



The Achilles' heel of positivism¹

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Abstract:

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*The 20th century encompasses philosophical trends as wide apart as (neo-) **positivism** and **postmodernism**. The assumed objectivity and neutrality of the former and the radical relativity claimed by the latter both have difficulties in accounting for the nature of **universality**. Since sense experience is directed towards concrete entities and events, the universal scope of law-statements remains problematic – particularly exemplified in the universal scope of **modal terms** (what will be designated as modal universality). Not even postmodernism can side-step this fundamental ontic dimension of reality. Insofar as the positivistic ideal of an objective and neutral science still dominates the thought-world of many practising (natural and social) scientists, a critique of the Achilles' heel of positivism may render a service to the ideal of Christian scholarship, since it is argued that such a critique highlights the inevitability of a distinct theoretical view of reality which ultimately emanates from a person's deepest convictions. The contributions of Popper and Stegmüller are contextualized in the argumentation. Popper realized that **rationality** needs a **more-than-rational foundation** and Stegmüller acknowledges that one cannot justify something without a prior trust. The inability of sense experience to account for the **functional properties** of natural things and their accompanying concepts indeed reveals the **Achilles' heel of positivism**. This view is explained with reference to the uniqueness of function concepts employed in the historical development of the concept of matter. In the final part of the article Popper's idea of falsification is assessed by taking into account the*

1 An earlier version of this article was presented at an International Popper (Centenary) Conference held in Chile (November 2002): Universidad Católica de Valparaíso, Facultad de Filosofía y Educación, Instituto de Filosofía. I want to thank anonymous referees for valuable suggestions regarding the focus, streamlining the flow of the argumentation and the economy of thought incorporated in the final form of this article.

criticism raised by Stegmüller. In the course of the argumentation the relevance for the South African context is mentioned with reference to the idea of **neutrality** as it is advanced in the current debate about the teaching of religion at school.

Opsomming

Die Achilleshiel van die positivisme

Die 20ste eeu omvat wysgerige strominge so ver van mekaar verwyderd soos die (neo-) positivisme en die postmodernisme. Die veronderstelde objektiwiteit en neutraliteit van eersgenoemde en die radikale relatiwiteit waarop laasgenoemde aanspraak maak, loop albei in probleme vas wanneer rekenskap gegee moet word van die aard van **universaliteit**. Aangesien sintuiglike ervaring altyd gerig is op konkrete dinge en gebeurtenisse, kan dit nie werklik rekenskap gee van die status van die formulering van (natuur-)wette nie – veral nie soos wat laasgenoemde weer-spiëel word in die universele reikwydte van modale terme nie (wat aangedui sal word as modale **universaliteit**). Nie eers die postmodernisme kan hierdie fundamentele dimensie van die werklikheid omseil nie. Insoverre die positivistiese ideaal van 'n objektiewe en neutrale wetenskap nog steeds die gedagte-wêreld van praktiserende (natuur- en geestes-) wetenskaplikes domineer, sal kritiek op die Achilleshiel van die positivisme 'n diens lewer aan die ideaal van Christelike wetenskapsbeoefening, aangesien betoog word dat dit die onvermydelikheid van 'n teoretiese werklikheidsvisie belig wat uiteindelik in die greep van die diepste oortuiginge van die wetenskaplike denker is. Die bydraes van Popper en Stegmüller word gekontekstualiseer in die ontvouende argumentasie. Popper het besef dat **rasionaliteit** 'n meer-as-logiese fundering benodig, terwyl Stegmüller erken dat niks geregverdig kan word sonder 'n voorafgegewe vertrouwe nie. Die onmoontlikheid om met behulp van sintuiglike ervaring rekenskap te gee van die **funksionele eienskappe** van natuurdinge en die daarmee gepaardgaande begrippe, onthul die **Achilleshiel van die positivisme**. Hierdie gesigspunt word verduidelik met verwysing na die uniekheid van die funksiebegrippe wat benut is in die ontwikkeling van die begrip **materie**. In die laaste gedeelte van die artikel word Popper se idee van valsifikasie beoordeel deur die kritiek van Stegmüller in ag te neem. In die loop van die argumentasie word die relevansie vir die Suid-Afrikaanse konteks vermeld met verwysing na die idee van **neutraliteit** wat 'n rol speel in die huidige debat oor godsdiensonderrig op skool.

1. Introduction

Amidst the emergence and continuation of diverse philosophical trends of thought at the end of the 19th and during the first decades of the 20th century, the positivist school acquired an exceptional grip on the minds – particularly of the *special scientists*, i.e. those working in the various natural sciences. The general idea that only an *objective* and *neutral*

endeavour, based upon *sense experience*, is worth obtaining the label *scientific*, not only constitutes the core conviction of the positivist legacy, but also permeates other orientations. Across the board scholarly reflection throughout the 20th century evinced a serious respect for “facts.”

Surely, this legacy did not continue to reign unchallenged. During the sixties neo-Marxism managed to infiltrate the mindscape of young intellectuals – both in Europe and the US – an in doing that it played a decisive role in the revolutionary events of the late sixties (the student revolts). In France students in Paris advanced with banners claiming that the idea of an objective and neutral science is *suspect*. Adorno, Horkheimer and Habermas emphasized that social theory by definition entails *social critique* – if one cannot envisage society to be different from what it *is*, the researcher is enslaved merely to follow its footsteps uncritically. During the sixties the controversy between “neopositivism” and its more sophisticated successor, “critical rationalism” (Popper and his followers), dominated the scene on the one hand, in opposition to the Frankfurt school of critical theory on the other hand. The 1970s witnessed the discussion between Luhman and Habermas concerning sociology as a “social technology or as a critical theory of society” (Münch, 1990:441). Yet, according to Münch, the 1980s pursued a different goal:

... constructing a theory of society and explaining and understanding the basic structures, roots and developments of modern societies. ... The great classics who contributed to a global perspective on modern society have been rediscovered, particularly Weber, Durkheim, and Parsons. They are used as more or less stable building blocks for a theory of society and an understanding of modernity (Münch, 1990: 442).

