

Science under Pressure

Proceedings

The Danish Institute for Studies
in Research and Research Policy
2001/1

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Foreword

Why a seminar on Science under pressure?

Science never operated in a vacuum, no matter how much its practitioners might have strived for it. Nor was the meaning of science ever, even from its own perspective, a given thing: Copernicus was a renegade rather than a heretic and heliocentric cosmology a treason rather than a sacrilege. The history of science and its place in historical contexts of culture, economy, and politics is a tale of tension as well as complexity. To be sure, different paradigms of science and research traditions as well as different fields of scientific knowledge production have conceived of the double contingency of science and society in very different ways, empirically as well as normatively. Thus, answers to the question of how to conceive of the relationship between science and society, and of how to assess it, abound - they have done so for centuries and will continue to do so. And the same holds for the continuous, but no less troubled, attempt made by scientists themselves to depict what science is and, pace *The Science Wars*, what it is not. Yet, in a time where science, as faithless to itself as ever, is facing growing demands and, equally important, a growing diversity of demands from the surrounding society, the proposition that science is, indeed, a contingent endeavor can hardly be questioned. And, at the turn of the century, Science and Technology Studies, long since emerged from the obscurity of Academic exotica, have left the hopeful ranks of burgeoning fields of inquiry and become a discipline in its own right.

In September 2000, The Danish Institute for Studies in Research and Research Policy had the pleasure of hosting a European seminar whose objective was to attack the question of scientific contingency head on by asking whether science is under pressure - or just challenged - and if so: in what sense. A range of scholars from different countries, with different disciplinary backgrounds, and with different experiences in regard to the relationship between science and society accepted our invitation and took part in a two-day discussion of the pressures and challenges facing science today. The contributions to this discussion from the speakers, with the addenda of Stefan Hermann's closing reply, are collected in the following proceedings.

Loet Leydesdorff provided input to a lively discussion about the complex, i.e. non-linear, dynamics of the interplay between universities, industry and government from the perspective of a system-theoretically informed Triple Helix model.



Steve Fuller, on the other hand, looked at the governance of science from the vantage point of normative republican political theory: How can citizens win influence on science, given that monastic truth seeking and hyper capitalist commercialism do not exhaust the alternatives open for modern-day universities?

Pressure on science rises and challenges emanate also from within the practice of science itself. Science can be controversial, and its insights and methods are susceptible to continuous critique and challenge, not least from within the echelons of its practitioners. But scientists will immediately agree that such critique and challenge is quintessential, not only to their own integrity and to the integrity of their respective disciplines, but also to the very quality of their insights.

Moving from the general, yet very different, system modeling perspectives of Leydesdorff and Fuller, Helge Kragh, partly in response to propositions made previously by Steve Fuller, discussed science and non-science from the perspective of physical science. In particular, he challenged the view that post-World War II science is unique and radically different from pre-World War II science. Trained in another discipline, Andreas Roepstorff presented some conclusion from an ethnographic case study on a science institution, challenging the dichotomous insider-outsider approach to understanding the meaning, role, and function of science. Science, so Roepstorff argues, must be conceived integratively as a culture-, social order-, and cosmology- producing practice. As could be expected, Kragh's and Roepstorff's presentations sparked an engaged discussion of disciplinary differences as a challenge to science practice.

Whereas Kragh and even Roepstorff set out to discuss the internal workings of scientific practice, Claus Emmeche's analysis brought awareness to the societal challenges that scientists are met by. Emmeche illustrated his general observations on challenges from outside Academia by way of a comment on the pressure that biotechnology-related areas of scientific research are experiencing these years. Transcending the outside-in perspective, Emmeche concluded his presentation by suggesting that science has returned the favor by producing knowledge of a nature that, more than ever, forces society to reflect on the terms and objectives of scientific knowledge production. At the same time, the new research agenda seems to have dealt a final blow to the scholastic isolationism of the »positivist ethos«, in effect making considerations of a political and ethical nature part and parcel of »good science«.

Acknowledging the, by now, almost trivial importance of the international community, the seminar's attention was, finally, directed towards the regional and the global level. Diana Wolff-Albers presented her views on the challenges that face science and technology in Europe as a result of increasing globalization, among them the scientific and technological infrastructure and the quality of human resources. But does increasing globalization make for the biggest pressure against science? Yes, says Thomas Whiston, but not »in the conventional resource allocation meaning of the term«. In his presentation, he argued that the pressure, which is really a challenge, is to contribute to »solutions to the most urgent global environmental problems and basic need of the global economy«. Thus, the urgency of environmental and socio-economic problems on a global scale calls for a »new global scientific agenda which involves all nations as equal partners«.

»Flipping the coin«, Stefan Hermann concludes these proceedings by challenging what he considers to be an underlying premise, of all the seminar presentations (with the exception of Roepstorff and, in part, Fuller), namely the confidence in science as such. Hermann urges us to reconsider, by way of critical sociology, this confidence. Not only is science, according to Hermann, a highly contingent social-cum-discursive practice, it is also a highly effective vehicle of social domination and normalization, which, however, so the Foucauldian argument goes, should not be contrasted to the pursuit of truth.

