

## Postmodernism and our understanding of science

### Introduction

In 1987 the *Philosopher's Index* opened the category postmodern(-ism) for the first time. In June 1994 one finds 699 entries in this category. This indicates how postmodernism exploded onto the philosophical scene. Characteristic of postmodernism thus far is the wide variety of themes variously applied to different disciplines. There is no consensus amongst users of postmodern ideas on the definition, scope and relations between such ideas (cf. Kirsten 1988:20). Ultimately postmodernists would resist any attempt at categorizing the definitive characteristics of postmodernism.

One could, however, give a short, incomplete description of some of the most prominent ideas developed by postmodernists over the past decade or so. They include Jean-Francois Lyotard's notion of the incredulity towards metanarratives (Lyotard 1979:xxiv). Metanarratives are attempts to interpret events in such a way as to indicate where something (persons, groups, nations, societal institutions) come from, what they are and where they are going to (cf. Heller and Fehèr 1988:2). Thus metanarratives legitimate what people do and justify their choice of action. Grand narratives which purport to interpret history, so Lyotard contends, have become incredulous.

Another strong postmodern idea comes from Jacques Derrida. His idea of deconstruction signifies a postmodern way of reading texts. The concept of a text becomes metaphorically extended to include persons, events and institutions. Deconstructing texts is a matter of "gaining access to the mode in which a system or structure, or ensemble, is constructed or constituted, historically speaking. Not to destroy it, or demolish it, nor to purify it, but in order to accede to its possibilities and its meaning; to its construction and its history" (Derrida in Mortley 1991:97). Closely associated with this style of reading texts is the idea that no authoritative interpretation of any text is possible and thus multiple readings of a text are possible and justified.

A large part of the writings on postmodernism has an underlying commitment to foster ideas of heterogeneity, fragmentation and difference (cf Boyne 1990:19). Wolfgang Welsch (1988:39) identifies this commitment as the crux of postmodernism: "indem sie die zutage tretende Vielfalt in ihrer Legitimität zu sichern und zu entfalten sucht." This implies an attitude of openness to anything different and thus the acknowledgement of the heterogeneous nature of our world.

Despite the flood of philosophical texts on postmodernism, relatively few attempts have been made to gauge the importance of postmodern ideas for the philosophy of science. However, Lyotard's enormously influential text *The postmodern condition* (1979) focussed on science and knowledge. He put the term metanarrative (grand narrative) into circulation. Lyotard defines the term modern to refer to the way in which science tries to legitimate its own status by means of philosophical discourse which appeal to some kind of grand narrative (Lyotard 1984:xxiii). Science needs to legitimate itself as being true knowledge by making use of another kind of knowledge, which Lyotard calls narrative knowledge (Lyotard 1984:29,30). Without this legitimation science

would presuppose its own validity and proceed on prejudice (Lyotard 1984:29). He examines two such grand narratives that previously legitimated science in the modern world, but now have lost their credibility. One is science as the liberator of humanity and the other science as a good influence on the character of its participants. He describes his now famous definition of the concept postmodern, namely an incredulity toward metanarratives, as being extremely simplified (Lyotard 1984:xxiv).

Lyotard (1984:18-27) also strongly focuses attention on the important role of narratives in human life in that narratives provide a certain kind of knowledge that cannot be had in any other way. He regards narrative and scientific knowledge as two distinct species of discourse (Lyotard 1984:26-27), which both fulfill legitimate functions and no one's existence is more or less necessary than the other's. Lyotard himself sees the function of legitimation as the primary role for narrative knowledge, and discusses it mostly in that context (1984:27-37).

In this article I want to look at philosophers who give different appraisals of the merits of postmodern ideas - with Lyotardian ones featuring prominently - for philosophy of science and our understanding of science. I will examine the attempts by Nancey Murphy (1990), Pauline-Marie Rosenau (1992), Zuzana Parusnikova (1992) and Joseph Rouse (1990, 1991a, 1991b) to develop (or reject) a postmodern philosophy of science. In a final section I will determine the worth of their views for our understanding of science and philosophy of science.

### Different appraisals of the use of postmodern ideas

#### Nancey Murphy

How varied and controversial definitions of postmodernism can be is clear from Nancey Murphy's article "Scientific realism and postmodern philosophy," in which she uses her own version of postmodernism to discredit scientific realism. According to her (Murphy 1990:292), postmodernism is the result of a revolution that took place in philosophy just after the middle of the twentieth century. This revolution radically changed conceptions of knowledge and language so that representatives of modern and postmodern conceptions often fail to communicate with one another. The originators of these changes are mainly W.V.O. Quine (and maybe Thomas Kuhn) in epistemology, and Ludwig Wittgenstein and J.L. Austin in philosophy of language.

It is clear-cut, says Murphy, that three central philosophical theses have dominated modern thought up to the middle of the twentieth century. The first is epistemological foundationalism, which she (Murphy 1990:292) defines as the view that knowledge can only be justified by "reconstructing it upon indubitable 'foundational' beliefs." Another dominating modern philosophical thesis is the representational or referential theory of language. Murphy (1990:292) defines this view as one which says that language gets its primary meaning "by representing the objects or facts to which it refers." The third philosophical thesis of modern thought is individualism (atomism) (Murphy 1990:292), which takes the individual "to be prior to the community." Murphy acknowledges the existence of minority positions in modernity, but claims that they have been decisively

shaped by the dominant philosophical theses already mentioned.

Murphy defines postmodernism thus as that which departs decisively from these theses. Postmodern epistemology as holism-cum-pragmatism is exemplified in Thomas Kuhn's philosophy of science, which Murphy (1990:294) describes as a "philosophy-of-science version of Quine's view of knowledge". This means that knowledge is now viewed holistically as a network or fabric, that a community only changes for pragmatic reasons (Murphy 1990:294). The postmodern view of language is found in the theory of meaning as use, developed by Ludwig Wittgenstein and J.L. Austin. This view appreciates both the "multiple uses of language", as well as the "many complex relations it has to the world" (Murphy 1990:294). Both these views - on epistemology and language - emphasises the indispensable role of the community in postmodern thought against modern individualism. As Murphy (1990:294) puts it: "language and the search for knowledge are communal achievements".