According to Münch the starting-point of the theoretical debate of the 1980s is

Weber’s theory of rationalization of modern society into spheres that are guided to an increasing extent by their own inner laws. This theory of rationalization has been combined – by Schluchter and Habermas – with the theory of functional differentiation as it was formulated by Luhmann (Münch, 1990:442).

By this time (the 1980s) the “linguistic turn” redirected the entire 20th century towards a move away from logical purity to linguistic ambiguity and an awareness of the relativity of interpretations. This linguistic term started to open up a new space for those who preferred to speak about *postmodernity*. This new catchword partially explored basic tenets of historicism – an emphasis on the historical situatedness and the relativity of human knowledge and human society – compare the introduction of

the sociological subdiscipline “sociology of knowledge” (initially by Mannheim and later on radicalized by Bloor and his followers from the Edinburgh school).

The hermeneutical tradition, strongly influenced by Heidegger and further explored by Gadamer, intended to transcend the impasse of historicism. Gadamer once remarked that Heidegger did not again want to introduce something *essential* or *divine* with his notion of *Sein* (Being), since he aimed much more at something that would – like an *event* – open the space in which hermeneutics could become (without any *final foundation*) a new *universal* (*zum neuen Universale wird*). This space is the dimension of language (*dieser Raum ist die Dimension der Sprache* – Gadamer, 1989:172). Within the hermeneutical approach tradition as such is not degraded – in fact, it is acknowledged that tradition enables the *continuity* of thought. Similarly, prejudices *per se* are not questioned, merely uncritical ones, such as the Enlightenment prejudice *against* prejudices (cf. Gadamer, 1998:271 ff.).

In his recent hermeneutical works Habermas opposes the idea of *neutrality* and opts for a *normative* understanding of his *deliberative democracy* (see Habermas, 1998:349 ff.). Against the long standing legacy of natural law – with its inherent discrepancy between “reason” and “positive law,” Habermas holds that this “duplication of the concept of law” is “sociologically implausible and has normatively awkward consequences” (Habermas, 1996:105).

However, in the context of a fusion of historicistic and hermeneutical traditions the nature of universality remains problematic. Grondin (1994: 10) remarks:

Neither the Gadamerian claim to universality – which seems to pertain to language, historicity, and his own philosophy as well – nor its denial by Habermas and Derrida has achieved any final clarity. One might well suppose that ‘universality’ refers to the universal validity of some proposition. If so, it would be easy to show that hermeneutics is stuck in a logical or pragmatic contradiction. Some have tried to construe the universal claim of hermeneutics as climaxing in the thesis that everything is historically conditioned, a thesis supposed to be universally valid. If this thesis is meant to apply universally, then it must apply to its own claim, which must itself be historically limited and therefore not universal. The universal claim of hermeneutics is thus considered self-contradictory.

Amidst the chaos and relativism of radical postmodernism, the recent challenge launched by Sokal and Bricmont caused considerable embarrassment within postmodern circles (cf. Sokal & Bricmont, 1999). The American journal, *Social Text*, positively accepted and published their

article (Sokal & Bricmont, 1996:217-252) “Transgressing the boundaries: Toward a transformative hermeneutics of quantum gravity” – and only afterwards it turned out that these authors aimed at unmasking the unsound position of postmodernity. Their critical stance, however, indeed did revive some of the older positivistic sentiments regarding neutral facts and observation.

With reference to what has been called Frege’s *Bedeutungsrationalismus* (“meaning-rationalism”) and Millikan’s critique on it, McDowell also discerns a scientific stance in contemporary thought, exemplified in the conviction that somehow the brain must be spirit (compare the ideas of Dennett, 1987; McDowell, 2001:173-174, footnote 36).

Within the context of contemporary South Africa the above-mentioned developments are extremely relevant. In line with the older positivistic belief in an objective and neutral natural science an explicit technocratic sentiment is present in the direction taken by the higher education system of the current government. The assumed neutrality is ingrained to such an extent that it surfaces unproblematically in the most recent discussions regarding the teaching of religion at school. The policy document of the government advances the idea that religious education ought to be neutral. The initial policy document did not distinguish between *state schools* and *public schools* (thus making the school actually an *extension* of the state). Although the subsequent document dropped this identification, it still continues the view that since the state is (supposedly) neutral, the school ought to be neutral as well.

In observing the *normative* standards of *public justice* the state ought to be impartial towards the legal interests integrated within its public order, but this impartiality fundamentally differs from neutrality.

What happens within the sphere of scholarship does not conform to this positivistic picture of objectivity and neutrality. Given the full circle – running through positivism, historicism, the linguistic turn (including the rise and development of hermeneutics, up to the most recent variants of a radical relativistic postmodernism) – this article will attempt to focus on the untenability of the one pillar of positivism. In line with this focus the untenability of the idea of scholarly neutrality in terms of what will be explained to be the Achilles’ heel of positivism will be highlighted. This delimitation has also been partially motivated by the centenary of Karl Popper that sparked off the conference in Chilli where an earlier version of this paper was presented. The thread linking the diverse stances during the 20th century is the notion of *universality*. The idea of modal universality will turn out to unveil the impasse of positivism and the supposed neutrality and objectivity of science.

Although Popper is sometimes associated with positivism, he considers himself to be a major figure in causing the *death* of positivism. One of his main concerns is the problem of *demarcation*, given in the question: is it possible to elevate the isolated domain of “science” to the level of being the sole source of reliable knowledge of reality, or is it rather that even science itself is dependent upon assumptions that cannot be “verified” by science itself? As it turned out, this question intimately coheres with the problem of *induction* (i.e., the nature of *generalizations*): is it possible to obtain knowledge with a claim to universality merely by investigating a limited number of instances?

