



“The unmasking of modern science” – the sequel (I)

J.L. (Hannes) van der Walt
Faculty of Education Sciences
Potchefstroom campus
North-West University
POTCHEFSTROOM
E-mail: jlvdwalt@intekom.co.za

Abstract

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In 1982, T.M. Moore claimed that positivism was in the process of being “unmasked”. Its shortcomings were being unmasked by its enemies as well as by its adherents. In describing the process of unmasking, Moore resorted to T.S. Kuhn’s sociological theory of normal science, paradigms, crises and revolutions. Moore then went on to challenge the Christian scholarly community to (inter alia) develop a new paradigm for science. Now, after just more than two decades have elapsed since this exhortation by Moore, a survey had to be done to see to what extent the secular as well as the Christian community has taken up the challenge and how both of them have progressed in the directions that Moore had predicted. It has also become time for the Christian community to assess its own progress towards developing a “new” scientific paradigm. In this article, the first part of a two-part article on this subject, the author concludes that modern science has not only surrendered the positivistic search for universal foundations and truth, but has become characterised by secularism, postmodern fragmentation and a preference for contingent foundations.

Opsomming

“The unmasking of modern science” – die vervolg (I)

In 1982 het T.M. Moore die stelling gewaag dat die positivisme in ’n proses van “ontmaskering” vasgevang was. Die tekortkominge daarvan is destyds blootgelê deur sowel die vyande as die aanhangers daarvan. In sy pogings om die ontmaskering te beskryf het Moore gebruik gemaak van T.S. Kuhn se sosio-

logiese teorie van normale wetenskap, paradigmas, krisis en revolusies. Moore het sy uiteensetting beëindig met ’n uitdaging aan die Christelike wetenskapsgemeenskap om na vore te kom met ’n eie nuwe paradigma vir wetenskapsbeoefening. Nou, nadat net meer as twee dekades verloop het sedert Moore hierdie oproep gedoen het, het die tyd aangebreek om ’n opname te maak van hoe die sekulêre sowel as die Christelike wetenskap gevorder het op die pad wat Moore voorspel het. So ’n oorsig bied ook aan die Christelike wetenskapsgemeenskap die geleentheid om bestek op te neem oor die ontwikkeling van ’n eie nuwe paradigma vir wetenskapsbeoefening. In hierdie artikel, die eerste deel van ’n tweedelige artikel oor die onderwerp, kom die outeur tot die gevolgtrekking dat moderne wetenskap nie net die positivistiese strewe na universele grondslae en waarheid laat vaar het nie, maar ook gekenmerk word deur sekularisme, postmoderne fragmentering en ’n voorkeur vir kontingente grondslae.

1. Introductory remarks

Just more than two decades ago, T.M. Moore (1982) published a study entitled *The unmasking of modern science*. The purpose of this publication was

to examine some of the indications of this unmasking in the writings of various religious critics and secular scientists. We hope to point out an important weakness in the theoretical foundation of modern science and to call evangelical scientists, teachers, preachers, scholars and concerned laymen to a concerted effort to exploit that weakness unto the creation of an entirely new paradigm for scientific activity (Moore, 1982:70).

At the time of publication, Moore was able to conclude that “the unmasking of modern science has begun”, and that “clearly the bastion of modern science is under assault, both from without and within” (Moore, 1982:71, 83). He also concluded that the scientific enterprise was being forced to examine itself and to face up to inconsistencies, contradictions and anomalies for which it could give no answers which satisfy its own criteria for validity. Thus, he thought, it was possible that modern science might be entering – or might be forced to enter – a period of crisis such as in the past has preceded a paradigm shift, a major alteration in the generally-accepted view of science and the scientific method. And, finally, he contended: “... if this is true, then this is indeed an opportune moment for Christians involved in that field of endeavour” (Moore, 1982:84).

He called on Christian scholars to apply their energies and efforts to three tasks:

- In the first place, there must be a continuing effort to expose the fallacies and inconsistencies of the secular and evolutionary approach to science.
- Second, there must begin a widespread yet highly organised effort to construct a comprehensive paradigm for scientific activity based upon the Biblical worldview.
- Finally, there must be a sustained and concerted evangelistic effort into the lost world, including among secular scientists. A Biblical view of science, he said, would only make sense to those who had learned to trust in Jesus Christ and had received the gift of eternal life and the new perspective it provided (Moore, 1982:85-86).

2. The purpose of this two-part sequel to Moore's study

Moore's study was published more than two decades ago. Since then, there have been several developments in the fields of philosophy and sociology of science and epistemology, in both "secular science" (Moore's term) and "Christian scholarship" (cf. Van der Hoeven, 1995). As indicated above, Moore also set an agenda for Christian scholars in the process of further developing and expounding a Christian view of science and scholarship, i.e. a view based on a Biblical life-view or cosmology. The questions that confront one in this regard are:

- How has the secular community of scientists/scholars responded to what Moore termed the "unmasking" of their paradigm? Did the members of this community indeed perceive the bastion of modern science to be under attack, that it was in crisis, and that a new paradigm was beginning to take shape?
- How has the Christian community of scientists/scholars responded to the three-fold task that Moore outlined for them? Has Moore read the future correctly when he exhorted Christian scholars to "begin a widespread yet highly organized effort to construct a comprehensive paradigm for scientific activity based upon the Biblical world-view"? Were the philosophical, spiritual and cultural conditions in the world conducive to the creation of such a new and comprehensive paradigm?