Whether Murphy is correct in her characterization of postmodern thought is beside the point (cf. Parusnikova's rejection (1992:25) of her views). Her view does however demonstrate that no clear and generally accepted demarcation is possible between modern and postmodern thought. It might thus be suggested that one should rather develop the idea of a continuum along which typical modern philosophy gradually acquires some of the varied characteristics of a postmodern nature. This proposal will be taken up in the conclusion.

#### Pauline Marie Rosenau

Pauline Marie Rosenau (1992) surveys an extremely wide range of postmodern texts written on a diversity of topics in order to gauge their relevance for the social sciences. According to her, postmodernism poses seemingly endless challenges for the social sciences, as it "rejects epistemological assumptions, refutes methodological conventions, resists knowledge claims, obscures all versions of truth, and dismisses policy recommendations" (Rosenau 1992:3). These challenges, Rosenau (1992:5) says, constitute some of the "greatest intellectual challenges to established knowledge of the twentieth century."

Rosenau points out that postmodernism was widely welcomed because it arrived concurrent with, and perhaps in response to major changes in the world, such as "societal upheaval, cultural transformation, political change, deep philosophical debate about core values, and disciplinary crises" (Rosenau 1992:9). The origins of postmodernism are also diverse. It has overlaps with several contemporary intellectual movements, such as French structuralism, romanticism, phenomenology, nihilism, populism, existentialism, hermeneutics, Western Marxism, critical theory and anarchism. She indicates that postmodernism shares elements with such views, but also differs from all of them. Postmodernism has a cut-and-paste character and shows an absence of unity. This is because postmodernism allows and encourages an infinite number of varying and differing combinations of alternatives drawn from a diversity of intellectual backgrounds. These combinations appropriate, transform and transcend the diverse ideas from various origins that are fashioned into a pastiche

(Rosenau 1992:12-14). This process of designing postmodern viewpoints explains why it is so extremely difficult to accurately characterize what postmodernism is. It also explains why it is so easy to select one or a few postmodern ideas and apply it to a certain topic and still have something "postmodern" - it is almost the way in which viruses duplicate themselves by continually changing their structure and genetic make-up! This analogy seems to fit postmodernism, a movement that is not "static and unchanging; rather it is endlessly dynamic, always in transition" (Rosenau 1992:17).

Although it is extremely difficult to classify postmodern ideas into a coherent conceptual scheme, it is possible to distinguish two broad strands within the postmodern debate. Rosenau refers to these strands as affirmative and skeptical postmodernism. Affirmative postmodernism is a general orientation which is generally hopeful and optimistic, and thus open to positive political action and the making of normative choices (Rosenau 1992:15,16). This strand of postmodernism envisages a new post-modern social science with "goals and methods substantially different from those of modern social science" (Rosenau 1992:169). Their emphasis would not be on prediction and policy formation, but rather on a kind of description which would focus on "novelty and reflexivity as it looks to the richness of difference and concentrates on the the unusual, the singular, and the original" (Rosenau 1992:169).

Skeptical postmodernism is the dark side of postmodernism, which offers a "negative, gloomy assessment" and argues that "the postmodern age is one of fragmentation, disintegration, malaise, meaninglessness, a vagueness or even absence of moral parameters and societal chaos" (Rosenau 1992:15). For this reason no social or political project could be worthy of commitment. This strand is very skeptical about a new postmodern social science and sees only a very limited role - criticism and deconstruction - for it. One of their reasons is that the universe is impossible to understand and the world is "fragmented, disrupted, disordered, interrupted and in search of instabilities" (Rosenau 1992:170). Obviously there is not much to understand for any kind of social science in this sort of world!

Rosenau examines several important postmodern themes and their implications for the social sciences. Her conclusion, which she presents in a "modernist demeanor," is that she does not find a major role for postmodernism in the social sciences. Her main argument against such a role is that postmodernism is an intellectual current that emerged in the humanities, where it can be applied "without undue consequences" (Rosenau 1992:167,168). However, she questions the application thereof in the social sciences, as it rests on the mistaken assumption that only minor differences exist between the humanities and the social sciences. This shows that she cannot go along with the postmodernists when they reject the application of the model of natural science inquiry in the social sciences. (They regard this application as part of the "larger techno-scientific corrupting cultural imperative" (Rosenau 1992:8)).

An example of a view that might work well in the humanities, but not in the social sciences, is that on the production of texts. Postmodern texts do not provide any answers in advance or any indisputable results. Rather, the postmodern reader is presented with more open, less

definitive and exploratory texts that avoid judgement and closure, and that present disputable descriptions (Rosenau 1992:170). This leaves a major role for the postmodern readers as interpreters, who must give their own meaning to such texts, by toiling for answers in them. For Rosenau, however, authors in the social sciences reporting scientific results must be rigorous, analytical and ought to ground their results on reasons and good evidence (Rosenau 1992:168). This imperative stems from the socio-political role that social scientific findings play in policy-making and effecting power relations. For this reason authors in the social sciences cannot refuse to accept responsibility for their texts, as postmodernists would urge them to. By implication she says that only modern social science can be trusted to provide results that will avoid bad consequences, such as expert advice leading to bad decisions which may have "serious repercussions on human life conditions and the environment" (Rosenau 1992:168).

In this context she judges postmodern proposals for a methodological reconstruction of the social sciences as "seriously flawed and epistemologically dubious" (Rosenau 1992:168,169). She does, however, acknowledge one major contribution of postmodernism on substantive themes in that it focuses attention on the marginalized, that which is left out and those who are constructed as the other. Postmodern social scientists want to look at that which modern social science has never cared to understand in any detail such as,

"what has been taken for granted, what has been neglected, regions of resistance, the forgotten, the irrational, the insignificant, the repressed, the borderline, the classical, the sacred, the traditional, the eccentric, the sublimated, the subjugated, the rejected, the nonessential, the marginal, the peripheral, the excluded, the tenuous, the silenced, the accidental, the dispersed, the disqualified, the deferred, the disjointed" (Rosenau 1992:8).