The systematic perspective in terms of which the Achilles' heel of positivism will be exposed will at once serve to account for the possibility – not only of a multiplicity – of alternative approaches in “science,” since in particular it will be made relevant for a critical appraisal of the possibility of Christian scholarship.

2. The limitations of sense experience

Modern positivism advocates a specific “medium” in service of their acclaimed objectivity and neutrality: *sense experience*. The adherents of positivism understood the issue of demarcation in terms of the ideal to provide an experiential foundation for reliable scientific knowledge.

Usually the term *empirical* is restricted to what is given by the *senses*. Much has been written about this philosophical orientation of positivism. The essential element which I want to highlight within this context is the emphasis it has laid upon *sense experience*. Of course one can relate this to the age-old epistemological quest to understand the *sources* of knowledge. Traditionally there have been two main candidates: the *senses* and *reason (intellect)*. Sometimes *intuition* is also introduced: either as a part of the former or of the latter, or in some instances as a faculty transcending the confines both of sensibility and rationality.

At first sight *observation* seems to be a quite innocent candidate if one is in search of a reliable basis for human knowledge. Yet, as such observation (in the context of “sense experience”) does not provide us with concepts and descriptive terms – the latter ought to be generated by the so-called “knowing subject” and it unfolds in the formulation of *arguments*. The problem is that no single argument can avoid the *concepts* present in the formulated *statements* or *propositions* regarding what has been observed. Implicitly or explicitly philosophers of science, in their attempt to give an account of the status of scientific knowledge, therefore had to account for the nature of concept formation.

3. Concept formation

Cassirer points out that it was the concept of number that first of all helped us to appreciate the nature and value of concept formation as such. Surely, Pythagorean thinking overestimated the role of number by claiming that number constitutes the *essence* of every entity. However, by leaving this metaphysical perspective aside we are enabled, according to Cassirer, to realize that although number does not constitute the essence of things, it does form the foundation for rational knowledge.² Of course this acknowledgement does cause serious problems for an account of concepts based upon (sense) experience. The human senses are always directed towards different kinds of *entities* and *processes*. For example, one can observe the different people present at a conference and see how they interact in the course of the event. One can even count those who are present at the event and assign a number to it, simply because those attending the conference individually and collectively display quantitative properties. However, in terms of affirming “sense experience” as the ultimate source of knowledge the crucial question arises: is it possible to come to a *sensory* observation (perception) of the numerical (and other) aspect(s) of the event? But before we explore this problem, it may be fruitful to highlight the implicit trust in human reason evident in the scientific legacy.

4. The “objectivity” of science: “reason” protected from faith?

Within the empiricistic tradition – in modern philosophy initially advocated by Locke, Berkeley and Hume, but later on continued by positivism and neo-positivism – “sense data” has received a central position. In order to understand it, we have to go back and look at the way in which Immanuel Kant reacted to the empiricistic stance.

In the thought of Kant a peculiar relationship between “chaotic sense material” and the *ordering* function of “thought categories” is portrayed. It is remarkable to note how influential this orientation of Kant is, for Popper (1972:68) still defends it: “Thus Kant was right that it is our intellect which imposes its laws – its ideas, its rules – upon the inarticulate mass of our ‘sensations’ and thereby brings order into them.”

2 “Der Anspruch, in der Zahl die Substanz der Dinge zu erfassen, tritt freilich allmählich zurück; aber zugleich vertieft und verschärft sich die Einsicht, dass in ihr die Substanz der rationalen Erkenntnis wurzelt” (Cassirer, 1910:35).

The distinctions introduced by Kant in this regard reflect his own attempt to arrive at a demarcation between (natural) *science* and practical *faith*. His position turned out to be an alternative to the traditional Roman Catholic distinction between reason and faith, since its justification for this view stems from a different basic motive. Kant wants to provide a firm foundation for the preceding ideal of an encompassing natural science that is restricted to the domain of *sense experience* (chaotic sensory impressions). Within the super-sensory domain of practical freedom, the category of *causality* does not apply. His famous statement is: "Ich mußte also das Wissen aufheben, um zum Glauben Platz zu bekommen" (Kant, 1787, Introduction to the second edition, B:xxx).³ Yet, what is concealed in this attempt to separate faith *and* science is a subtle faith *in* science!

5. Faith in science

Positivism and neo-positivism apparently pursued this split between faith and science to its ultimate consequences by claiming that "science" is an "objective" and "neutral" enterprise.⁴ With "(sense-) experience" as the sole and final judge, the criterion of *empirical verification* has been introduced to disqualify any and all *philosophical* presuppositions. "Science" is supposed to be without any presuppositions whatsoever. By the late twenties of the 20th century a circle of thinkers – eventually known as the Wiener Kreis (the Vienna Circle) – ridiculed metaphysics, while "science" was promoted to be the only reliable guide to life.

6. The alternative route proposed by Popper

Hacohen (2002:195) points out that Popper "sought to overcome the gap the Wiener Kreis had opened between science and philosophy". By attempting this Popper once again opened the avenue to historical perspectives, because there is no single discipline (special science) which does not mirror within its own confines the successive trends manifested in the history of philosophy. But we have to explore the historical background a bit further in order to appreciate what Popper achieved.

3 Max Müller translates this statement as follows: "I had therefore to remove *knowledge*, in order to make room for belief" (Müller, 1961:512).

4 Haeckel summarizes this dualistic position by claiming that faith commences where science terminates. See the excellent biographical work written by Hemleben (1974).