Among the responsibilities of The Danish Institute for Studies in Research and Research Policy is the task of providing decisionmakers and the public with knowledge of the contextual conditions of science and research and the effect with which science and research exert an influence on society. I believe that Science under pressure makes a contribution in this regard.

The seminar was organized by researcher Kristian Kindtler in collaboration with research director Elisabeth Vestergaard. And the proceedings were edited by Anne-Mette Pedersen. On behalf of the institute, I want to thank all who participated in the seminar

Aarhus, January 2001
Karen Siune, Director

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Insiders and Outsiders Unite!

Science and Science Studies in/of the 21. Century

Andreas Roepstorff*

Abstract

In the current discussion of science, one finds a struggle between the outside description of science conducted by those studying the sciences without being (natural) scientists, and the inside understanding by those who undertake science. Based on an ethnographic study of a scientific institution, it is argued that this distinction is not a fruitful one. It fails to capture that science is not only a mundane practice for scientists, but that it is also plays a general and important role as part of a modern social order. An order, that presently appears to undergo rapid transformations. The outsider-insider distinction therefore fails to correctly identify the current pressures on science and it is useless for the important discussion on which role science ought to play in the future.

Introduction: Imagining Science and Pressure

We learn from the heading of this seminar that Science is under Pressure. That is indeed a very strong image that, as all versatile metaphors, in itself is empty of any real content since it is applicable to all sorts of understandings of science, from the day-to-day interactions of concrete persons, to the high-polished metaphysical entity of Science. As a scientist sometimes studying other scientists it is my experience that neither the 'pressure' nor the 'science' notion has an unequivocal content. However, this does not imply that science and pressure can never be given any meaningful interpretation. Try to conceptualise a metaphorical co-ordinate system where the different understandings of Science is on one axis, and the different understandings of Pressure on the other. This generates a two-dimensional semantic landscape of science-pressure. This landscape is not uniform, rather it appears to have two main attractors, each containing a science-pressure complex with particular meanings condensing around each of the concepts. This was at least how I experienced it as I worked through my material with the 'science under pressure' metaphor in mind. In order to outline which understanding of science occurs in these attractors, I will in the following recapitulate the process of semantic condensation as I experienced it. Through four encirclements, that bring us to

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Russian biologists, Martian anthropologists, European brain mappers, and Insiders and Outsiders, I will give shape to the two science-pressure attractors and eventually connect them.

First encirclement: a statue and a Russian biologist

At first the heading Science under Pressure evoked to me a recurring, vivid picture: A bright monolithic instance, Science, consisting of a sculpture-like statue of ever changing contours that was being squeezed by a heavy weight in a scenario somewhat similar to an old, used car being transformed into a cubic piece of scrap metal.

My next mental flash of imagery was evoked memories from doing research with and among scientists in the former Soviet Union. They condensed around an e-mail I had received a few days earlier. It was written by a Russian biologist, AT, and it reached me through an extended network of researchers. The Russian scientist introduced himself in the following way:

»I am a Russian marine biologist. Among other things like marine ecology, invertebrate taxonomy & morphology, I am interested in the history and recent state of traditional coastal fishery along the Russian European North and Far East. During 1997 - 1998 I headed a study of the recent state of coastal villages and a study of recent state of traditional modes of nature use in these villages.

To my mind, traditional coastal fishery [in the XVI - XX centuries in this area] is an interesting example of self-governance of local resources. Now, after 70 years of total State regulations of fishery (and of course the same time of every-day poaching) fishermen in the coastal villages are intuitively trying to work out some self-regulations. On this way they face with misunderstanding of local authorities, and State Fishery inspection.....

No doubt I am a dilettante in social sciences. I am looking for colleagues, who will be interested in discussing problems of history and recent state of coastal fishery, and in particular coastal fishery in Russia....

Now I am trying to find funds to continue the work, By various reasons, local authorities in the moment still are not going to support the project (I think they need few more years, to realize that they are not able to solve conflicts and frictions in this field, and of course they just have not money even for more actually needs). That's why I look for additional funding. Probably you can advice me the foundations, which could be interested in such studies.«

It was not initially obvious to me why this first encirclement of the Science under Pressure theme would connect a statue, a car breaker's machinery and a Russian biologist turned sociologist, but I was probably experiencing the power of metaphors in creating vivid imagery in so-called blended mental spaces. If one asks experts on the mechanisms of semantics, such as the Danish semiotician Per Age Brandt (e.g. 2000), this is how metaphors build up complicated meanings from more concrete elementary semantic relationships. By backtracking the elements involved in this mental blend, it is, therefore, possible to get a grip of the meaning of the notions that went into the metaphor.