This tendency is confirmed by the major impact of postmodernism on social science in Europe, which is the "preference for anti-quantitative methodologies and in the emphasis on a small number of cases" (Mouton 1993:3). Social scientists prefer qualitative and participatory methodologies in which they can focus on ordinary persons and their understanding of the world.

Rosenau does not seem to be committed to a specific view on the outcome of the challenges that postmodernism presents to modern social science. She regards it as unlikely that any form of postmodern social science would gain undisputed acceptance in the near future (Rosenau 1992:174). It could happen that the postmodern challenge will split the social sciences into two groups, with the one influenced by the natural sciences and the other by the humanities (Rosenau 1992:9). Another possibility is that postmodernism will be selectively integrated into the mainstream social science (Rosenau 1992:181). This opens the risk that postmodernism will lose its identity and integrity, through adapting to, and compromising with, modern social science. Such a process would involve "abandoning those postmodern assumptions that appear most absurd to conventional social science and harmonizing the remainder" (Rosenau 1992:181). No doubt that modern

social science will be calling the shots if this last scenario works out!

Although Rosenau might be correct about the origin of most postmodern ideas in the humanities, this does not seem to be true about Lyotard's *The Postmodern Condition*, which reads like a philosophy of science text most of the time. This places it in a different category and indeed worthwhile to take it, or related work attempting to spell out its implications, seriously. The discussion of Joseph Rouse's philosophy of science later on presents such an opportunity. However, Rosenau's emphasis on the differences between the humanities and the social sciences, especially the reference to the influence of social scientists on policy making and power relations, is very valuable. So too are her attempts to show how valuable postmodern insights can be integrated into rigorous social scientific disciplines.

Another important contribution made by Rosenau is her discussion of the complex origins of postmodernism and how the endless variety of postmodern viewpoints comes about. These explanations create the impression that postmodernism as intellectual movement consists of a wide variety of ideas which are endlessly combined into new versions that can be applied to ever new areas. Thus, one is cautioned to create rigid definitions of postmodernism, but rather encouraged to be aware of the endless possibilities of using one or more postmodern ideas to bring about better understanding of some aspect of reality.

Zuzana Parusnikova

In an article with the title "Is a postmodern philosophy of science possible?" Zuzana Parusnikova (1992) answers a tentative no to this question, as she does not have much hope of applying postmodern ideas to the traditional discipline of philosophy of science. She characterizes postmodernism as consisting mainly of two tendencies. The first tendency derives from the Lyotardian idea that our world is fragmented into a plurality of worlds constituted by local autonomous discourses which cannot be unified by any grand narrative (Parusnikova 1992:23). This implies that even science itself cannot be viewed as having "one homogeneous discourse but rather (the concept is) an empty label for a diversity of research areas and activities" (Parusnikova 1992:23). Science thus displays its own diversity and plurality. Each of these smaller units plays their own games and displays rules that its practitioners themselves have made. This postmodern idea on fragmented discourses would lead to philosophy of science becoming the exclusive domain of highly trained scientists concerned with conceptual issues in their own discipline. A plurality of "finite meta-discourses" about science would arise where scientists reflect on their own discipline "without any great unifying ambitions" (Parusnikova 1992:35).

The second tendency of postmodernism that Parusnikova judges to be relevant to science is the poststructuralist idea of meaning as fundamentally elusive, slippery and ungraspable (1992:21; 31). This implies that some postmodernists think it fundamentally impossible to make meaning present. Science, on the other hand, relies on the idea that it is possible to put things clearly in language, to sort them out and include them in a hierarchy. However, this tendency in postmodernism tries to deconstruct texts, which means

they want to show that every text betrays itself, has tensions between its "intended logics and various forms of unintended paradoxical activity which are suppressed in dogmatic, orthodox readings" (Parusnikova 1992:33). Taking this tendency seriously would lead to a literary criticism of scientific texts in which any authority of meaning would be destabilized (Parusnikova 1992:37).

In both cases of the two postmodern tendencies, philosophy of science is conceptualized as an "epistemological, foundationalist discipline" (Parusnikova 1992:22) which will dissolve into other activities performed by academics better equipped than philosophers. This is in full accordance with the clearly stated postmodern conception of the role of philosophy, i.e. that philosophers can no longer provide any unique insights. Thus, philosophers of science have no unique insights relevant to science, unless they become specialists in science itself; at most they can conduct conversations with disturbing or edifying functions. This does not mean that they can provide any wisdom, but that they can only provoke, challenge or entertain (Parusnikova 1992:24). At times Parusnikova has an extremely negative view of postmodern philosophers. She interprets them to be saying that nothing should be taken too seriously, as it is not worth the trouble. Therefore she characterises postmodern philosophers as being like a contemporary Socrates who questions everything, but who - unlike Socrates - are not aiming to achieve the good or truth. Thus it becomes understandable why she "fail to understand how such philosophy could relate to a scientific discourse" (Parusnikova 1992:25). However, her interpretation and use of postmodern ideas are not the only ones possible. How a more selective and fruitful use of postmodern ideas is possible can be seen in the writings of Joseph Rouse.

Parusnikova's article is an attempt to determine the relevance of Lyotardian postmodernism and deconstruction for philosophy of science. She is at least partially correct in her judgement of the implications of postmodernism for a modern, foundationalist type of philosophy of science. Lyotardian postmodernism would indeed imply a severely diminished role for philosophy of science in that its role seemingly would have to be appropriated by philosophically inclined specialists within the various disciplines, or by various scientists, historians or literary critics studying different aspects of various sciences. Whether philosophy of science's loss of the role of cultural overseer in epistemological context, "who knows everyone's common ground" (Rorty 1980:317) is something worth mourning about is dubious. It would be if no other role could be defined for philosophy of science and the acceptance of postmodernism thus meant depriving philosophers of science of any meaningful role, in that no postmodern philosophy of science is possible at all. But is this really the case? I want to argue that a critical examination of Rouse's views will show both the viability of his proposals for a postmodern philosophy of science, as well as a meaningful, though differently defined role for philosophers of science.