6.1 Kant's ultimate trust in "reason"

The position taken by (neo-) positivism certainly was not totally new or original. Already Kant was convinced by his British predecessor, David Hume, that exact natural laws cannot be grounded in "experience." After all, Kant could not agree with Hume that we obtain *all* knowledge from sensory perception or "experience" alone.⁵ What impressed Kant particularly is the ability of human beings to produce an intellectual formulation of the laws which things in nature obey. As a consequence he wanted to explain *how* such knowledge is possible.

Kant was particularly impressed by the contribution of Galileo to the development of the modern natural sciences. What impressed him was that Galileo formulated his law of inertia with the aid of a pure thought-experiment. In his famous treatise on "two new sciences" (1638) Galileo used the following thought-experiment: if a body is put in motion on an indefinitely extended path, then this body would *continue* its motion infinitely, i.e. it would not discontinue its motion *except* if something exerts power on it (e.g. gravity or friction).⁶

From this law of inertia Kant drew the following conclusion: if it was possible for Galileo to formulate a thought experiment out of the spontaneous subjectivity of theoretical thought and to deduce a *natural law* from it – the kinematical law of *inertia* – then this must entail that elements of knowledge are previously (a priori) present within the human mind, which in the first place makes possible our knowledge of reality.

Within the development of modern philosophy the theory of knowledge (epistemology) has witnessed a remarkable shift from the "object" to the "subject". This shift is known as the "Copernican" revolution in epistemology and it reinforced the notion of things within nature as "*objects*". Someone inclined to defend the neutrality of observation normally would be willing to accept as the most general observation-term this notion of an "object": all the different things in nature are to be seen as "objects". However, this observation-term in itself displays the tremendous subjectivist assumption (prejudice) so deeply impregnated in our Western notion of science – as such causing an inability to appraise things in nature as

5 Hume (1739) claimed: "To hate, to love, to think, to feel, to see, all this is nothing but to perceive" (*A Treatise of Human Nature*, I,2,6).

6 Galileo thus turned the Aristotelian conception upside down, for according to Aristotle something moving is constantly in need of a cause. Galileo realized that movement does not need a cause – only a *change of movement* (for instance acceleration or deceleration) requires a cause.

genuine *subjects*, i.e. as being subjected to (God-given) physical laws for their existence as material things.

In so far as physical entities are *material* they are not *objects* but *subjects* (subject to physical laws), and in so far as they are *objects* they are considered according to some or other *non-physical* facet – for example as something *perceived* (*sense-object*), as something *analysed* (identified and distinguished from something else – *logical-analytical object*), as something *bought* or *sold* (*economic object*), and so on. Therefore, although things such as these could be objectified by humans, this objectification pre-supposes their primary existence as (physical) subjects. Speaking about them in all possible contexts as *objects* simply underscores the powerful subjectivist (human-centred) legacy operative in Western thinking. Since material entities indeed only occur within the domain of sense experience through the mediation of subjective observational acts (of objectification), it is understandable why the term “object” has acquired such a crucial position. But the question now is: how can we move beyond the limitations of a strict positivistic stance?

6.2 Setting a new scene: transcending (neo-)positivism

(Neo-) positivism can be described as the philosophical idolization of the experimental method on the basis of sensory perception. Neemann aptly refers to this conviction with an apology to the biblical saying: in the beginning was the Word. “*Am Anfang war die Methode.*” (“In the beginning was the Method” – Neumann, 1986:70.) The central principle of the Wiener Kreis, in the twenties and thirties of the 20th century, was that of “verification.”

6.2.1 Wittgenstein and Popper

Already Ernst Mach claimed – on the grounds of empirical (i.e. sensory) perception – that only mathematics and physics are to be allowed within in the domain of the sciences.

This delimitation of science led Wittgenstein, the mathematician-engineer-philosopher, to the point of view that the limits of my language are the limits of my world (*Tractatus* 5.6.). According to Wittgenstein the task of philosophy is to delimit the controversial terrain of the natural sciences (= physics) (4.113) – and the totality of the natural sciences constitutes the totality of true propositions (4.11). That which transcends the propositions of physics (which is meaningful) and logic (the propositions of which are tautologies and therefore meaningless: 4.461) *cannot be known or lingually expressed* – it belongs to the sphere of *nonsense* (*Unsinn*). The objection that the *Tractatus* itself would be a

victim of such a delimitation of science (to logic and natural science) is obviated by Wittgenstein's comment that his propositions serve an illuminating end:

[A]nyone who understands me eventually recognizes them [propositions] as nonsensical, when he has used them – as steps – to climb up beyond them. (He must, so to speak, throw away the ladder after he has climbed up it) (6.54)!

Karl Popper reacted strongly against this attempt at delimitation by Wittgenstein. He investigates, for instance, the following sentence by Wittgenstein: "Philosophy is no theory, but an activity" (4.112). This sentence clearly does *not* belong to the totality of natural scientific propositions, and therefore also not to the totality of true propositions. On the other hand, it is not a *false* proposition either, since if it were, then its negation would have to be true and therefore it would belong to the natural sciences. The only possibility then would be the mentioned conclusion of Wittgenstein (6.54): the sentence is nonsensical. Although Wittgenstein admits with this statement that the *Tractatus* is nonsensical, he declares in the final paragraph of the *Preface* that the truth of his notions appear to him unassailable and definitive. He is even of the opinion that he has found the final solution to the problems on all cardinal points. In a radical fashion Popper (1966) responds that this view shows that we can communicate "unassailably and definitely true thoughts" by way of propositions which are admittedly "nonsensical," and that we can solve problems "*finally* by propounding *nonsense*".

The implication is that all the metaphysical nonsense against which Bacon, Hume, Kant and Russell had fought for centuries may now "comfortably settle down, and even frankly admit that it is nonsense" for we now have a new kind of nonsense at our disposal: "nonsense that communicates thoughts whose truth is unassailable and definitive; in other words, *deeply significant nonsense*" (cf. Popper, 1966-II:297).