In the first imagery, the abstract notions of science and pressure were being transformed into physically embedded representations: a massive, brutal piece of metal threatening to impose its weight by the force of gravity on a beautiful, refined transformable object of human construction, presumably a representation of science. The next imagery was simultaneously much more concrete and much further removed from the *Science under Pressure* metaphor. It did not directly embody abstract notions like science and pressure. Rather it evoked a concrete person: a Russian scientist trained in one field, but broadly interested in all sorts of other things. Working against the ideas of local authorities and on behalf of a good cause, he was sending messages out in the world asking to be embedded in a network of other researchers hopefully with access to the necessary material resources to allow for a continuation of his work.

Apparently this stereotype of the post-Soviet condition for researchers was another archetypal example of Science under Pressure. On second thought, the biologist TA epitomised a situation experienced by many of my ex-Soviet colleagues. They are well-educated broad-minded individuals who have been trained to value the accumulation of knowledge in 'Science', understood as a transcendental field not directly under local political control, as an important

field of human endeavour. An endeavour they continue to contribute to and identify with although the conditions are now very difficult and the personal costs immense. The situation for many scientists in Russia the last 10 years thereby appears to express in an almost cosmological manner central conflicts within (West)European metaphysics surrounding the strange notion of Science.

This is not the place to discuss why Russia continuously appears to produce 'doomsday hyperversions' of European metaphysical conflicts. It is neither the place for a hagiographic description of how science after all is made in Russia in spite of all sorts of eternal pressures. It was, however, striking that the loose line of associations, which the title for this seminar kept condensing around, led me to seemingly unrelated images of cartoon-like representations of a human construction being crushed and to distant networks of people doing the impossible.

This tension between two images: On one hand the abstract Science, capital S, threatened by Pressure, capital P, and the much more diffuse and seemingly unrelated image of networks of interacting people busily involved in conducting science reflects a tension inherent in my understanding of the concept that appears to point to more general properties of this strange entity. It is namely similar to the distinction employed by Steven Fuller (1997: 25-26) between a *philosophical, substantive* definition of science as a general institution on one hand and a *sociological, functional* definition on the other describing actual scientists involved in actual work. Although Science, capital S, is the title of the quoted book, the sociologist Fuller does not appear to believe in the internal consistency of this notion. He is, rather, busy debunking the whole concept, and in that he finds support in a strange manuscript apparently made by some radical outsiders observing the scientific community: a group of Martians presenting a provocative analysis of the Earthlings' relation to science. We will, for the second encirclement, follow their arguments in some detail.

Second encirclement: a Martian outsider's perspective on Science

In *Science* (Fuller 1997) there is a chapter called *Science as Superstition: A Lost Martian Chronicle* (op. cit: 40-79) allegedly paraphrasing *The Martian Ultraviolet Paper on that Distinctively Superstition Called Science*, an essay written by a group of Martian anthropologists studying Earthly devotional rituals. The paper presents a summary of an outsider's view on this strange multi-faceted set of phenomena that earthlings claim to group under the common heading of Science.

In struggling with the intricacies of science, the Martian anthropologists decide that the central research question must be a classical anthropological one: The determination of whether humanity's faith in science is superstitious (op. cit. p. 47). In order to answer that question, they structure their analysis around five classical notions from the sociology of religion: *mystery*, *soteriology*, *saintliness*, *magic causation* and *theodicy* (Weber 1993).

The Martians aptly demonstrate that just as these five categories were useful for Max Weber in understanding, as a non-believer, the sociological role and function of religion, they can be used to organise a sociology of science that will not take the sayings of the insiders of science for granted. The Earthling's understanding of Science appears to the Martians to be full of superstition in Malinowski's sense (1954), since they appear to see 'science' as a magical entity that in itself has an intrinsic causality. To the Martian observer this causality does not emanate from Science itself. Science as an institution should rather be understood in relation to other causally relevant factors of a social nature.

This is best exemplified in the two appendices to the paper. Here the Martians demonstrate how the famous four norms describing the modern scientific ethos for the scientific insider *Universalism*, *Communism*, *Disinterestedness*, and *Organised Scepticism* (Merton 1942) to the Martian outsiders have a completely different make-up. They appear like *Cultural Imperialism*, *Mafiosism*, *Opportunism*, and *Collective Irresponsibility* respectively. Finally the Martians demonstrate how the Science Citation Index, the most widely used evaluative standard both within and outside of the scientific community, is not just a neutral representation of the activities of scientists and their long-term impact. It is, the Martians claim, an actively used battlefield where individual scientists strategically use their choice of citations in articles as a ballot system »inflating the citation counts of their colleagues who are regarded as

even marginally powerful« (op. cit. p. 71). In epistemological terms, a figure in the citation index is therefore not just a *natural* kind that passively reflects reality, it is an *interactive* kind (Hacking 1999; Roepstorff 1999) that, since it feeds back on reality, is actively being shaped and used by the involved scientists.