#### Joseph Rouse

The discussion of Joseph Rouse starts with an exposition of his characterization of modern philosophy of science, and then moves on to his two proposals for a postmodern philosophy of science. Next I discuss his use of a typical

postmodern idea, i.e. an explanation using narratives, for providing a fresh understanding of science, before I finally make an evaluation whether his proposals are viable.

Joseph Rouse's discussions of modernity and postmodernism with respect to the philosophy of science revolves around the Lyotardian idea of "global narratives of legitimation" (Rouse 1991b:610). In philosophy of science these metanarratives refer to the importance of the ability to tell a certain kind of story about the history of science which would justify the cultural authority of (natural) science in the Western world (Rouse 1991b:611). Such metanarratives touch on two issues. The one is the crucial role of the story of the spectacular growth of modern science and its wide-ranging influence through its technological applications in the narrative legitimation of modernity, as well as in the counter narratives which subvert the story of modern progress into one of unfolding disaster (Rouse 1991b:611). The other issue touched upon by the metanarratives of modern science is the attempt to justifiably view the history of science in terms of modernist ideas of progress or rational development (Rouse 1991b:611).

If Rouse (1991a:141) wants to classify most twentieth century philosophers of science - which he divides into three main traditions of logical empiricism, Kuhnian post-empiricism (or postpositivism) and convergent realism - as being modernist and thus concerned with the narrative legitimation of science, then he has to define modernity not as a position, but as a "shared field of conflict" (Rouse 1991b:610). Such a shared field of conflict has both extensive areas of agreement, as well as several areas in which sharp differences are encountered. He identifies a few areas of such agreement among modern philosophers of science - including Carnap, Kuhn, Feyerabend and Boyd - belonging to the three traditions mentioned above. The first area of agreement is that they provide a "unified narrative structure within which to write the internal or philosophical history of science" (Rouse 1991a:141). They also agree that certain important concepts used in the interpretation of science, such as explanation or confirmation, are basically the same regardless of scientific discipline or the stage of its development. That there is a unitary and hierarchical relation - in whichever direction - between theory and observation/experiment is another common assumption. The final shared area of agreement is that all three traditions find a theory of meaning/reference regarded as an indispensable key for understanding science, its concepts and theory change in a philosophical way (Rouse 1991a:141). What Rouse is trying to say is that in their criticism of the conception of a dichotomy between theory and observation, postpositivists adopted a holistic theory of meaning through which both theoretical and observational terms are "treated as being implicitly defined by the theory in which they occur" (Newton-Smith 1981:12). This contrasts with the earlier positivist and neo-positivist approach which thought theoretical terms have their meaning determined holistically, whereas observational terms have their meaning specified in terms of verification and falsification conditions (Newton-Smith 1981:11).

Within these areas of agreement, diverse modern philosophers of science share a field of conflict. An example will illustrate the point. Whether positivists and realists can successfully give a global legitimation of modern science or whether they dismally fail in the view

of radical postpositivists such as Paul Feyerabend, both parties to this conflict fully agree that the autonomy and cultural authority of the sciences require narrative legitimation. It is only in terms of this shared agreement that Feyerabend's rejection of the modernist project of legitimation could have its "proclaimed cultural and political consequence of challenging the preeminence of the sciences" (Rouse 1991b:608).

Is it possible to have a philosophy of science that reject the shared assumptions of the modern philosophy of science traditions? Rouse examines the so-called "piecemealist" critics - which include R Miller, L Laudan, D Shapere and P Galison - of these traditions to determine whether they succeed in creating a postmodernist philosophy of science in which there is no attempt at any global legitimation of modern science viewed as a unity (cf Rouse 1991b:609). According to Rouse's interpretation the piecemealists see their own fundamental break with the unified tradition in the philosophy of science as being a reorientation in different ways. They reject general explanations of science in favour of topic-specific or domain-determined explanations of science. They furthermore favour "multi-directional" relations among theories, methods, observation, instrumentation, experiment and values or goals (Rouse 1991a:155). That the nature of science can be better understood by examining necessities of language without taking into account the practice of science is also rejected. Finally, they assume to be able to provide a better understanding of the history of science as a "narrative of progress, of rational inquiry, and/or of the gradual approach toward truth" (Rouse 1991a:155).

For a balanced judgement on the piecemealist approach, which does not rely solely on Rouse's presentation of their views, I give a short overview of one such proposal, namely that of Peter Galison. Galison (1988:198) characterizes modernist tendencies in twentieth century philosophy of science in the sense of a search for a unifying scheme grounded first on observation (logical positivism) and then on theory (postempiricism). The unity of their accounts is enforced by a master narrative, i.e. by providing a privileged vantage point (Galison 1988:207), which he characterizes as: "in the case of the positivists it is from the 'observational foundation' building up, in the case of the antipositivists it is from the theoretical 'paradigm,' 'conceptual scheme,' or 'hard core' looking down." Galison typifies his own alternative as a critical postmodern model (for physics only) which creates room for a diversity of physicists, such as theorists, experimentalists and instrument makers (Galison 1988:208), who can have strikingly different perspectives from one another on their discipline. He furthermore does not want to make the unwarranted assumption that there is a universally fixed, hierarchical relation between experiment and theory; rather he develops a view in which he accords partial autonomy to theory, experimentation and instrumentation. Continuity or discontinuity does not necessarily correspond between them; according to Galison "the breaks can occur at any level and the levels are intercalated so it is quite possible for continuity to persist at one level while being broken at another" (1988:208, 209). Thus, for Galison his own philosophy of science is postmodern for its focus on one discipline alone, the accommodation of diversity in it and the varied

possible relationships between theory, experimentation and instrumentation (note that he has dropped the category of observation).