Popper asks himself how one can oppose this position of Wittgenstein. Every possible objection against it, after all, is philosophical in nature and therefore *nonsense*. This objection simply constitutes a *fortified dogmatism*.⁷

7 "All that is required, is to delimit the concept sense (or: *meaning*) in an appropriately *narrow* way so as to rid oneself of all awkward questions simply by saying that one does not find them *meaningful*. Every reasoned objection to this conception of meaning is simply rejected as *nonsensical*: Once enthroned, the dogma of meaning is for ever raised above the possibility of attack. It is unassailable and definitive" (Popper, 1966-II:297).

This meaning-conception of Wittgenstein, with its included delimitation of science, is just as untenable as the “verification principle” of neo-positivism. The term “logical positivism” (or logical empiricism) was brought into being to refer to a group of philosophers, logicians and mathematicians who became known in Vienna as *der Wiener Kreis*. The movement originally centred in Moritz Schlick, with philosophically oriented members such as Carnap, Neurath, Feigl, Waismann, Zilsel and Kraft, as well as natural scientific and mathematically oriented members like Frank, Menger, Gödel and Hahn. Carnap, Neurath and Hahn in 1929 published a manifesto entitled “Wissenschaftliche Weltauffassung, Der Wiener Kreis”. In this circle Wittgenstein’s *Tractatus* was also discussed and from it (cf. 4.024) they borrowed their famous verification principle: *the meaning of a statement lies in the manner by which it is verified*.

In his publication, *Language, truth and logic* (1936), A.J. Ayer explains that factual assertions are subject to the following criterion of verification: a sentence is meaningful for any specific person if and *only* if that person knows which perceptions would lead him (under certain conditions) to accept the proposition as true or to reject them as false (Ayer, 1967:35). A closer analysis causes Ayer to distinguish between a *strong* and a *weak sense* of verification. A proposition is verifiable in the first sense, if and only if the truth thereof can be conclusively determined in experience. A proposition is verifiable in the latter sense if it is possible to render the experience probable (Ayer, 1967:36-38). Ayer fully realizes that general formulations of laws *cannot* be conclusively verified – in consequence he has to accept verification in the weak sense. In a later preface (1946) he is nonetheless of the opinion that a class of empirical propositions exists that are conclusively verifiable. These are the basic propositions, which exclusively refer to the content of a *single* experience, and which can be identified as unique. Ayer is convinced that he has eliminated all metaphysics by means of this verification-criterion.

The newer theory of science of the past 40 years has realized, due to the influence of Popper, Toulmin, Polanyi (originally a chemist) and especially Thomas Kuhn (physicist) that even *physics* is inevitably gripped by a theoretical picture of reality (paradigm) and that it is possible to speak meaningfully of an ultimate commitment in every scientific activity – a central conviction out of which the scientist accounts for the deepest fundamental questions of doing science. This realization came about partly because of the *non-verifiability* of the (neo-positivist) verification principle.

6.2.2 Popper's "critical rationalism"

As an alternative to (neo-) positivism Popper defends a *critical rationalism*. Popper explains that the choice he had to make does not concern "simply an intellectual affair" because it is "a moral decision" (Popper, 1966-II: 232). If only that which can be defended by "means of argument or experience" is considered to be "acceptable", then we have an uncritical or comprehensive rationalism. This boils down to "the principle that any assumption which cannot be supported either by argument or by experience is to be discarded" (Popper, 1966-II:230). According to Popper this kind of rationalism is demonstrably inconsistent:

Now it is easy to see that this principle of an uncritical rationalism is inconsistent for since it cannot, in its turn, be supported by argument or by experience, it implies that it should itself be discarded. (It is analogous to the paradox of the liar, i.e. to a sentence which asserts its own falsity.) Uncritical rationalism is therefore logically untenable; and since a purely logical argument can show this, uncritical rationalism can be defeated by its own chosen weapon, argument (Popper, 1966-II:230).

Popper proceeds by generalizing this criticism. He says that since "all argument must proceed from assumptions, it is plainly impossible to demand that all assumptions should be based on argument" (Popper, 1966-II:230). He explicitly rejects the demand raised by many philosophers, namely that we should start without any assumptions whatsoever.

In anticipation of Gadamer's mentioned criticism of Enlightenment, manifested in its prejudice against prejudice,⁸ Popper indicates that the "assumption" behind the rejection of all assumptions should be recognized:

For they themselves rest upon the truly colossal assumption that it is possible to start without, or with only a few assumptions, and still to obtain results that are worth while. (Indeed, this principle of avoiding all presuppositions is not, as some may think, a counsel of perfection, but a form of the paradox of the liar) (Popper, 1966-II:230).

8 "The overcoming of all prejudices, this global demand of the Enlightenment, will itself prove to be a prejudice, and removing it opens the way to an appropriate understanding of the finitude which dominates not only our humanity but also our historical consciousness" (Gadamer, 1998:276).

Since neither logical argument nor experience can establish the rationalist attitude, Popper opts for a different stance: that of *critical rationalism*. He first of all points out that

whoever adopts the rationalist attitude does so because he has adopted, consciously or unconsciously, some proposal, or decision, or belief, or behaviour; an adoption which may be called 'irrational'. Whether this adoption is tentative or leads to a settled habit, we may describe it as an irrational faith in *reason*. So rationalism is necessarily far from comprehensive or self-contained. This has frequently been overlooked by rationalists who thus exposed themselves to a beating in their own field and by their own favourite weapon whenever an irrationalist took the trouble to turn it against them. And indeed it did not escape the attention of some enemies of rationalism that one can always refuse to accept arguments, either all arguments or those of a certain kind; and that such an attitude can be carried through without becoming logically inconsistent. This led them to see that the uncritical rationalist who believes that rationalism is self-contained and can be established by argument must be wrong. Irrationalism is logically superior to uncritical rationalism (Popper, 1966-II:231).