In order to find answers to these two questions, a meta-study¹ was undertaken. A large number of publications, from the pens and computers of secular scientists as well as of Christian scholars, have appeared in the last 25 years. A relatively large proportion of these take the form of single (wide-ranging) studies in which the authors expound their views with respect to specific aspects of philosophy and sociology of science and/or epistemology. In others, the authors developed a meta-analytical perspective with regards to recent developments in these disciplines. In other words, they describe recent developments, based on their own life- and worldviews and perceptions of what knowledge and science should achieve. In order to present a brief, coherent and consistent overview of developments in the fields of philosophy and sociology of science and epistemology (where applicable), and as a way of preventing the subject from becoming unmanageable because of too much detail, mainly the latter type of publications was consulted to put the following overview together.² Its purpose, as has been mentioned, was to find answers to the two questions stated above.

Since Moore ended his discussion of the crisis experienced by modern secular science with a discussion of Thomas Kuhn’s theory about scientific paradigms and the way crises occur in established scientific paradigms, this discussion will now continue from that point onwards.

3. Kuhn, his supporters and his critics

To make the point that “modern science” was in crisis, Moore employed Thomas S. Kuhn’s (1922-1996) views on how science historically developed, as expounded in the latter’s well-known publication *The structure of scientific revolutions*, first published in 1962 (Kuhn, 1970; 1973). It has become a truism, says Fuller

1 A *meta-study* (also: *meta-analysis*) is a scientific method in terms of which the analyses made by other scholars are analysed for the purpose of discovering a broader and consistent picture of occurrences and developments (cf. Leedy & Ormrod, 2005:238). Apple (1999:344-345) calls this method “synthetic analyses that review a field” and also: “synthetic appraisals”. Jansen (2006:33) refers to it as “systematic reviews” or “research synthesis”.

2 Because of the method followed, there will always be a measure of subjectivity in the writing of an article such as this. The author is constantly compelled to decide what to include and what to leave by the wayside.

(1997:11), to speak of Kuhn as having deposed the positivist image of inquiry.³

Kuhn's historico-sociological analysis of how science evolved and developed indeed posed a threat to the optimistic and cumulative view of science held by positivists and empiricists, which was the dominant view of rationality for something like a century till the mid-twentieth century⁴ (Fowler, 2004:52). Kuhn claimed that the most important changes in science were radically discontinuous, indeed a revolutionary transition between incommensurable paradigms. According to him, a group of scientists would accept, usually as a result of their training, as well as of their dogmatic initiation into the world of science, a particular paradigm as the obvious and natural framework⁵ within which they do their work as scientists. In some cases, they would tend to force reality to fit into the framework in which they are working. In other cases, they would attend only to the problems and puzzles which they are confronted with in terms of their theoretical framework or paradigm. Because working in that particular paradigm is deemed to be the "normal" way of doing science, they run the risk of overlooking other problems and puzzles (Mautner, 2000:300; Van den Beukel, 2000:13-16).

In his study, Moore does not refer to the fact that Kuhn's views were interpreted in different ways, to such an extent that Kuhn himself

3 Neither Kuhn nor the positivists seemed to see matters this way, which is why Kuhn's book *The structure of scientific revolutions* (1962/1970/1973) was published as the final instalment of the *International Encyclopedia of Unified Science* (Fuller, 1997:11). There is, of course, the possibility that Kuhn deliberately intended sabotaging positivism from the inside. In 2000, Kuhn (2000:91) stated that others like Paul Feyerabend, Russ Hanson, Mary Hesse, Michael Polanyi, Stephen Toulmin and a few others should also receive recognition for effecting the transition in the philosophy of science for which he received (all) the credit.

4 During that period science, redefined as the systematic ordering of indubitable sensory observations by a universally valid rational method, was seen as the basis for a universal certainty (Fowler, 2004:52).

5 Kuhn (1962/1973:43 ff.) uses the term *paradigm* in a wide range of meanings (cf. Masterman, 1970:59 ff.; Godfrey-Smith, 2003:75-79). He uses it at times to refer to a "set of commitments", then again to refer to a view of reality, or to a scientific tradition or to a theoretical framework. According to Godfrey-Smith (2003:76), Kuhn initially seems to have preferred to attach a "looser" or more common meaning to the term, viz. that it referred to a broad framework within which a particular group of specialist scientists worked. Later on, in response to his critics, he limited the meaning of the term to "disciplinary matrix" or "exemplar" (cf. Kuhn, 1970:271-272).

lamented in 1970 that his critics seemed to read the publications of a “Kuhn₁” as well as of a “Kuhn₂” (Kuhn, 1970:231). After studying the works of his critics (including Popper, Feyerabend, Lakatos, Toulmin, Watkins and Masterman – see Lakatos & Musgrave, 1970), he concluded that the misunderstanding of his work should be blamed on inadequate communication. He also concluded that there were at least three sets of issues that separated his critics from him: method, the problem of normal science and the fact that he was alleged to have accepted that the majority of the scholars working in a paradigm decided whether they were involved in “normal science” (“mob rule”) (Kuhn, 1970:234). Without entering into the detail of his defence with respect to “method”, it is important to note that Kuhn bases his views on how science works and evolves on sociological and historical analyses and insights (Kuhn, 1970:240). Because of his insistence to look at science as a sociologist of science, he tends to analyse the community structure of science (Kuhn, 1970:252). The sociological base of his position highlights the extent to which he regards scientific knowledge as intrinsically a product of a congeries of specialists’ communities (Kuhn, 1970:253).