Despite the seemingly significantly different assumptions that the piecemealists share from those contained in the traditions stretching from positivism to realism, Rouse judges their philosophies of science to belong firmly to "the project of situating the sciences within the philosophical narratives of 'modernity'" (Rouse 1991a:160). The main reason for his judgement is that they too interpret the history of science as a narrative of progress, rationality or the successful pursuit of truth, which serves to legitimate scientific practices and results (Rouse 1991a:160). The commitment of the piecemealists to provide a better narrative of scientific progress leads them to provide their own versions of an internal history of science (Rouse 1991a:157). Maintaining this idea requires that they distinguish between the content of science (its theories, methods, observations, reasoning) and the context within which scientists conceive, establish and communicate this content. The factors grouped under the content of science are the ones they regard as fundamental for understanding the development of science. Despite their avowed disinterest in a theory of meaning, this distinction demands an underlying theory of meaning which would justify "the identification of this common content across various modes of presentation, to different intended (and unintended) audiences, whose goals and assumptions may differ" (Rouse 1991a:158).

Even more damaging to their attempt to construct a postmodern philosophy of science, according to Rouse, is their emphasis on the diversity of scientific disciplines against the idea of a unified science. Acknowledging a diversity of autonomous domains of science which function according to their own rationality is judged by Rouse (1991a:157) not to be an appropriation of the postmodern emphasis on heterogeneity, but a promotion of the "disciplinary closure and autonomy which is the other side of modern rationalization." Thus Rouse prefers to once again interpret piecemealists as being modern, because he can purportedly show that their proposals concur with a fundamental part of the story of modernity, i.e. "the construction of autonomous domains of knowledge and practice, which can be rationally administered in accordance with internal goals and standards" (1991a:157). Whether his interpretation of the piecemealists is fair, will be critically examined in the evaluation of his views.

#### Two proposals for a postmodern philosophy of science

If the piecemealists are, according to Rouse, unable to break away successfully from the modern paradigm of philosophy of science, two questions arise. Is it possible for Rouse himself to break away from this paradigm, and if so, how does he do it? Rouse puts forward two affirmative proposals. One proposal he presents as an interesting but untried recipe - which he acknowledges would still take "much skillful adaptation to come out well, if it can do so at all" (Rouse 1991:161). Important ingredients of his recipe include doing without any attempts to narratively legitimate the history of science as a history of rationality, progress or the search for truth, as well as without the delegitimation and debunking of science by means of anti-modern narratives. This implies that scientific practices and disciplines will be partially

legitimated within specific contexts and for particular purposes, and this localized legitimation - meaning legitimation conducted by scientists in and for their own specific disciplines - will not square well with the large-scale legitimation attempted in grand narratives. Limited, local legitimation also means a revision of the concept of science, which emphasizes that various sciences differ interestingly from one another, and are complexly related - though these are not limited to their mutual relationships, but are also found among various components within a scientific discipline itself (cf Rouse 1991a:161). A further ingredient of Rouse's recipe for a postmodern philosophy is the proposal to blur the distinction between the internal and external history of science, as well as to acknowledge that the concept of science has blurred edges in that it can refer to much more than just theories, observations and experiments and might also include museums, technology, science classes, advertisements, and so on. He furthermore proposes to think of knowers as "situated agents with an inescapably partial position" who are not studying a natural world out there, "entirely distinct" from the ways human beings interact with it (Rouse 1991a:161).

Rouse's second proposal for a postmodern philosophy of science consists of his critical examination, as well as endorsement of Arthur Fine's views as an example of what would fit in with his proposal for a postmodern philosophy of science - despite the fact that Fine himself does not present his views as being explicitly postmodern. This proposal - the endorsement of the contents of Fine's philosophy - contains another example of a theme that is clearly related to Lyotard's postmodernism. It is an attempt by Fine to develop a philosophy of science without any grand narratives, in which the legitimations of scientific disciplines and practices - in the words of an ingredient of Rouse' recipe - are "always to be partial, and to take place in specific contexts, for particular purposes, to which large-scale (de-) legitimation has little relevance" (Rouse 1991a:161). This idea is very similar to Lyotard's alternative to consensus which he regards as an "outmoded and suspect value" (Lyotard 1984:66). He rejects terror, which he describes as the assumption that language games are isomorphic, as well as the attempt to make them so, instead of acknowledging that they are heteromorphous in nature. Once that is recognised, consensus is possible - resulting in a temporary contract - on the rules of a language game and legitimate moves therein, but he emphasizes that such consensus must be local, in the sense that the present players of a language game (scientific discipline) agree on it and that it is subject to cancellation at any later stage (Lyotard 1984:66). This seems to be the underlying rationale that Rouse accepts for a postmodern philosophy of science, which will be illustrated below by Fine's philosophy of science and Rouse's endorsement thereof.

Rouse (1991b:609) chooses to discuss Arthur Fine's postmodern philosophy of science because Fine's opposition to any global legitimation project for science is "more centrally and explicitly" developed than anyone else's, without giving in to science-bashing or relinquishing the intellectual means necessary for a critical discussion of the cultural and political significance of the sciences. Fine clearly fits into the requirements that Rouse sets out for a postmodern philosophy of science when he interprets realist and instrumentalist

philosophies of science as attempts to make sense of "science" (Fine 1986:171). This implies a common presupposition that modern science requires or permits a general interpretation of the scientific enterprise as a whole (Fine 1986:171). He rejects this approach to science and wants to explore "what happens philosophically when we approach science with trust and openly" (Fine 1986:177). Approaching science in this way means giving up both rigid attachments to philosophical ideas about science, as well as any intention to attach science to "some ready-made philosophical engine" (Fine 1986:177). What one would be left with is Fine's natural ontological attitude (NOA), which is the common ground that would be left if the attempts by realism and instrumentalism to ascribe an overall aim to science, to make sense of science and to authenticate science are rejected. This common ground would include a description of scientific practice "in terms of structures of evidence and inferences sometime generating beliefs about what is true, and sometimes generating reasonable pragmatic commitments that fall short of belief" (Fine 1986:170).