This view of Popper indeed resounds not only in the thinking of Gadamer, but also in the works of another prominent philosopher of science, Wolfgang Stegmüller. In reaction to the mentioned attempt of Kant to remove science in order to make room for belief, Stegmüller (1969b:33) says:

One does not have to restrict knowledge in order to make room for faith. Much rather one already has to believe in something to be able to speak about knowing and science at all.⁹

This insight should be connected to the nature of *evidence*. Stegmüller argues that one can believe in evidence or that one cannot believe in it, but this belief or unbelief is not capable of acquiring a more basic foundation. It is a primordial decision preceding all rationality. It has to be taken in every single case where something has to be known.¹⁰

Similarly, in harmony with Popper's acknowledgement that the confidence in the rationality of human thinking in itself is not rational,

9 "Man muss nicht das Wissen beseitigen, um den Glauben Platz zu machen. Vielmehr muss man bereits etwas glauben, um überhaupt von Wissen und Wissenschaft reden zu können" (Stegmüller, 1969b:33).

10 "An Einsicht kann man glauben oder nicht glauben, man kann diesen Glauben oder Unglauben aber nicht weiter begründen, ... Es ist eine 'vorrationalen Urentscheidung', die hier getroffen werden muss, und zwar in jeden einzelnen Falle, wo etwas anerkannt werden soll" (Stegmüller, 1969b:169).

Stegmüller (1969b:212) points out that within no single domain of knowing thinking can claim that it is self-assured:

somewhere an ultimate knowing must be given; without that we could not even start¹¹ ... We should already 'dispose of' an absolute evidence, i.e. we have to believe in it in advance,¹² ... in science *believing* is found, in religion one *knows* (or: pretends to know).¹³

This enlarged approach created room for the conviction that the range of science should not be narrowly reduced to (the methods of) mathematics, physics and logic (as the ideal of modern *natural science* claims) – it indeed encompasses all reality. A critical question at this point is: is it possible to make the transition from individual instances without confidence in the reality of universality? From what we have argued in an earlier context it is clear that *universality* indeed poses a serious problem for “empirical observation”. This leads us to the heart of positivism.

7. Uncovering the Achilles' heel of positivism

Popper discusses universality first of all with reference to what he calls *strict* and *numerical* universality (Popper, 1968:62 ff.). It is clear to Popper that the universality of natural laws precludes any attempt to ascertain empirically every single event to which the law might apply:

For the verification of a natural law could only be carried out by empirically ascertaining every single event to which the law might apply, and by finding that every such event actually conforms to the law – clearly an impossible task (Popper, 1968:63).

The other side of the coin is that Popper does not consider it to be meaningful to establish a direct confrontation between statements and observations. He realizes that human observation is already intertwined with conceptual elements.

The psychologist bias poses the question “how could we ever reach any knowledge of facts if not through sense-perception?” (Popper, 1968:94). Whatever we know about the “world of facts must therefore be ex-

11 “Irgendein absolutes Wissen muß es geben; ohne dieses könnten wir überhaupt nicht beginnen” (Stegmüller, 1969b:194).

12 “Absolute Evidenz müssen wir schon ‘haben’, d.h. wir müssen an sie bereits glauben, ...” (Stegmüller, 1969b:194).

13 “... in der Wissenschaft wird geglaubt, in der Religion weiss man (oder: behauptet man, zu wissen)” (Stegmüller, 1969b:212).

pressible in the form of statements *about our experiences*" (Popper, 1968:94). Popper then argues that this doctrine "founders" in his "opinion on the problems of induction and of universals" (Popper, 1968:94).

It is noteworthy that Bernays (1974:601) introduces the conviction that the "proper characteristic of rationality" is "to be found in the conceptual element". On this basis he supports Popper in the latter's emphasis on the presence of *conceptual* elements in observation:

All empirical investigations of nature are based on this fundamental stock of concepts contained in our background knowledge. Popper has repeatedly stressed the circumstance that the statements which we ordinarily regard as simply observational already presuppose this conceptual basis, so that in a proper sense we cannot say that natural science starts from observations (Bernays, 1974:602).

Unfortunately, in his subsequent discussion of universality, Popper does not distinguish between the universality of (functional) properties and the universal structural features of entities. This distinction is particularly useful when it comes to a criticism of the conceptual untenability of positivism.

Let us explore this issue in some more detail. In order to highlight the limitations of the senses in the acquisition of knowledge, we consider the concept of matter in terms of some of its main conceptual transformations.

We have referred to the fact that the Pythagoreans adhered to one statement above all else: *everything is number*. After the discovery of irrational numbers – revealing within the seemingly form-giving and delimiting function of number something *formless* – Greek mathematics as a whole was transformed into a *spatial mode* (the *geometrization* after the initial *arithmetization*). As a consequence material entities were no longer described purely in arithmetical terms. The aspect of *space* then provided the necessary terms required to characterize material entities. This spatial angle of approach remained in force until the rise of modern philosophy, since philosophers like Descartes (1596-1650) and Kant (1724-1804) still saw the "essence" of material things in their *extension*.

Particularly through the work done by Galileo and Newton the main tendency of classical physics eventually underwent a shift in perspective by attempting to describe all physical phenomena exclusively in terms of

(kinematical) *motion*.¹⁴ Writing about the foundations of physics, David Hilbert refers to the *mechanistic ideal of unity in physics* but immediately adds the remark that we now finally have to free us from this untenable ideal (cf. Hilbert, 1970:258).¹⁵

Since the introduction of the atom theory of Niels Bohr in 1913, and actually already since the discovery of radio-activity in 1896 and the discovery of the energy quantum h ,¹⁶ modern physics has realized that matter is indeed characterized by physical energy operation – the physical aspect of reality must therefore be seen as the qualifying function of matter, stamping physical entities in their energy-operation.

