 4/00

Eva Sørensen & Jacob Torfing
Kompetenceudvikling i Danmark

Research Paper no. 5/00

Susana Borrás
Science, technology and innovation in European Politics

Research Paper no. 6/00

Lars A. Engberg
Social housing in Denmark

Research Paper no. 7/00

John Andersen
Køn, klasse og ligestilling

Research Paper no. 8/00

Anne Reff Pedersen, Svend Bayer og Nina Middelboe
En præsentation af KIT
- At arbejde med kvalitative interview via lyd

Research Paper no. 9/00

Povl A. Hansen och Göran Serin
Industrins teknologistruktur i Öresundsregionen

Research Paper no 10/00

Jesper Jespersen
ØMUéns politiske økonomi

Research Paper no 11/00

Jesper Jespersen
Makroøkonomisk teori og ØMUén