What does the natural ontological attitude imply for a philosophy of science? It implies that philosophers should resist questions about the overall aim or meaning of science (Fine 1986:172,173). This does not imply that science has no meaning or aim, but rather that such questions must be asked locally, i.e. whether a specific investigation, scientific researcher or team of researchers have aims and what meanings individual projects have. Fine urges philosophers of science to resist the logical fallacy that would lead them from the statement "They all have aims" to "There is an aim they all have" (Fine 1986:173). There is no need to worry about a general aim for science as it is possible to cope perfectly well with much less than that. Fine compares science with life in that it shows "its multiple and mini-aims daily" (Fine 1986:174). Finding general aims or goals for science would in no way improve our understanding of science. A closely related implication is that Fine regards science as an historical entity which grows and changes as a result of various internal and external pressures. This means that a variety of questions can be asked about any of its aspects at any specific time and therefore it can be studied from different angles by various disciplines (Fine 1986:173). Fine thus rejects the idea that science has an essence other than its contingent, historical existence which changes continually (Fine 1986:174).

Fine characterizes his own philosophy of science as a "minimalist stance" which shows "just how minimal an adequate philosophy of science can be" (Fine 1984:101). He recommends a trusting attitude toward the overall good sense of science, as well as our own, in which scientific truths as well as everyday truths are accepted. This acceptance follows on an inspection of a matter in which it has been decided what is most reasonable to believe in. However, explaining the everyday use of the concept of truth in a theory or analysis of truth is unacceptable to Fine (1984:101), as no additions would be either legitimate or required. His "no-theory conception of truth" sees the concept of truth as an unanalysed term with a basic and well-understood use and he accepts its usual logic and grammar (Fine 1986:175). This means accepting its variety of uses, but refraining from explaining them as grounded in the nature of truth, or attempting to show what makes truths true (Fine

1986:175). What Fine wants to argue is that philosophical conceptions of truth are global and essentialist, whereas a conception of truth functions in a pragmatic way in a local scientific context where scientists themselves negotiate their meaning for use in their specific context (Rouse 1991b:611). Thus, such conceptual questions are local issues to specific scientists who can answer them adequately "with the exercise of imagination and judgement" (Rouse 1991b:612). If philosophers of science want to play any meaningful role they would have to engage the use of such concepts by a specific group of scientists, and also respect "the contextualised concerns which circumscribe that use" (Rouse 1991b:612). Such a sensitivity to context, as well as to the historically contingent nature of science and the particular concerns of groups of scientists engaged in scientific practices and disciplines are the factors which convince Joseph Rouse (1991b:625) to endorse Arthur Fine's natural ontological attitude as a step in the right direction toward a postmodern philosophy of science.

#### The use of narratives to explain the workings of science

Joseph Rouse attempts a narrative reconstruction of science by taking up another Lyotardian idea, viz. the importance of narratives in everyday life. For Rouse this means that it is fundamental for our understanding of science to look at the work of scientists as a process, rather than view their work as a product, i.e. theories, results of experiments, or data. Rouse's narrative reconstruction of science shows how a narrative understanding of science can be illuminating. Thereby it is also explicitly postmodern in nature. He challenges the modern demand for a global legitimation of science by demonstrating that scientists do not need philosophical explications of the epistemic and ontological standing of scientific research. The reason is that a narrative understanding of science reveals that scientists have a "developing sense of what counts as an adequate explanation, of when a claim is well confirmed, of whether a postulated entity can be taken as actually existing, and so forth" (Rouse 1990:193). Rouse furthermore denies that scientists would take criticisms of their use of concepts seriously if it is based on general philosophical views; only criticism directed at the scientific concerns of a specific discipline and couched in the terms used in that particular discipline / practice at a specific time will be taken seriously (Rouse 1990:194).

Joseph Rouse's postmodern reconstruction of the activity of scientists in terms of a narrative understanding consists of explanations of science as a series of activities situated in a narrative field, of what makes scientific claims, procedures or experiments significant and of the role of scientific literature within the narrative field of science. Characteristic of his narrative reconstruction of science is his assumption that narratives are not only important to a specific group of academic disciplines, but to all of them (Rouse 1990:181). He does not show that scientific results are presented in the form of a narrative; his concerns with narratives and science lie elsewhere. He rejects from the start the possibility of imposing a narrative scheme on science, because he wants to demonstrate that "we live within various ongoing stories" - even in science (Rouse 1990:181). His emphasis is indeed on ongoing stories, which means that he understands scientific knowledge as belonging to

narratives that are continually constructed and reconstructed by several authors all struggling to play a major part in the unfolding of the story's plot.

How does a narrative reconstruction of science illuminate the activities of scientists? One way is to see scientists as sharing a narrative field, which means that several narratives are competing for dominance within a contested field (Rouse 1990:185). This means that meaningful differences as well as convergence of opinions are simultaneously possible within that field. The differences result from the work of various scientists who aim "to push the story line in different directions" (Rouse 1990:182). These different directions constantly threaten the narrative coherence within a specific scientific discipline which, in the form of a shared understanding of the current research situation, is needed for keeping differences intelligible and for creative scientific work to be done (Rouse 1990:182). New scientific knowledge, Rouse (1990:183) argues, results from this "ongoing tension between narrative coherence and its threatened unraveling".

This idea of scientists sharing a contested field of competing narratives becomes more intelligible once one asks how scientists decide on the significance of claims, procedures, experiments or theories. According to Rouse (1990:186) it is impossible to understand science unless one knows how scientists resolve this issue of the significance of any scientific contribution, as it crops up at all levels of decision-making in the scientific community. A narrative understanding of science illuminates this issue too. Scientists have a reasonably coherent narrative about the development of their field and place their own work within this narrative as "an intelligible response to the history of successes and failures" which have led to the present situation (Rouse 1990:186). If a scientific result becomes significant, it results from the extent to which such a result "advances or transforms the narrative of how a field of research has recently developed" (Rouse 1990:186). If it does advance or transform the narrative, it means that such a result becomes significant for use in further scientific investigations in that field or related ones. It also implies that significant scientific results which advance or transform the narrative, thus change the shared understanding of scientists in that field and alters ideas about what is to be regarded as significant contributions to that field (Rouse 1990:187). Because of this possibility of exerting influence on the unfolding of their narrative field, scientific research is highly competitive. Scientists vie with one another to influence the direction of research in their field and to create an important place for their results in the unfolding narratives of their field (Rouse 1990:190).