The analysis of the Martian Outsiders does, according to Fuller, cast serious doubts on the actual content of science as described by the scientific Insider. The obvious conclusion is therefore that there is no 'nature' to Science in general. Along the lines of the Religion-Science comparison, the Martian anthropologists therefore suggest that the best parallel to an understanding of the future of Science is to study the history of the World Religions. In particular they emphasise the period when »Christendom was secularized when the emerging nation-states of Europe in the seventeenth century refused to grant a single Church special economic and political privileges. This led to a period of evangelism, in which religious believers competed to attract believers who would materially sustain their effort« (op. cit. p. 60). In the current science funding situation, the Martians see a similar process of de-coupling between the (nation)state and science as an institution, and they envisage a future of »humans embarking on a second Enlightenment, one in which science continues to enjoy popular support even after, like Christendom, its sacred status and state support have been removed« (op. cit. 62).

Being myself an earthling anthropologist studying earthling scientists, I have been creatively provoked by the Martian perspective. I would therefore in the following like to examine the extent to which the Martian analysis appears to be applicable to my recent research. The third encirclement will therefore take us to a leading brain-imaging laboratory.

Third encirclement: the laboratory as a temple

As part of a research project on the ethnography of mind-brain researchers, I recently spent half a year at a scientific institution that specialises in examining the neural basis of cognitive functions in humans. The institute had been set up in the middle of the 1990's by a substantial grant from a tremendously rich medical research charity. This had allowed for the construction of a purpose-built house in the middle of one of the best research environments in Britain which was the workplace for an international, mainly European group of scientists from several disciplines (neurology, psychiatry, psychology, physics, mathematics, biology and others).

Although the institute was formally part of a university structure, being funded by the research charity, informally known as *The Trust*, gave the department some advantages not usually found in publicly funded research institutes in Britain. It had for some years been the official policy of the Trust to pay its researchers at a higher level than in comparable state funded research positions, and the department had relatively more money for running costs. Although the financial details, as so often in anthropological work, were difficult to oversee, it appeared that there were sufficient resources to do, what needed be done: The physical space was well-designed and -equipped, and computer networks and brain scanners were continuously updated and of a very high standard. During the last decade, the government policy in Britain as in most of Europe has been to actively promote co-operation between industry and universities thereby encouraging the formation of a government-industry-university triple helix (Etzkowitz & Leydesdorff 1997). Such formation was, however, not encouraged by the Trust. The agreement was, rather, that the Trust sponsored the institute through a five year renewable contract. During that period they were to be the main provider of resources to the institute which should, then, pay back in excellent research.

But how does one measure success? Judging by the reports of the institute and by the things valorised in the daily interactions, one standard appeared to be the most important: peer-recognition in its various forms. The most important aspect of this was the track record of published papers, but there were also other symbolic markers of recognition such as invitations to give special, honourable lectures, prizes from various committees and invitations to membership of various scientific organisations. These measurement of productivity and success were very visible in the day-to-day interactions of the place. Each time a paper was submitted for publication, the abstract was circulated on the internal e-mail, people receiving prizes were publicly men-

tioned and lauded, and when one of the senior researchers became a member of the highly prestigious Royal Society, a small reception was held for all members of staff. On the third floor, where the principal investigators resided, emblems of success were furthermore made publicly visible in the form of framed pre-prints of papers published in *Science* and *Nature*, two journals widely accepted as the most important journals for any scientist to publish in. Other walls would spot posters announcing important scientific talks given by researchers from the institute.

By most conceivable standards the centre was doing very well. According to the Science Citation Index, the senior scientists had thousands of citations of their work, and rumours had it that at least two of them were in the British top 10 of most quoted scientists. Sceptics both within and outside the department claimed, however, that these impressive results not only expressed the long-term scientific importance of the work done. According to their analysis of the Science Citation Index numbers, which ran along the same lines as the one conducted by the Martian anthropologists, the impressive amount of citations was partly due to the enormous hype (McCrone 1999) that surrounded the field of brain-imaging in the 1990's. A hype which almost automatically secured a higher rate of citation than in any other related field, and this gave the leading scientists in the field many opportunities to collectively boost citation ranks by quoting among themselves.

The workings of the Science Citation Index system as outlined by the Martians appeared, in other words, to be a generally known and accepted fact. This definitely put some pressure on the younger researchers about to establish themselves. It was seen as important to think out experiments in such a way that they could be published in 'good' journals. Before conducting an experiment, one would discuss which journals could potentially publish the expected results. In this process Impact Factor tables, that analyse the average amount of citations generated by publications in various journals, were an important tool. In my interviews, many young scientists would express a feeling of tension between these 'mundane' aspects of gaining credentials in a scientific career on one hand, and the larger project of adding novel, important knowledge to Science on the other. The latter project was a norm that many would explicitly and without questioning claim to identify with.