Also important, in view of Moore’s study, is the fact that Kuhn consistently keeps mentioning the role of ideological commitment in science. A group of scientists working in a particular paradigm, for instance, must share certain ideological commitments if their enterprise is to succeed. Kuhn (1970:240) keeps on asking: “How will a particular constellation of beliefs, values, and imperatives affect group behaviour?” In his opinion, group behaviour will be affected decisively by the shared commitments, but the individual choices that members of the group make will be a function of personality, education, and the prior pattern of professional research (Kuhn, 1970:241). Different values lead to different conclusions and to different choices (for instance, with respect to the paradigm in which one decides to work). More important, though scientists share values (in the context of their paradigm) and must continue to do so if science is to survive, they do not all apply them in the same way. Simplicity, scope, fruitfulness and even accuracy can be judged quite differently (which is not to say that they may be judged arbitrarily) by different people. They may also differ in their conclusions without violating any accepted rule (of the paradigm) (Kuhn, 1970:262).

An important insight of Kuhn’s, and which he shares with Popper (Kuhn, 1970:242), is that all scientists *necessarily* develop their

ideas within a definite theoretical framework. Even scientific revolutions (when “normal” science becomes questioned) demand such frameworks, since they always involve the rejection and replacement of a framework or of some of its integral parts. “Since the science which I call normal is precisely research within a framework, it can only be the opposite side of a coin the face of which is revolutions” (Kuhn, 1970:242).

He also conceded that Masterman was probably correct in her criticism that

the term ‘paradigm’ points to the central philosophical aspect of my book but that its treatment there is badly confused. No aspect of my viewpoint has evolved more since the book was written, and her paper has helped in that development (Kuhn, 1970:234).⁶

4. Post-Kuhnian developments

There was in essence a two-fold reaction to Kuhn’s views. On the one hand, many philosophers of science thought that Kuhn was impugning the rationality, objectivity and progress of science. In his later writings (especially in the *Postscript* to the second edition of his book *The structure of scientific revolutions*) he tried to reassure them that this was not the case. On the other hand, sociologists of science and others anxious to debunk “modern science” (such as Moore and other Christian scholars) responded to Kuhn’s ideas with enthusiasm. So did some social thinkers who took Kuhn to be saying that to become truly scientific was to become dogmatically committed to some “paradigm” (Mautner, 2000:301).

6 Hoyningen-Huene (1993:xv-xvi) points out that not only has the reception of Kuhn’s theory failed to do it justice, but also that his readers are far from agreeing on the precise content of his central theses and their validity. Interpretations of Kuhn are extraordinarily varied as a result of this. Kuhn himself admitted that weaknesses, obscurities, unclarity, vagueness, confusion, real difficulties, ambiguities, misunderstandings, substantive errors, and provisional formulations grounded in metaphor and intuition are all to be found both in *Structure* and in later works (also cf. Fuller, 2006:21-22). Hoyningen-Huene makes these observations despite certain concerted efforts in 1990 on the part of Kuhn to clear up some of the (terminological) confusion (cf. Kuhn, 2000:90-104). Hung (1997:387-390) is critical also of Kuhn’s concept of incommensurability, the relativism of his stance, his unclear concept of *meaning*, his failure to distinguish clearly between generic theory and specific theory, the naturalistic epistemology underlying his views, and the fact that he thinks his paradigm view of science can be both descriptive and prescriptive.

Another tendency also seemed to have gained momentum after *Structure*, viz. the distinction/division between the public and the private domains of people’s lives. This “split” was reinforced by more pronounced secularism.⁷

According to one dictionary, *secularism* refers to a doctrine in terms of which religion is rejected, especially in the realm of ethics; it can also refer to the view that religion has no place in civil affairs (Collins, 1999). Secularism is the process by which civil authority became autonomous from religious control, says Fuller (2000:399), and according to Fowler (2004:59), it created the illusion of a separation of rationality and religious faith. “Pre-secularist” science was based on tests of religious commitment, but secularism caused rationality to operate in science in isolation from religious faith.

Secularism in science (and epistemology) occurred once the Enlightenment transformed the intellectual orientation of academic theology from the professional training of clerics to a form of critical inquiry conducted independent from religious authorities (Fuller, 2000:210) and their grand narratives.⁸ Fowler (2002:34) agrees with the second meaning offered by the Collins dictionary when he says: “One of the greatest triumphs of secularism has been to banish belief in spiritual powers in relation to the world of secular reality, confining them to a separate realm”. In Van der Walt’s (1994:367) opinion, secularism can be regarded as a religion or an ideology in its own right – even as the “mother of all ideologies”. Secularism is a religion, ideology or alternative lifeview that possesses the power to ban all other religions from the public domain, and to install itself in their places as the only publicly acceptable religion. Like any other religion, secularism tends to determine everything in the lives of its adherents. All other religions, however, are relegated to the personal and private lives of their adherents (Van der Walt, 2004a:91-93; 94; 96; also cf. Van der Walt, 2004b).

The important point here, with respect to the topic under discussion, is that, in terms of secularism, a distinction (even a division) was made between the public and the private spheres of people’s lives. Science and scholarship, since they belong to the public lives of

7 Van der Hoeven (1995:55-56) mentions a few other recent developments that either might have reinforced the split, or might be symptomatic of the split: postmetaphysical thinking, nihilism, pluralism and nomadism.

8 Theological, religious and life-view systems.

people, have to remain neutral. Religion, since it belongs to the private domain of people's lives, should therefore have no influence in the context of science and scholarship (Van der Walt, 2004a:93, 95). Some members of the Christian community also accepted a dualist view of life in which a so-called secular realm existed alongside a religious realm (cf. discussions of secularism by McCarthy *et al.*, 1981:83; De Ruyter, 1994; Barbour, 1997; Marsden, 1997).