This brief sketch of the genesis and growth of the concept of matter illustrates in which way different (modal/aspectual) property-terms served to characterize matter – starting with the perspective of number and then proceeding to the aspect of space, the kinematical aspect and eventually the physical aspect of reality.

What is important to realize is that the *description* of matter was decisively dependent upon a particular *theoretical view of reality* (Kuhn would have used the expression *paradigm* or *disciplinary matrix*) that is entailed in the preference which is assigned to specific property-terms.

The crucial question now is: Is it possible to account for this foundational choice in an empirical way? In other words:

- Is it possible to *perceive* the numerical aspect?
- Can we *weigh* the spatial aspect?
- Can we determine the *volume* of the kinematical aspect?
- Can we “measure” the “distance” between the spatial aspect and the physical aspect?

14 The British philosopher, Thomas Hobbes (1588-1679), was familiar with the mechanics of Galileo enabling him – as opposed to Descartes – to employ the basic concept, *moving body*, as a descriptive tool.

15 It is therefore strange that the contemporary physical scientist from Cambridge, Stephen Hawking, still writes: “The eventual goal of science is to provide a single theory that describes the whole universe” (Hawking, 1988:10).

16 In order to account for the discrete nature of the omission or absorption of energy, Planck postulated that radiant energy is *quantized*, proportional to the frequency ν in the formula $E = h\nu$ – where n is an integer, ν the frequency, and h the quantum of action (*Wirkungsquantum*) with the value 6.624×10^{-34} .

The obvious absurdity of these questions not only illustrates the unsoundness of the positivistic faith in facts, but at once points at a crucial distinction implicitly operative throughout the history of the special sciences, namely the distinction between aspects and entities. These aspects enable our scholarly reflection to discern a *universal coherence* between different *kinds of entities* – just think about the (unspecified) universal scope of the fundamental laws of thermodynamics (which hold for *all possible* physical entities). In general at this level an implicit choice regarding particular modes of explanation causes a theoretical divergence among special scientists. The question concerning the *relationship* and *coherence* among the different aspects of reality (in terms of which we can describe anything) simply cannot be settled with the aid of the positivistic method of (empirical) perception and verification.

Nonetheless, positivism did realize that one can only discover the *structural nature* of an entity and the laws holding for physical entities by investigating the *lawfulness* (law-conformity) they evince. But it is precisely the difference between the *universality* of a *law* and the *unique instances* that can be empirically tested in experimental settings that once again unveils the mistaken nature of a positivistic position. A limited number of experimental instances could never warrant the claim of *universality* contained in law statements.

In its materialistic variant positivism reveals even further inconsistencies. Let us look at the typical claim that matter is all there is: *atoms, molecules, and macro-molecules in interaction*. This *statement* claims that there is nothing beyond matter – but what about the statement making this claim? Is it true? If so, then there is something immaterial (truth). Then what about those natural laws which hold for material things? They condition being material but are not themselves material. Thus, both with respect to the *truth-value* and the *universal validity* of natural laws, the basic claim of positivistic materialism is self-defeating.

Popper did not know this distinction between modal and typical laws. Making this distinction entails the acknowledgement that differently structured entities all function within universal modal aspects of reality (either as subjects or as objects). Therefore, whereas modal laws are given for all kinds of subjects, typical entitary laws are only given for a limited class of subjects. Typical laws always *specify* (but never: individualize) the universal modal laws – for example, thermodynamics, as a purely modal physical theory, abstracts from the typical differences between the solid state, the fluid state, and the gaseous state. Discussing the nature of an a priori synthetic element in the “empirical sciences”, Stegmüller (1969a: 316) raised the following possibility:

Surely, this cannot imply that the totality of law-statements present in a natural science could be of an a priori nature. Much rather, such an apriorism should limit itself to the construction of a limited number of a priori valid law relationships, while, furthermore, all more specific laws of nature should be dependent on empirical testing.

In fact this distinction is already present in the thought of Kant, who distinguished between his (supposedly universally valid *a priori*) *thought categories* on the one hand, and so-called *empirical laws of nature* on the other hand (Kant, 1783 par. 36:320).

Keeping in mind that we must distinguish laws in an *ontical* sense from our *hypothetical law statements* in scientific formulations, it is still remarkable to note the similarity between the just-mentioned statement of Stegmüller and the following explanation of Stafleu (related to the distinction between modal laws and typical laws):

Whereas typical laws can usually be found by induction and generalization of empirical facts or lower level law statements, modal laws are found by abstraction. Euclidean geometry, Galileo's discovery of the laws of motion ..., and thermodynamic laws are all examples of laws found by abstraction. This state of affairs is reflected in the use of the term 'rational mechanics', in distinction from experimental physics (Stafleu, 1980:11).

Whereas Kant ought to receive credit for having wrestled with the dimension of modal universality – in his search for the synthetic a priori (cf. Strauss, 2000) – positivism and neo-positivism ought to be acknowledged for their emphasis on experimental testing (not the same as verification). Only through studying the orderliness or law-conformity of entities is it possible to arrive at an understanding of the type laws holding for that limited class of entities conforming to their peculiar type laws. In the case of physics it requires empirical research through experimentation. Of course this do not free physics from an overarching and underlying paradigm (theoretical perspective) in which modal properties are also accounted for. Sometimes this dimension of theory formation is implicitly acknowledged when reference is made to theoretical terms which cannot directly be tested against actual experiences.

8. The Achilles' heel of positivism and the possibility of Christian scholarship

The inevitability of employing modal functional concepts underscores the necessity of a theoretical view of reality. Such a view can either accept the radical diversity within reality – evinced in the irreducibility of the various modal aspects – or it can attempt to elevate one or more than

one mode(s) of explanation to a level where a single mode or a combination of a few modes may serve as a explanatory device for whatever there is. Attempts such as these ultimately proceed from a misdirected trust in human reason, supposedly capable of finding a point of rest within the creational diversity. All the -isms within the various academic disciplines witness the negative effects of such an attempt to explain reality from *within*.