As everywhere else, norms were rarely discussed publicly. The four norms of the scientific ethos outlined by Merton (1942) *Universalism, Communism, Disinterestedness, Organised Scepticism* did, however, appear as useful notions

around which important aspects of the internal logic of the place could be condensed. One of the important outputs of the institute is a software package that has become one of the most used frameworks for the manipulation and interpretation of the highly complex brain-imaging data. It elegantly integrates a couple of well-known statistical methods and it allows for the generation of results whose statistical significance is supported by a long tradition of scientific knowledge and practice. Over the last 10 years the software package, along with the methodologies and conceptualisations inscribed in its use, has become central in setting the standard for how findings worthy of publication can and should be extracted from the massive arrays of raw data generated by brain scanners. The software is therefore a practical implementation of the *Universalist* idea »that truth-claims, whatever their source, are to be subjected to *preestablished impersonal criteria*« (op. cit. p. 270). Although the development and maintenance of the package requires a substantial amount of man-power, it is made publicly available via the World Wide Web, and free support is offered through the e-mail based help-line frequented by the community of researchers using the software. This way of sharing and distributing results of scientific work is, in other words, fully in line with Merton's norm of *Communism* which implies that »the substantive findings of science are product of a social collaboration and are assigned to the community. They constitute a common heritage in which the equity of the individual producer is severely limited« (op. cit. p 273).

Due to the explicit policy of the Trust, a level of institutional *Disinterestedness* was inherent in the very funding structure of the department and contrary to many other current brain-research centres, there were hardly any signs of a close co-operation between science and industry that could pollute the 'pure science' aspect. On the contrary, this institutional attitude appeared to enjoin disinterested activity to the extent that »it is to the interest of scientists to conform on pain of sanctions and, insofar as the norm has been internalized, on pain of psychological conflict« (p. 274). As described by Merton, this norm of disinterestedness was not blindly internalised, it was rather an ongoing focal point for the interpretation and evaluation of actions conducted by people both within and outside the department. Finally, the *Organised scepticism* was not only a concurrent tone of the informal interactions, it was also the theme underlying most of the recurring ritualised meetings attended by most of the staff. In the weekly *Journal Club*, for instance, a recent, allegedly important scientific paper would usually be discussed and torn apart by the community of researchers. Similarly, in the weekly *Project Presentations* proposed experiments were made subject to tough discussions and scrutiny that would often change the design and outlay of the experimental paradigm.

The Martian outsider observed something similar to the Mertonian norms organising and attracting the behaviour of scientists. They did, however, diabolically suggest that if one shifted the frame of reference from the community of scientists to the society in which this community was embedded, the four norms could be given the radically different headings of *Cultural Imperialism*, *Mafiosism*, *Opportunism*, and *Collective Irresponsibility* respectively. They interpreted this finding as a normative underdetermination of science since the same set of norms can be given alternatively valued spin according to the context in which they are regarded (op. cit. 62-67). We shall return to the Martian interpretation later, but for now it suffices to say that at a descriptive, as opposed to an evaluative, level there appeared to be a strong correlation between the findings of the Martians and my field-work experiences.

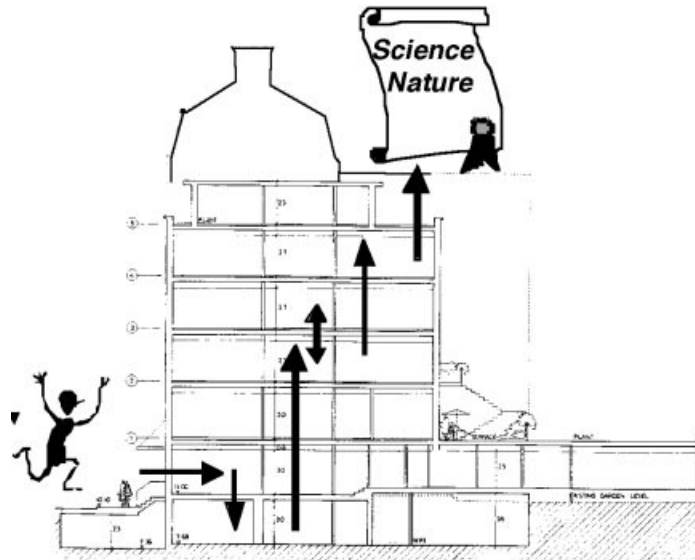
The importance of the Science Citation Index and the rediscovery of the Mertonian norms were, however, not the only findings that our Martian anthropologists appeared to get right. They claimed in their analysis that Science, as an institution, be best analysed as a special instance of the general religious structure. Institutions are, however, not only abstract entities, they are also situated in concrete locations, workplaces (Hacking 1988) where the abstract logic of the tradition is being turned into practice. That implies that if the Martian analogy is correct, then an analysis of the actual site of science should identify structures, functions and meanings comparable to a workplace of Religion such as a temple or a monastery.

An analysis of the symbolic meaning of the physical lay-out of the institute appeared, indeed, to confirm the finding of the Martian anthropologists. Although the building was purpose-built in the beginning of the 1990's it had inherited the name, St. John's House, and the physical face from the previous building at the site which since the beginning of the 20th Century had housed a convent. Standing high over the entrance door, a statue of St. John still symbolically baptised everybody walking into the building. In its contemporary function, the institute had a strictly hierarchical organisation of physical space. Individual volunteers, called *subjects* in the vernacular of the place, would walk under St. John, into the house and down to the scanners in the basement where they underwent a number of examinations. As an outcome of this, the subjects, or more precisely representations of activity in their brains, were transformed into data in the form of mathematically described objects. In the ideal description these data would flow up through the house to the second floor where young scientists, the fellows, would subject them to the first analysis. The transformed data would then be discussed with the

senior scientists *the principals* residing on the third floor. Finally they would be presented in the seminar room on the top floor before they could leave into the global circulation of scientific knowledge presented in conferences and solidified and inscribed in leading journals (Roepstorff forthcoming).