As intimated, secularism, together with postmodernism and post-structuralism,⁹ created a split between what can be regarded as *public* and what should be seen as *private, individual or personal*. Science as practised in the public domain, such as at public or state universities and colleges, should not be affected or contaminated in any way by religious commitments (such as those based, for instance, on the Bible or any other holy book) or by the concomitant life-view or cosmoscope (life-view) held by believers (belonging, for instance, to main-stream religions). Forms of science affected by religious commitment and faith assumptions are admissible only in private institutions of learning, such as private schools, colleges or universities. In such cases, the practising of science, and the training in these forms of life-conceptually determined science, should be privately funded (whereas training and tuition at public institutions can and should be publicly funded) (Van der Walt, 2003:132-133).

The divide between what is regarded as public and what as private explains why Christian scholars¹⁰ and their "secular" counterparts¹¹ tend to exploit the insights offered by Kuhn in quite different ways. Because both groups partially base their position about science on Kuhn's ideas, they are still able to communicate with each other, although from different ideological bases or sets of commitments.

Another development, viz. the appearance of a "postmodern mood or climate", to borrow a phrase from Van der Hoeven (1995:55), serves as background for developments described in 5 below

9 A school of thought which emerged in the late 1970s, claiming to supersede and/or to *problematise* the earlier structuralism. It is best understood as die French-inspired variant of the so-called "linguistic turn" (Honderich, 2005:745).

10 Assumed to be plying their trade in the "private domain".

11 Assumed to be working in the "public domain".

(piecemealism and constructivism). According to Van der Hoeven (1995:56),

postmodernism is primarily the abandonment of ideals of the Enlightenment regarding its pretensions of true universality (scientific, societal, cultural), but also, more broadly, the definitive cessation of all ‘great stories’, especially the metaphysical and religious accounts. It substitutes for these small stories, the right of each individual to his or her’s; playing with ideas; subtle deconstruction of the inheritance that strove after universality or pretended to universality; pluralism as primary given.

Postmodernism, according to Middleton and Walsh (1995:15, 19, 35), rejected the progress ideal associated with *neutral* positivistic science, but also caused “total scheme of things”-approaches¹² to become less acceptable. The practice of developing grand-scale narratives tended to become replaced by perspectival and problem-centred approaches to science and to life in general (Middleton & Walsh, 1995:32; O’Loughlin, 1999:55 ff., 2000:55 ff.; Plantinga, 1995:34). This new approach seemed to provide stimuli for the development of individual and social constructivism (Middleton & Walsh, 1995:37, 50) and relativism, inter alia because of rejecting foundationalism and objectivity/objectivism (cf. Plantinga, 1995:30-31). According to Middleton and Walsh (1995:56), postmodernists do not require a grand narrative to help them determine direction in science or in life; they can decide for themselves what course to take. This view led, inter alia, to the supposition that whatever structure there was to anything was a product of the cognitive processes of the particular structurer, i.e. the person who knows and studies reality. Structure that is perceived in a phenomenon is solely the perceiver’s way of viewing things. All frameworks that give structure are open to question since they are nothing but individual points of view (Fowler, 2004:53).

According to Fowler (2004), “consensus crumbled into dust”¹³ after

12 Systematic discussions about phenomena or ideological positions.

13 It is interesting to note that similar observations have been made in non-Christian circles. Fuller (1997:2), for instance, observed that in the public understanding of science “the identity of science has become so unstable in the contemporary world that it makes sense to ask whether knowledge production is the primary social function of highly publicised pieces of research – such as the Human Genome Project and the Hubble Space telescope. There is no conception of scientific method unless one means the attempt to use one

repeated failure of attempts, especially by the logical positivists, to demonstrate the existence of a universal rational foundation for science. Klapwijk (1987:102) agrees with this when he concludes that modern philosophy “has developed into a critique of ideologies or has postured as a hermeneutics of suspicion”.¹⁴ This development, says Fowler (2004:53), is often attributed to the work of Thomas Kuhn, but he was neither the leader nor the most influential figure in bringing to an end the consensus about scientific reason as the basis for rational certainty. “A wide range of scholars, though differing on details, were united in the judgement that the basis on which that consensus rested was now decisively discredited ...”.

While there remained some scholars who persisted in believing that scientific reason provided the universal certainty, significant numbers of well respected scholars rejected this belief as one having no rational foundation. There still remained those who continued to hold their belief that scientific reason provides rational certainties, but they could no longer claim to represent the generally accepted view about science and scholarship. They were now simply one faction among others. This did not mean, Fowler (2004:53) maintains, that there was any general rejection of scientific knowledge or of its value for human endeavour. It meant simply that this knowledge came to be seen as fallible with no rational basis for regarding it as having unique authority over and above all other sources of knowledge.

Postmodernism is frequently portrayed in a rather negative light. In Fowler’s (2004:54) opinion, much of what has been said of postmodernism, especially from a Christian perspective, might be accurate, but there is also another side to postmodernism that is often overlooked. According to him, nothing is more characteristic of

successful form of inquiry as the model for them all. Even then, *success* is a concept fraught with difficulties, involving a complicated relationship between science and its history.”