In the light of this attempt to explain scientific activity as embedded in a narrative field, Rouse explains the workings of scientific literature. He does not portray scientific papers as being narratives themselves, but rather as something that can only be understood in the context of a story (Rouse 1990:188) - the narrative field of a specific discipline. Although this narrative context is only barely, if at all, sketched within a paper, scientific authors presuppose that "their peers and readers already understand that situation" (Rouse 1990:191). They nevertheless situate the results of their scientific activity within a context containing narrative fragments of the recent development of the field, which would be adequate



for other scientists to judge whether they add to or transform the narrative(s) of their discipline (cf Rouse 1990:188,190). Thus readers of scientific papers are mostly other scientists who read with the purpose of finding out "what results they must take account of, what techniques they may usefully employ, and what research opportunities they could profitably take up" (Rouse 1990:188). Textbooks and review articles are also reconstructions of the narrative(s) of a discipline which relate significant results which have modified or transformed the narrative(s) (cf Rouse 1990:189).

#### Evaluation of Joseph Rouse

Thus far it has been illustrated how Joseph Rouse sketches the outlines of a postmodern philosophy of science which is strongly related to some Lyotardian postmodern themes. What is the worth of his proposal for a postmodern philosophy of science? Rouse succeeds in presenting a coherent postmodern philosophy of science based on Lyotardian themes. I will evaluate his view by looking critically at his use of narratives, the endorsement of Arthur Fine's philosophy of science, the distinction made between modern and postmodern and the role he assigns to philosophers of science.

Rouse's use of the idea of narratives for providing a deeper understanding of science is clearly a success. It provides us with insight in the way in which scientists judge the significance of any new scientific work and subsequently re-evaluate previous work. It also deepens our understanding of the fierce competition among scientists for getting their results accepted. Endorsing Arthur Fine's philosophy of science as conforming to his own proposals for a postmodern philosophy of science - though Fine himself does not describe his philosophy in those terms - enables Rouse to illustrate his point about the viability of a postmodern philosophy of science effectively. Fine resists all attempts at providing overall views or general theories - thus nothing in the style of a grand narrative is given. He describes science as having no overall aim, no essence and no general theory of truth. Furthermore scientists are urged to answer their own conceptual questions and philosophers - in support of Rorty's view on the diminished role of philosophy - are cautioned to resist interpreting science through their own philosophical theories.

His characterization of a modern philosophy of science with its tendency towards a unitary explanation of science seems to be accurate. However, whether he can so easily classify the bulk of twentieth century philosophers of science as being all similarly modern is questionable. One could easily argue that Thomas Kuhn provides a non-essentialist definition of science, as the nature and rules of science changes along with every paradigm shift. The same could be said about the piecemealist, Peter Galison. His philosophy of science is specifically devised for physics, and he allows for a variety of relationships between theory, experimentation and observation. He furthermore - in typically postmodern fashion - allows for, and accommodates diversity in physics. He wants to create a historiography of science that has room for "a multiplicity of cultures within the much larger rubric of scientific practice: A culture of theory, surely, but also a culture of experimentation, and a culture of instrument building" (Galison (1988:211). Although Galison appropriates other themes from the complex debates about postmodernism than the Lyotardian ones that

Rouse emphasizes, Rouse should at least acknowledge the explicit postmodern nature of Galison's work.

The interpretation that Rouse gives of Galison and the other piecemealists raises an important question. It concerns the assumption behind his discussion of them. Rouse assumes that if he can point to any form of continuity between the piecemealists and the modern tradition they try to overcome, then they fail either to overcome a modern philosophy of science, or to establish a postmodern one (cf. 1991a:155). This assumption shows Rouse's own views on postmodernism, which are mainly determined by Lyotardian themes. Rouse is too rigid in his definition of postmodernism along Lyotardian lines. At this stage of the debates on postmodernism there are several other versions of postmodernism besides those of Lyotard. Furthermore, amidst so much controversy about the characteristics of postmodernism, Rouse would do better to recognize various kinds of both modern and postmodern characteristics and thus place different philosophies of science on a continuum somewhere between being fully modern or postmodern. The overview of different philosophies of science in this article supports this view. Rouse, for example, nowhere uses deconstruction and Murphy's (perhaps controversial) classification of Kuhn, Wittgenstein and Austin as postmodern thinkers shows the extent to which issues about postmodernism are still debated, and not yet settled. Whether postmodernism is really something that tries to overcome modernity (modernism), is also still controversial. One possible definition of postmodernism - well supported in the literature - goes as follows: Postmodernism stimulates a deeper insight in, and better understanding of modernity. A definition of postmodernism can be given in Hegelian terms: postmodernism is the spirit of the Enlightenment (modernity) coming to self-consciousness, or as Giddens (1990:48) puts it: "modernity coming to understand itself." Postmodernism can be considered to be in no way trans- or anti-modern; as Wolfgang Iser says: "Sie ist eigentlich radikal-modern, nicht post-modern." Thus one can interpret postmodernism as reflection on the nature, potential, shortcomings and darker sides of modernity. That such a definition is plausible supports the view that Rouse should rather place different philosophies of science on a continuum somewhere between being fully modern or postmodern: placement would depend on the depth of influence that the appropriation of various modern or postmodern characteristics, has on a specific philosophy of science.