The house is therefore in cosmological terms a site of transformation: A black box (Latour 1987) where subjects entering under the baptising hand of St. John in a vertical flow through the house are being turned into objectivity ready to be inscribed in the immortal annals of *Science* and *Nature* (Figure 1). As the old convent, the modern laboratory thereby connects a profane world of day-to-day interactions to a sacred transcendental world of meaning above time and space.

Figure 1: The laboratory as a black-box transforming subjects into objectivity in a vertical flow through the house.



Apparently we see in the structure and function of my site of research an archetypal embodiment of the mainstream scientific project as outlined by the Martian Anthropologists. On an institutional level, Science apparently shares with Religion a cosmological role in establishing what is true and eternal as opposed to just arbitrary, profane and politically motivated. On a functional level, science appears, however, to be somewhat more mundane: It is about publishing, disseminating, and writing; about being cited and getting recognised.

It may appear that I have been overly emphasising elements that would fit into this picture. Obviously it is difficult for me to prove that I have not been misled by my own analysis, but even on close reflection I don't think that I have systematically committed that error. Rather, the remarkable coherence between the structure of the building, the day-to-day activities and the archetypal Mertonian norms of science should properly be understood in relation to the on-going reconstruction of the scientific field as described by the Martians. The change in research-funding during the 1990's in Britain meant that, judged by Mertonian standards, much of public, state-finance research funding have become polluted by the need to stress commercial application and align the research with short-term policy plans. The Trust appears in the economical-ideological landscape of science policy as a non nation-state source of substantial economic and symbolic capital, explicitly holding a particular set of traditional (Mertonian) norms in high esteem. It thereby supports and reinforces an orthodox interpretation and representation of the scientific norms and values that explicitly and demonstratively works against much of the current public research policy which, relative to the Mertonian standards, favour a heterodox alliance with commercial interests and short-term political priorities. As always when one identifies a shift from doxic unquestioned values, such as the Mertonian norms in their first formulation, to an explicit presentation of orthodox and heterodox interpretations, this suggest that a reconfiguration of the surrounding political and social field is ongoing (Bourdieu 1977; Strathern 1995). That reconfiguration is very likely due the decoupling of the nation-states and Science foreseen by the Martians. A decoupling that takes apart institutions which appears to have been connected at least since the modern nation-states arose sometime in the middle of the 19. Century. In this ongoing process of change the Trust appears to emphasise the idealised norms and values of the scientific identity.

Whereas the Martians interpreted this decoupling as the coming of a second Enlightenment (Fuller, 1997, p. 60-62), the results from my fieldwork could, however, just as well point to a different scenario: A situation similar to the pre-nation-state medieval Europe where rich monastic orders were working alongside state institutions of the pre-nation political landscape, sometimes co-operating, sometimes struggling against them. Perhaps the Trust and other similar entities will in the future be seen as acting in a similar way in the post-national political landscape. They set up symbolic monasteries that not only act as a framework for the practical doings of scientists, but also as cathedrals acting as sources of identification and sites of maintenance for

transcendental values of a Mertonian Science. Rather than a 'new' enlightenment modernity, we therefore appear to see an amodern scenario. Amodern because two of the most forceful elements of modernity, a conceptual nature-culture dichotomy (Latour 1993) and a political nation-state unity (Greenfeld 1992) both appear to be undergoing major reconfigurations.

With this analysis at hand it suddenly makes sense why my initial chain of associations to *Science under Pressure* led me from the mutilation of a beautiful piece of human construction to a Russian biologist. Most of the former Soviet Union have, namely, in the most brutal way experienced a decoupling between the (nation)state and the financing of science. In that part of the world it appears, however, to be absolutely uncertain which instances will fill out this gap and how the coming reconfiguration will affect not only the practice of science, but also the norms and values it will follow and/or identify with.

Fourth encirclement: the Outsider and the Insider perspectives revisited

On a descriptive level, the Martian analysis appears to resonate well with my results. There is, however, another more evaluative level, where the Martians, or perhaps Fuller's reading of them, in my opinion misconstrue central aspects of science. Fuller claims, namely, that the Martians in paralleling Science and Religion make a serious debunking of the whole scientific project. This is, however, only possible because the Martians, properly unknowingly, reproduce epistemological problems concerning knowledge generated by Outsiders and Insiders that have for some time been a major concern to earthling anthropologists studying knowledge in general and scientific knowledge in particular.