14 Or, he adds, it has simply presented itself as a continuation of the conversation of the West (Richard Rorty). Plantinga (1995:30 ff.) is convinced that (logical) positivism was replaced by a new “two-headed” monster: on the one hand “perennial naturalism” which insists that everything should be understood in naturalistic and evolutionistic terms, and on the other, “creative anti-realism” which insists that everything be explained in constructivist terms, and insists on the autonomy of the human being. These new developments are just as opposed to Christian ways of thinking as (logical) positivism, but they are perhaps more dangerous because they are much more plausible.

the postmodern world than cultural diversity and contrast. The negativity that postmodernism is sometimes depicted exists side by side with more positive aspects such as viewing the world as full of promise and possibilities. It is a world of new freedom for the human spirit; a freedom to venture out in the exploration of new frontiers of possibility giving life new direction, purpose and meaning. In the academic world this new hopeful face can be seen in those who have taken the collapse of a universal rational certainty as the cue for the systematic development of fresh rational accounts of human experience that will provide new frameworks of meaning and purpose for human life. According to Fowler, we might think in this connection of such names as Gadamer, Rorty, Habermas and Derrida. A superficial reading of their works, especially of deconstructionists¹⁵ like Derrida, can leave the impression that they provide academic foundation for the culture of hopelessness described by the critics of postmodernism. A more careful reading, however, makes it clear that what they are aiming to do is to destroy the last vestiges of hope in the rational certainties of the modern world as a basis for a meaningful, purposeful life, so that they may replace it with a radically new basis for giving hope and meaning to human life (Fowler, 2004:54-55).

5. Developments in secular philosophy and sociology of science

5.1 The piecemealists: emergence of a dialectic, and a new synthesis

According to Fuller (1993:101), scholars began searching for the middle ground, i.e. between the optimistic "continuous growth" view of science held by positivists and empiricists, and Kuhn's view of "normal science" intermittently broken by periods of "crisis" and "revolution". The search for the middle ground, says Fuller, often takes the form of a dialectical synthesis:

The first moment of this would-be dialectic was when the positivists suggested that scientific knowledge is distinguished by some metric of continuous growth, such as the steady accumulation of facts or the subsumation of more phenomena under fewer laws. The second moment was provided by Thomas Kuhn, who claimed that the most important changes in

15 A full discussion of each of these new frameworks goes beyond the scope of this discussion. Also cf. Fowler (2004:55 ff).

science were radically discontinuous, indeed a revolutionary transition between incommensurable paradigms. The putative synthesis, then, is to say that there are some local discontinuities between successive paradigms, but that these are not incompatible with net epistemic growth in the long run.

Barrow (1999:60 ff.) uses the metaphor of archaeologists who discover the building blocks of a huge structure under the sand to explain this would-be dialectic. Positivists thought that science was cumulative: scientists discover more and more truths about the world. The realisation that this picture of science was naive, and that sometimes scientists abandoned earlier views as mistaken, did not really alter the basic optimism of the positivist. It was said that earlier scientific theory was only abandoned in order to put a better theory in its place (Mautner, 2000:300).

To explain the dialectic or putative synthesis between the ideas of cumulative growth and Kuhn's view of normal science interrupted by periods of crisis and revolution, a metaphor used by Otto von Neurath was revived. Neurath, one of the members of the Vienna Circle, had used the metaphor of a boat on the open sea already as far back as 1921 in his publication entitled *Anti-Spengler* (1973). The metaphor was revived in recent times by others such as Quine (1953), Lievers (2003:150) and Godfrey-Smith (2003:30; cf. also Fuller, 1993:101, and Blackburn, 1996:259) to explain the idea that science was cumulative but that the accumulation was piecemeal. According to Neurath (1973:198-199)

... we are like sailors who on the open sea must reconstruct their ship but are never able to start afresh from the bottom. Where a beam is taken away a new one must at once be put there, and for this the rest of the ship is used as support. In this way, by using the old beams and driftwood, the ship can be shaped entirely anew, but only by gradual construction.

This image, as well as Laudan's (1984) of *reticulation*, contributes to the idea that the body of scientific knowledge is an inert creature broken up into parts of just the right size to be taken up for separate inspection. According to the *piecemealists*, one such part, say a theory or a method, can be examined, contested, and even substantially changed, while the rest of the corpus remains intact in the *background* (Fuller, 1993:101). Exponents of this piecemealist view still regard themselves as *continuists*. According to Foucault (1996:103), to recognise a discontinuity is never anything more than to register a problem that needs to be solved.

Fuller (1993:102) had two problems with the ideas of the piecemealists:

- Has every part of the main corpus of scientific knowledge been formally introduced for consideration; has every part of our existing body of knowledge been explicitly added at some point in history, and can it therefore, if the scientific community sees fit, be removed at some point in the future?
- Does the part of our body of knowledge that has been placed in the background while we consider a specific part not itself changed as a result of disagreements between scientists about the part under scrutiny?

The piecemealists' views amount to “a strong version of social antirealism, for these views suggest that no change has been brought about in the scientific corpus until the change has been recognized as such by the scientific community”. He regards Laudan's (1984) “consensualist theory of validation” as a good example of such social antirealism (Fuller, 1993:103).

Fuller (1993:104), however, accepts the ideas of the piecemealists when it comes to the phenomenology of scientific change. But that, according to him, accounts only for how scientific revolutions are perceived, and not for *how they actually occur*. In his opinion, scientific change happens as it were subliminally, and by the time the change is realised, it has become fully irreversible (cf. Fuller, 1993:104-106 for a detailed description of how Fuller himself views scientific change). His view of scientific change is an “elaboration of Kuhn's talk of invisible scientific revolutions”. In his opinion, the piecemealists seem to have been oblivious of the fact that change can occur in the body of knowledge that is in the “background” or “below the surface” when a part of the existing knowledge is being analysed, discussed and debated (Fuller, 1993:106).

5.2 Scientific magpies, social constructivists and other postmodern developments

The most recent two or three decades of doing science world-wide have also been characterised by a synthetic or *magpie* approach to theory construction (Sim & Van Loon, 2005:6 ff.). This approach has been characterised by the fact that scientists tend to fit bits and pieces of various theories together in order to perform scientific tasks. According to Sim and Van Loon (2005:7 ff.; 117 ff.), “[e]xcept for the most committed enthusiasts of particular movements, most

critics tend to operate in magpie fashion these days, selecting a bit of this theory and a bit of that for their own personalized approach". The mere presence of many competing theories makes this possible.