In spite of the contrary – owing to the uninformed prejudices against the possibility of Christian scholarship – claimed by those who oppose the idea of a Christian view within the special sciences, the Christian starting-point actually liberates the scholar from the one-sided and distorting effects of divinizing aspects of reality. At the same time the elementary biblical insight that one should not view anything (or any aspect of creation) as divine, helps us to understand why science in all its subdivisions can never be *neutral* with respect to the issue about the ultimate origin and final destination of reality.

The educational policy of the state should therefore never fall prey to positivistic *faith in* a supposedly objective and neutral science – and that for the following reasons:

- The current practice and the history of every singly discipline, to a smaller or larger degree, exemplifies alternative theoretical stances (mathematics not excluded).
- The theoretical divergence within the special sciences is a direct consequence of the unavoidability of (implicitly or explicitly) proceeding from a particular theoretical view of reality.
- In order to be impartial, the state should not superimpose upon education in South Africa the distorted perspective of one theoretical orientation, namely that of positivism. It must rather attempt to *protect* the constitutional rights of particular “conviction communities,” such as primary, secondary and tertiary educational and scientific institutions.

While we have learned from positivism that there is no substitute for “empirical investigation” when it comes to a discernment of the structural laws and principles of (natural and social) entities, and while post-modernism has opened our eyes for false certainties and for an acknowledgement of the provisional nature of human knowledge, a biblical starting-point enables us to understand (natural and social) entities within the matrix of God-given laws. Furthermore, a biblical point of departure deepens the postmodern claim concerning the fallibility of human endeavours with an appeal to the liberating power of redemption in Christ. In principle this starting-point safe-guards a scholar from one-

sidedly absolutizing facets of created reality, without suggesting in any way that scholarly knowledge could be elevated to our last certainty in life, for that would simply mean that once again we have surrendered to an idolatrous trust in reason.

9. Stegmüller and the problem of modal universality

Before we conclude our discussion a few remarks about Stegmüller's position in respect of modal universality is needed. The way in which Stegmüller transformed Kuhn's thought on the basis of Sneed's theory of mathematical physics, comes much closer to an actual acknowledgement of modal universality. According to him, what would appear to be unique and unprecedented in Kuhn's work,

is the fact that he appears to impute irrational behavior to the practitioners of the exact natural sciences (of all people!). And indeed he appears to impute it to both of the forms of the scientific practice distinguished by him. Anyone engaged in normal science is a narrow-minded dogmatist clinging uncritically to his theory. Those engaged in extraordinary research leading to scientific revolutions are religious fanatics under the spell of conversion, trying by all means of persuasion and propaganda to convert others to the *new paradigm* as revealed to themselves (Stegmüller, 1976:vii).

Not only do the natural scientists work in an *irrational* manner – according to the critics of Kuhn it would appear as if he is also a proponent of the *non-inductive* nature of the natural sciences.

A comparison between four prominent figures provides the following picture:

- Hume: the natural sciences proceed *inductively* and *non-rationally*;
- Carnap: the natural sciences proceed *inductively* and *rationally*;
- Popper: the natural sciences proceed *non-inductively* and *rationally*;
- Kuhn: the natural sciences proceed *non-inductively* and *non-rationally*; (cf. Stegmüller, 1975:487-490).

Though it will take us too far to explore in more detail the way in which Stegmüller accounts for a threefold *immunity* of theories against possible falsifications, it will be sufficient to say that what he called the *structural nucleus* of a theory, which remains untouched when hypothetical extensions of it are challenged with falsification, operates on the level of *modal universality*. Only those scientists who succeed in erecting new structural nuclei are involved in extraordinary research. Normal scientists

merely explore the structural nucleus of a theory by working on *hypothetical extensions* of it.

It turns out that Popper is mainly focused on *abnormal science*, whereas Stegmüller is of the opinion that the processes of rigorous testing and confirmation or falsification actually typically belong to *normal science*. If the normal scientist is subjected to a norm constantly requiring an involvement in the *change* of the structural nucleus of theories, it would entail an *inhuman* challenge to the average scientist – something like: “*Become a Newton or an Einstein!*” He remarks:

In so far as this maxim is directed towards “normal scientists”, who are in their domain of work constantly involved in sober and productive labour and who are also by far the majority of scientists, it is gruesome and inhuman. It implies that the assessment of every scholarly competence is made dependent upon the extent to which it conforms to this demand and that with it a devastating value-judgment is passed upon practically all scientists (Stegmüller, 1980:52).

10. Concluding remark

On the basis of a brief and incomplete sketch of the intellectual landscape of the 20th century – spanned between positivism and postmodernity – we have restricted ourselves to an exposition and critique of the Achilles’ heel of positivism. Popper, who accepted a plea of being guilty to the accusation that he “killed” positivism (1974-I:69 ff.), indeed could have deepened his criticism of positivism if he was in a position to consider the distinction between the modal and structural dimensions of reality. His considerations with regard to *universality* and the problem of *induction* would have been much stronger had he been able to consider the implications of what we have called *modal universality*.

In conclusion we have highlighted the relevance of these considerations both for the South African context and for an understanding of the nature and task of Christian scholarship. Given the *technocratic, scientific* undertones surfacing within the educational policies of the South African government, policy-makers may benefit from critically questioning the (positivistic) assumptions regarding the supposed *objectivity* and *neutrality* of scholarly activities.

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Key concepts:

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Kernbegrippe:

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positivisme
modale universaliteit
teoretiese werklikheidsbeeld
Christelik-wetenskaplike denke