The Martian paper represents, according to Fuller, the view of the ultimate Outsider designed for Outsider consumption and this perspective is in Fuller's representation ideal for secularising and de-mystifying the notion of Science that to ordinary Earthlings are surrounded by an air of the sacred. Properly unknowingly the Martians thereby reproduce the strategy commonly applied by Earthling critical intellectuals (no mentioning of Fuller here) who see it as a noble pursuit to demonstrate that behind any apparently stable and solid representation lies nothing but fetishism and false consciousness (Latour 1999: 276-280). The difference between the knowledge claims of Insiders and Outsiders was, as so much else of relevance for the contemporary discussion of science, discussed by Robert Merton, this time in one of his later articles on the sociology of knowledge »The Perspective of Insiders and Outsiders«

(Merton 1972). The paper is fuelled by a concern about the rise of the so-called *Insider Doctrine* of knowledge which in its strong form claims »the epistemological principle that particular groups in each moment of history have *monopolistic* access to certain kinds of knowledge« (p. 102).

Tracing the doctrine in the recent history of ideas from Marx to the German nazis, Merton discusses at length the version of it propagated by his contemporary black intellectuals who claim that »as a matter of social epistemology, *only* black historians can truly understand black history, *only* black ethnologists can understand black culture, only black sociologists can understand the social life of the black and so on« (p. 103). This analysis demonstrates that the epistemological and ontological claim of the Insider Doctrine develops in social groups 'on the way up' fuelled by an impetus to gain control over their social and political environment (p. 110).

In Merton's material, the Insider doctrine does not apply to the natural sciences since it«does not argue for a Black Physics, Black Chemistry, Black Biology or Black Technology for the new will to control their fate deals with the social environment, not the environment of nature....[and there is moreover] nothing in the life experiences of Negroes that is said to sensitize them to the subject matters and problematics of the physical and life sciences« (op. cit.). In the current discussion on the natural sciences, we see, however, a clash between Insider and Outsider perspectives. The Outsiders, often arguing along the lines of Fuller's Martians, claim to debunk the whole notion of science and they are being confronted by the so-called Science Warriors that claim only Insiders, that is scientists and a few respectable philosophers of science (Weinberg 2000), should speak on behalf of Science. The argument of the scientific insiders run very much along the lines of Merton's analysis. As opposed to the Black intellectuals in Merton's case, scientists do have something in their personal and professional training and life experience that could be said to sensitise them to the physical and life sciences. They are therefore in a position where they can claim a particular Insider-knowledge of the sciences. In contrast to the Black intellectuals discussed by Merton, this application of the Insider doctrine does, however, appear to be a response to a feeling of pressure (Sokal 1996)⁴, rather than as a tool employed by people on the way up the social ladder.

⁴ *The most famous battle in the 'Science War' between what one could call Radical Realists and Universal Constructionists was the well-known Sokal affair, a battle beautifully won by the science warriors. It might, however, be a Pyrrhus victory that did not at all confront the real problems underlying the current pressure on science and scientists (for a discussion see Kjærgaard 1997; Roepstorff 1999).*

In ethnography and anthropology, the methodological debate has continuously been nourished, sometimes in an almost navel-contemplating way (Clifford & Marcus 1986), by an examination of the possibilities and problems of the insider-outsider distinction. This has indeed been the case ever since field-work-based research became *the* methodology in ethnography in the beginning of the 20th Century with the explicit aim of grasping, 'the native's point of view, his relation to life, to realise *his* vision of *his* world« (Malinowski 1922: 25). The traditional field-work method relied on (a myth of) the possibility to reconstruct from the outside the native's point of view, so that this Insider perspective and all its limitations could be dissected and communicated. The epistemological and phenomenological movement underlying this strategy has, however, been increasingly difficult to uphold once anthropologists turned the attention to their own societies. This radically problematised the very existence of an 'outsider' platform from where the Insider perspective could be constructed.

This problem is arguably nowhere more potent than in the emerging field of 'anthropology of science' (Latour 1990). It can be argued that none of the emerging bulk of 'outsider' studies of science represents a truly outside perspective. As the anthropologist and his or her subjects are immersed in and have emerged from rather similar life-worlds, it is, rather, studies conducted among like-minded people with whom one shares professional, educational and personal experiences. This means that it is almost impossible in a consistent way to treat the more or less obscure abstract concepts, that one encounters, as free-floating arbitrary notions. This has otherwise been *the* treatment of notions from magic to *kula*, that in the hands of the anthropologist can be made to point to a real reality invisible to the poor insiders that are trapped in their own notions. A classical strategy applied when studying knowledge of 'the natives', applied by Lévy-Bruhl (1966), Lévi-Strauss (1962), Malinowski (1954) and Atran (1998) alike for varying purposes, has been to judge the knowledge of the natives by the (supposedly) universal standards of scientific knowledge. This conceptualisation only made sense because these anthropologists did not feel a need for explaining science, which was simply taken for granted as a universal measurement. This observation was already made by the Polish microbiologist and epistemologist Ludwik Fleck in 1935 (1979) but nobody paid any attention to him in his lifetime. It was only when anthropologists began studying the actual work of scientists, which proved no more straight forward than the doings of the natives, that it became obvious that there no longer was a stable, outside ground that one could compare to. (Latour 1990).