Our view of modern science is further complicated by the application of many new metaphors (cf. Neurath's *boat*, the *piecemeal approach*, the *magpie approach*, alluded to already). Other metaphors that are being bandied about are that theories tend to grow like "rhizomes", in other words they expand like communication networks, and each follows its own direction, even beyond recognised authority structures; that science is (or rather should be) "nomadic" (Van der Hoeven, 1995:56), in other words not bound to any rules, authority or any particular theoretical or thought system. It knows no boundaries.¹⁶

Science is not seen any more as one thing, it is many. People have become more open-minded about what science might be, and they are prepared to entertain alternative visions of science (Fuller, 1997:8-9). It is not closed, but open to new approaches. Objections to novelty and to alternatives come from particular groups with vested interests, not from science as a whole. It is therefore possible to gain understanding and to solve problems by combining bits and pieces of *science* with *prima facie unscientific* opinions and procedures. Purely theoretical subjects have profited from foreign invasions from other disciplines. One can even succeed by altogether staying outside science. Numerous non-scientific cultures supported their members materially and spiritually. True, says Feyerabend (2005:852), they ran into difficulties – but so did science-based Western civilisation. The old antagonism between theory and practice and the related antagonism between *scientific* and *unscientific* approaches may still survive in practice, or in some archaic slogans; however, it has lost much of its philosophical bite.

It is clear from the preceding discussion, that the magpie approach can be regarded as a departure from what O'Loughlin (1999:49)

16 The "Sokal scandal" in 1996 was an example of this tendency (Macey, 2001:358). Sokal claimed that *pi* was not a constant, and therefore not a universally applicable factor. Its value relies on the observer, and is therefore, unavoidably subject to historicism (Sim & Van Loon, 2005:13-14). In his own words: "My original motivation had to do with epistemic relativism. It seems to me that a sloppily thought-out relativism has become the unexamined *Zeitgeist* in large sectors of the American humanities and some parts of the social sciences" (Sokal, 2003:56).

called the scientific paradigm. The scientific “view from nowhere” (decontextualisation), the search for objective truth and neutrality are being relinquished in favour of views of knowledge as (embodied) discursive practice, voice and standpoint epistemologies.¹⁷ According to her,

... as social circumstances have changed across the globe and as we come to understand that simplistic accounts of knowledge as either subjective or objective are not only inaccurate but dangerous, then research epistemologies which acknowledge subjectivity while at the same time accept that subjectivity itself must be constrained by regulative realism (the acknowledgement of the material world and its processes) then I think we can continue on the path of re-mapping the epistemic terrain in ... research in the human sciences (O’Loughlin, 1999:57).

Fuller (2000:xv), a self-declared social constructivist, contends that social constructivists need to maintain a “strategic allegiance” with their “main foes” the piecemealists, since neither group believes in the independent reality of the social world, which explains why each in its own way is oblivious to the unintended consequences of human action, the alienation of reason from the reasoner, and the latent functions of apparently irrational practices – “all staples of macrosociological theory of every possible ideological stripe, ranging from classical political economy through Marx and Durkheim, down to contemporary American, French, British and German structural-functionalism” (Fuller, 1993:103).

What we have mentioned so far under the heading *Magpies and social constructivists* can arguably be construed as postmodern(ist), i.e. post-scientific, approaches. Postmodernism itself is, however, difficult to define. The term *postmodernism* has become highly meaning-inflated and equivocal (cf. Bezuidenhout, 2005:4). Post-modernism seems to be sceptical about the notion of progress and of grand-scale solutions to problems, but at the same time, says Bezuidenhout, one of the most self-confident political projects, neo-liberalism, seems still to reign sovereign with its faith in an unrestricted market economy. Certain scientific approaches to science and scholarship such as empiricism are also still alive and

17 *A standpoint or voice epistemology* is a philosophical position that advocates starting research from the perspective of those, such as blacks, women, the poor, gays and lesbians, who tend to be oppressed in the society in which they find themselves, or the society in which the research is taking place.

well. In Bezuidenhout's opinion, the age of postmodernism has in fact come and gone, possibly because of 9/11. The puzzling question is now: what can we expect in its place?

Bezuidenhout has no name yet for the new approach to life in general, and to knowledge construction (research, science, scholarship) in particular that is beginning to emerge. In his opinion, the new approach is characterised by cynicism. Humankind is portrayed as being in such a hopeless state that one would think that it can only be saved by becoming extinct as a species. Western culture, for instance, is not being attacked by barbarians from the outside, but is indeed dying from the inside like a body racked with cancer.

This dissolution of identity is reinforced by the perception that we find ourselves in the "depths of a cultural winter", characterised by social constructivism, disbelief in the "progress myth", renouncement of the nostalgia for a total scheme of things, a continuing commitment to human autonomy, a consumer culture with regards to religions and worldviews, a collapse of modernity, the decentered self – a subject with no substance – and the "nomadic homelessness" of modern people (Middleton & Walsh, 1995:12-13; 25, 31-33, 35, 41-84; also cf. Geelen, 2005).

Furedi (2004:19) concludes:

Our culture continually emphasizes problems that are not susceptible to human intervention ... Theories of globalization stress the inability of people and their nation states to deal with forces that are beyond their control. ... It is widely believed that the world is out of control and that there is little human beings can do to master these developments or influence their destiny.