What role does Rouse's postmodern philosophy of science offer its practitioners? In the postmodern philosophy of science proposed by Rouse, scientists would take responsibility for the philosophical issues cropping up in the shared discourse of their own specific scientific disciplines. This would either imply that scientists undergo philosophical training as well, or that scientists have skilled philosophers of science - conversant with both disciplines - that are capable of engaging in interdisciplinary dialogue with them. It could not imply that all scientists become philosophically minded, as it just simply is the case that most scientists are not philosophically inclined most of the time. This is borne out by the experience Bryan Magee had (and the author as well) with attempts to bring scientists and philosophers together for discussion. These attempts failed for lack of



interest among scientists. Although many philosophers might have the same experience with scientists, it is also true that "many of the path-breakers who actually made the scientific revolution of this century have written books of philosophical reflection about it" (Magee 1978:203, 204). Thomas Kuhn gives a better explanation of the central role of such reflection for some scientists. They make extensive use of thought experiments, which can have the same outcome as scientific revolutions, viz. a radical conceptual change of a specific science. This philosophical aspect of scientific transformation is clearly expressed in Kuhn's reference to these scientists as the great "weavers of new conceptual fabrics" (1981:26).

The idea of Rouse that philosophy of science should be informed by a thorough knowledge of the workings of a science makes sense, as philosophical theories about science can only be meaningful and relevant if they are informed by the specific issues, contents and workings of that discipline with which scientists are (often only tacitly) familiar. Although Rouse would limit philosophers of science to this role, there is another function which they can fulfil. In a sense this function betrays the views of both Rouse and Fine on the limited role of philosophy, because it is ironically exemplified as an unacknowledged function in their own work. It has to do with the traditional broader perspective of philosophy which tends to utilize a critical distance in developing its views. This typical philosophical stance provides unique insight in, and understanding, of science. One can see it when Lyotard, Fine and Rouse apply the Wittgensteinian notion of language games to the various scientific disciplines and when Fine and Rouse give a strong non-essentialist definition of science. It also enables Lyotard to note the significance of narratives in human life and thus Rouse can use that to give a narrative reconstruction of science whereby he thoroughly illuminates the workings of science and the everyday activities of scientists. One is left, though, with a nagging feeling that Rouse might here have slipped back into a modernist approach which he so consistently detects in others, viz. the idea that science is something capable of unitary (narrative) explanation.

How do postmodern ideas contribute to our understanding of science?

What are the most important contributions that postmodern ideas can make to our understanding of science? The preceding overview of the literature suggests that postmodernism provides a bewildering diversity of ideas that can be used in an endless variety of ways to illuminate different aspects of science. Some examples are the following:

\* postmodernism makes us conscious of the metanarratives that are used to justify the cultural authority of (natural) science in the Western world. Such metanarratives use as justification either the spectacular growth of modern science, or its supposed embodiment of progress or rational development.

\* instead of the overall legitimization of science by means of metanarratives, postmodernism suggests that scientists themselves give a localised, partial legitimization of their own scientific practices and disciplines within specific contexts and for particular purposes.

\* postmodernism rejects any unified explanations of the essential nature of science. Science is viewed as consisting of a set of fragmented, local autonomous

discourses of which no one definition applicable to all sciences can be given. Similarly, science has no overall meaning or aim, although specific projects or parts of a discipline might have their own aims. Scientists themselves must reach a local consensus on the definition of their discipline or on the aim(s) of their project(s).

\* postmodernists would encourage scientists to be aware not only of the diversity of science, but also of the diversity of conceptions and practices of science within their own disciplines. Not only is there a diversity of different "cultures" (such as theory, experimentation, instrument building, cf. Galison) in physics, for example, but also a diversity of possible relationships between theory and observation. It is no longer possible to assert simplistically that observation determines theory, or vice versa.

\* postmodernism presents us with a narrative interpretation of science, which helps us to understand the workings of science as process much better. It shows that scientific knowledge belongs to narratives that are continually constructed and reconstructed by several authors all struggling to play a major part in the unfolding of the story's plot. Scientists share a narrative field, in which their narratives are competing for dominance. This means that meaningful differences as well as convergence of opinions are simultaneously possible within that field. If a scientific result becomes significant, it results from the extent to which such a result advances or transforms the narrative of how a field of research has recently developed. This means that such a result becomes significant for use in further scientific investigations in that field or related ones. It also changes the shared understanding of scientists in that field and alters ideas about what is to be regarded as significant contributions to that field.

\* postmodernism presents scientists with an ethical imperative as well. It urges scientists to become aware of all kinds of things, persons, events and issues that were previously ignored, for whatever reasons. In this sense it purports to become the voice of those who are voiceless in our contemporary culture. Such a widening of perspective and a deepening of outlook can unearth valuable new insights about the construction of our natural and human world.

\* postmodernism would, on the one hand, imply a severely diminished role for philosophy of science. Many aspects of its role would have to be appropriated by philosophically inclined specialists within the various disciplines, or by various scientists, historians or literary critics studying different aspects of various sciences. Scientists themselves would take responsibility for the philosophical issues cropping up in the shared discourse of their own specific scientific disciplines. This would either imply that scientists undergo philosophical training as well, or that scientists have skilled philosophers of science - conversant with both disciplines - that are capable of engaging in interdisciplinary dialogue with them.

However, on the other hand, there is another, more traditional function which philosophers of science can fulfil. It is ironically exemplified as an unacknowledged function in the work of these postmodern philosophers, although most of them explicitly deny this function to philosophy of science. It has to do with the traditional broader perspective of philosophy which tends to utilize a

critical distance in developing its views. This typical philosophical stance provides unique insight in, and understanding, of science, such as a narrative or postmodern understanding.

### Conclusion

At this stage of the debates on postmodernism, there is still a lot of controversy about the exact definitions of modernity and postmodernism. What is clear, however, is that postmodernism presents us with a wide variety of ideas that can be used in different combinations to enlighten aspects of our reality. Thus, different sets of ideas can be classified as being postmodern, and it is not at all clear that all these ideas can be helpful in a specific quest for a better understanding of our world. Sometimes they are helpful and sometimes not. In typical postmodern fashion one will have to cut and paste amongst postmodern ideas; appropriate, transform or transcend diverse ideas; construct them into a pastiche and apply it locally to determine its worth.

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