The Martians did, as many modern so-called critical social scientists (Latour 1999: 276-280), try to ground the epistemology of their natives, the scientists, in their societal structure. That is, however, not a feasible method either, since the very content of the knowledge generated within a particular tradition is not a simple derivative of the social. On the contrary, knowledge is an integral part of the social since, to paraphrase Bruno Latour, »a society that collides particles inside gigantic accelerators, [or a society that study the nature of the mind in brain scanners, AR] is not the same as one that does not« (Latour 1990). This implies that it is not, as the Martians attempted, possible to use 'the social' as a neutral ground onto which one can analytically project science. The interesting question is, rather, how nature, society and 'cosmology' is made in one simultaneously movement.

This is well exemplified by the institute that I visited. The Mertonian *idealistic* interpretation would be that they were simply following the silent norms of proper science. A Martian anthropologist would against this propose a *critical* interpretation, namely that they are indeed just a religious institution in disguise, hiding earthly human ambition under the veil of the magic of science. The *realist* earthling anthropologist would be able to recognise both perspectives, but he would not focus on the evaluation of the norms as such. He would rather be stricken by the fact that in the institution, knowledge and cosmology appear to go hand in hand. This is not because the two reflect each other, for there is no direct connection between the norms, structures and social organisation of the laboratory on one hand (Roepstorff forthcoming), and the actual content of the knowledge being produced on the other. There is, however, apparently no problem about being at the same time a producer of knowledge at the very highest level and being an almost explicit temple to *Science* and *Nature* understood both as abstract entities and as concrete sites of publication. This shifts the analytical focus away from an normative evaluation of the norms to an analysis of how they intermingle with the social organisation. The Insider interpretation, that the Outsider anthropologist would not directly disagree with, is that it is precisely because the institute adheres to Mertonian norms and because one takes on the responsibility and the possibilities that goes with them, that one may create that very special environment which is needed for knowledge to be made creatively and scrutinised properly.

Conclusion

Once one has relegated from the artificial outsider-insider dichotomy, the Martian/Fuller question of whether the belief in science is superstitious and whether science is nothing but a religion-substitute becomes relatively ridiculous. The anthropologist would claim, although he may on this point part with his informants, that obviously science is not just a passive reflection of a given reality. It is an active process of making knowledge (Fleck 1979). Through this activity other aspects are generated as well: a social order that stages how, why and by whom knowledge should be made, truths established and controversies settled. In that perspective it is important to know what are the explicit and implicit rules of the game: Are we playing by and judging each other by Mertonian norms, or do we follow other rules? Or, to paraphrase a recent case from Denmark who should we trust when we decide whether chewing gum is good for our health? What is at stake is, in other words, how science is to be placed in the social order (Merton 1938), and what types of institutions are set up to decide what is right and wrong (Vestergaard 2000).

In the Science-Pressure metaphorical landscape, that I outlined in the introduction, this question resides somewhere near the attractor-site where the beautiful sculpture-being-crushed resides. The two cases of the Russian biologist and the European brain mappers apparently reside near the other attractor where science is a practical activity undertaken by concrete people. There is, however, a common link between these two cases that sends an extension right across the science-pressure landscape to the other attractor of the beautiful human construction threatened by brutal forces. The Russian biologist, that asks to be embedded in new networks, and the Trust, that in an orthodox movement supports and imposes the importance of old norms, are both active responses to common global changes in the current role of science, both in terms of the funding structure and in terms of the place of science in the social order and in the public image. These changes appear to imply that a special role for science in the social order can no longer be taken granted, and that in the future the part played by science may be very different from the present one (Vestergaard, *op. cit.*). As a response, both parties appear to be consciously striving to connect the day-to-day activities of making science with an abstract idea of science as a beautiful and privileged sphere of human activity. This is part of an active process of making cosmology (Barth 1987) and social order and of establishing criteria for who and what should be trusted in settling what is right and wrong.

In this process, there are neither specially privileged outsiders nor insiders. On the contrary, the issue is much too important to end up as a clash between self-proclaimed Insiders insisting on the special role of scientists to talk for science confronting rhetorically constructed Outsiders setting out on the don quixoteian mission of de-mystifying and de-bunking.

The take-home message from this science study lies, therefore, somewhere else: There is no inherent contradiction between science, culture and cosmology. On the contrary, when making science people do, as when they do all sorts of other things, also make culture, cosmology and social order. The challenge lies, therefore, in transcending the banal dichotomy between the Insider and the Outsider perspectives where the Insider claims »pure science is not to be touched by outsiders« while the Outsider claims » what you call science is nothing but religion which is nothing but the social expressing it-self«. As the *bon mot* for this diplomatic mission it is worth recapitulating how Merton ended his little treatise on Insiders and Outsiders:

»Insiders and Outsiders unite. You have nothing to loose but your claims. You have a world of understanding to win (Merton 1972).«

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