Rorty (1999:262-263) concurs:

There is a sense that everything has fallen to pieces, that the sociopolitical future of humanity has become utterly unforeseeable. People are feeling let down by history, and are experiencing self-indulgent, pathetic hopelessness.¹⁸

18 It is interesting to note that, according to Eagleton (2004:54), Rorty himself can be seen as an anti-theorist. Anti-theory is a kind of scepticism of theory that is itself theoretically interesting. For Rorty, theory is just how you try to justify your life; it gives fundamental reasons for what you do. You cannot justify your way of life by theory because theory itself is part of that way of life, not something set

According to Bezuidenhout (2005:4), we are witnessing a new movement:

Whereas modernism believed in progress, and postmodernism questioned the progress myth, people now seem to begin wondering whether we have not begun making a U-turn – are we not on the way back to what we had left behind?

5.3 Other current approaches

According to Feyerabend (2005:852), Kuhn’s work, *The structure of scientific revolutions*, was the last major attempt so far to subject a complex practice – science – to abstract thought. Although science has been affected by Kuhn’s views on how science worked and evolved, older (positivistic and empiristic) approaches are today still producing results. The realism/anti-realism/constructivism/empiricism debate is as alive as ever, and has received impetus from the contributions of Putnam, Van Fraassen, Rorty and others. Still other scientists have persisted with “cognitive models of scientific knowledge which are naturalistic” (they do not distinguish between logical and empirical laws of thought) and based on only partly rational patterns of adaptation. Others emphasised details and objected to premature generalisations. All these researchers appreciate what Kuhn did, but think that his approach is still far too abstract. Typical of the *magpie* approach, they study particular events, conduct interviews, invade laboratories, challenge scientists, examine their technologies, images, conceptions, and explore the often glaring antagonisms between disciplines, schools, and individual research groups. Summarising their results, we can say, according to Feyerabend (2005:852), that the problem is no longer how to articulate the monolith *science*, but what to do with the scattered collection of efforts that has replaced it. Science is no more the monolith of rationality (Fuller, 1997:8).

Apart from all the approaches discussed so far, another plethora of approaches to knowledge and the practice of science can be mentioned as relevant to the pursuit of scientific knowledge.¹⁹ There are, for instance, those who tend to work with the so-called *power-knowledge nexus*, who show how different knowledge fields are

apart from it. What counts as a legitimate reason or valid idea will be determined for you by your way of life itself.

19 The scope of this overview does not allow a detailed discussion of them. Only a few of the most prominent are mentioned.

constructed, and how discourses both construct and are constructed by political/epistemological moves. In some cases, knowledge is deliberately socially contextualised, not only in terms of a discourse community, but also in terms of the material conditions underlying the whole enterprise of knowledge production, its social utility, and the power relations out of which it is produced. In critical studies of this nature, knowledge is regarded as a form of social or cultural capital: "The knowledge itself must be recognized both within (a particular) field of power and in the connections between that specific field and more powerful fields of high status as well" (Apple, 1999:343-345). Among the issues that have been dealt with in critical studies are critical gender theory, critical race theory, critical theory of social interactions, political economy of urban conditions and other areas of major concern, such as marketisation, privatisation and the effects of reforms in these areas, much of which is guided by ideological commitments that have to be sorted through and unpacked (Apple, 1999:345). Studies of this nature relate to the different social fields of power in which scholars find themselves.

Harvey (1990:3), in his detailed discussion of *critical social research* methodology, stresses that this approach to social research can be distinguished from other forms of knowledge construction in that knowledge and critique are deliberately intertwined. "The difference", he says, "between critical approaches and non-critical approaches is not the difference between the presence and absence of critique, rather it is the difference between approaches in which critique is an integral part of the process and those in which it is peripheral". Indeed, he argues, "it is arguable that for a critical methodologist, *knowledge is critique*". Knowledge is, therefore, a dynamic process, and not a static entity. For critical methodologists, knowledge is a process of moving towards an understanding of the world and of the knowledge which structures one's perceptions of that world. Critical social research, he says, thus aims at an analysis of social processes, delving between ostensive and dominant conceptual frames, in order to reveal the underlying practices, their historical specificity and structural manifestations (Harvey, 1990:3-4). Critical social research, he continues, does not take the apparent social structure, social processes, or accepted history for granted. It tries to dig beneath the surface of appearances. It asks how social systems really work, how ideology or history conceals the processes which oppress and control people (Harvey, 1990:6).

Akin to critical social research, is *critical rationalism*. It is a school or position of twentieth century philosophy, according to Zecha (1995:71), which advocates a critical attitude, especially in scientific research. The driving force to criticism, says Zecha, is rationality, i.e. the readiness to learn from mistakes and false theories. *Falsifiability* or *falsification*, respectively, are the key notions of the critico-rational *game* in research²⁰ (Zecha, 1994:13).

Space does not allow coverage of all the modern approaches to science. It is worthwhile, however, to note that Higgs (1995) and his co-authors regarded the following approaches as relevant to research in education in the late 20th century: logical empiricism, critical theory, phenomenology, hermeneutics (also cf. Danner, 1997) and systems theory. Some of these approaches are also discussed in a recent book written by Higgs and Smith (2003), such as logical empiricism, hermeneutics, systems theory, phenomenology and critical theory. Three "new" approaches are, however, also mentioned: feminism, African philosophy (also cf. Makgoba, 1999; Hoppers, 2002; Horn, 2003 and Van der Walt, 2004c), and postmodernism. Hung (1997:440 ff.) discusses realism and various forms of anti-realism in some detail.

This brief overview of approaches lends support to Fuller's (2006:4-5) conclusion about the understandings of science that we find today. According to him, overriding concerns about rationality and progress in science as a whole have been replaced by more technical analyses of the relationship between evidence and inference in particular fields. Lost is an ongoing and wide-ranging philosophical debate about the direction that should be given to a form of inquiry that could command universal assent. Epistemology is now more preoccupied with face-saving exercises to shore up expertise, the elusive quest for "credible testimony" and "discipline boundary maintenance".

5.4 Fuller's explanation of why secular science developed as described above

Although we now have a picture of how the philosophy and sociology of science has developed during the last few decades in so-called secular circles, we have to try to fathom exactly *why* all of this happened. Why, for instance, has there been a move away from

20 In a sense, this approach is a revival of the philosophies of Karl Popper, Hans Albert and Wolfgang Brezinka (cf. Zecha, 1994:11-12).

attempting to articulate the monolith *science* towards a more piecemeal, nomadic, magpie and “science as complex” approach, in which social constructivism seems to have become the preferred scientific method?

Fuller (2000:xv) offers an explanation. In the 1970’s, the latest trending was to be highly critical of any number of taken-for-granted beliefs that scientists might hold, thereby opening the door to alternative ways of being and thinking. The odd man out at the time was Kuhn, who not only failed to privilege criticism, but actually went so far as to argue (in *Structure*) that it should be avoided at all costs until a line of inquiry is saddled with so many unsolved empirical problems that it is forced to ask critical questions about the phenomenological foundations of the entire enterprise. Towards the end of the 20th century, this *acritical* perspective of Kuhn’s has colonised the academy. The progeny of Kuhn’s incisive philosophical critics now suppose the basic truth of his account of science, with the result that the radical scepticism of deconstruction has now yielded to a postmodern pluralism that offends only by opening its doors to too many perspectives – courtesy of Kuhn.²¹ The critical turn of mind has become so alien to philosophy and sociology of science that it has itself become a fit subject for anthropological (and even taxidermic!) studies. Kuhn’s *Structure* helped to level disciplinary hierarchies and overturn inappropriate methodological standards, thereby contributing to the climate of pluralism that (at least for the time being), continues to flourish in most systems of higher education in the West (Fuller, 2000:3).

In Fuller’s critical opinion of Kuhn’s contribution to our understanding of the history and sociology of science, Kuhn’s *Structure* can be tagged as “the consummate postmodernist work”:

The cross-disciplinary appeal (of the work) is founded on its ability to compel readers without demanding too much engagement in return. It is not a master narrative but a *servant narrative* that is indefinitely adaptable to the user’s wishes.

21 Kuhn’s theory influenced the thinking of Feyerabend and Lakatos, and structuralist theories of science also show such influence. His ideas also had enormous impact in individual disciplines, especially the humanities (Hoyningen-Huene, 1993:xix-xx). According to Hung (1997:390), Kuhn’s theory has had a tremendous impact in the philosophy of science. “It was instrumental,” he says, “in dislodging the classical tradition from the central stage. Indeed, its influence has spread far and beyond: well into fields such as general philosophy, psychology, sociology, education, and the historiography of science.”

Although the death of the grand narrative (a vivid name for “philosophical history”) and the rise of relativism are usually associated with Jean-Francois Lyotard (1924-1998) and allied French thinkers, Kuhn’s stylistic achievement was to ease not only humanists and social scientists, analytic philosophers, and other congenial Francophobes into a postmodern mindset (Fuller, 2000:31).

Fuller (2000:xvi; 2006:4, 17) believes that Kuhn’s *Structure* has influenced science, as well as the history, philosophy and sociology of science, *for the worse*. Fuller is not without hope, however. As a devout social constructivist, he believes that

even disappointment (in the post-Kuhnian developments) can be used strategically to point out better paths that were originally not taken, but (with some adjustment) can be taken up in the future.

In contrast with Kuhn’s thesis that history “can be done only of periods and episodes whose defining debates have now reached closure, because the terms of the debates have been either resolved or superseded”, Fuller believes that other avenues can be explored, and alternative perspectives constructed – if not in a piecemeal manner, then at least gradually (cf. Neurath’s boat metaphor).

6. Preliminary conclusion

This then is where we stand with developments in the sphere of so-called secular philosophy and sociology of science at the beginning of the 21st century. We shall return in section 3 (towards the end of the second part of this article) to the three problems outlined by Moore (cf. section 1 above) and the two aims of this discussion (section 2 above) when we draw a number of general conclusions based on this meta-analysis. At this point, however, we can conclude that secular philosophy of science and scholarship has been unmasked both from within and without as having surrendered the positivistic and scientific search for a stable universal foundation of science, an optimistic cumulative view of science, and for universal absolute certainty. It now seems to favour diverse searches for contingent foundations, “credible testimony”, “discipline boundary maintenance”, social constructivism, postmodern pluralism and fallibilism, all of which tend to result in the magpie and other piecemeal approaches inclined to seeing theories as flexible formulations that can be plied and used to suit particular situations. In brief, modern secular science seems to be characterised by

secularism, postmodern fragmentation and a preference for contingent foundations. The members of the secular community of scholars indeed perceive the bastion of modern science to have been under attack. They realise that it is in crisis; a new paradigm has not yet begun to take shape.

In the second part of this article, developments in Christian philosophy and sociology of science will be tracked and conclusions will be drawn with reference to the tasks outlined by Moore for Christian scholarship. In the process, we shall see how it tries to deal with the three characteristics of modern secular science just mentioned.

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Key concepts:

Kuhn, Thomas S.
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meta-theory
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Kernbegrippe:

Kuhn, Thomas S.
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sekularisme
wetenskap
wetenskapsbeoefening