1993. The mediating role of metaphor and analogy in the relationship between science and religion. **Tydskrif vir Christelike Wetenskap,** jrg. 29, 4e kwartaal, 1993, 60 -73.

The mediating role of metaphor and analogy in the relationship between science and religion.

Prof. M. Elaine Botha
Department of Philosophy,
PU for CHE
Potchefstroom

ABSTRACT

Approaches which argue "that" religious presuppositions and Christian commitment influence scientific theories often neglect to demonstrate "how" this is the case. Metaphorical hermeneutics is a methodology that can be implemented to demonstrate this required "how"-relationship. The paper will argue that:

* One avenue in which the relationship between science and religion becomes apparent is the meaning of scientific concepts. Contrary to the radical distinction between theory and observation and the radical theory-ladeness of observation-thesis, which both assume a reductionist theory of meaning, a theory of meaning is required that takes into account both epistemic and so called non-epistemic factors (such as inter alia the dimension of discovery and the representational resources that are part of the scientists culture) in the process of concept formation. A network theory of meaning which requires rejection of the radical distinction between literal and metaphorical language and also implies that the distinction between observation and theory in science is relative and contextually determined is judged a good candidate for such a theory of meaning. Scientific concepts are embedded in a network

of beliefs in which metaphysical beliefs are as constitutive as any other type of belief present in the network.

* Scientific concepts are regulated, determined, conditioned by the choice of ontological strata and conceptual schemata which limit their parameters of meaning. These ontological and conceptual schemata are closely related to (not causally determined by) a basic metaphor – often, but not necessarily, of religious origin – which dictates the choice of analogical emphasis present in the scientific metaphor functioning as control belief in the cluster of beliefs that make up a theory.

* Contrary to general opinion, it is argued that religious factors are not per definition non-epistemic in nature, but could function both externally and internally in scientific theorizing and can therefore also have a constitutive and intrinsically epistemic character.

* The nature of the "influence" of religion on science varies. It can function as the source or origin of creative and innovative ideas for theorizing. Religious considerations, notions, ideas and concepts can externally contextually condition theories but can also penetrate, pervade or permeate theories internally via a set of basic or core beliefs. In the latter sense the term refers to "the manner in which these notions function", or the way in which these beliefs are held (and not their content). This is the pervasive and permeating influence of a set of basic or core beliefs, assumptions or presuppositions which are given privileged and priority status in the process of theorizing.

* Religiously determined basic beliefs in science have to be sought within the scope of philosophical assumptions and metaphysical beliefs which guide or control research and

theorizing. Not all metaphysical beliefs and philosophical assumptions necessarily have this guiding/controlling function. Internal scientific control beliefs need not necessarily be "religious" in either origin or content in order to function "religiously" (i.e. analogous to religious belief) within the belief structure of scientific cognition. Any belief within the belief structure of scientific knowledge can be 'elevated' to the status of a control belief.

* The basic image or picture of reality (scientific world"view"/ Weltbild) provides the basic categories (categorial system) or schemata in terms of which the (scientific discipline or theory's) "world" is seen. It provides an account of the purported structure of the domain of discourse (and all the entities, processes and laws claimed to be present in it) and its relationships to other areas/domains of reality. It conditions the metaphors and analogies which are regarded as acceptable in order to approximate and articulate the structure of the entities, laws and processes under discussion in the domain. Such a basic view, provides both the basic- and conveyance metaphors which structure the generation of hypotheses and the formation of concepts in theorizing.

* Theory constitutive scientific metaphors (i.e. metaphors which propose models) often reflect and are permeated by deeper basic metaphorical notions intrinsically religious in nature which determine which analogical moments of a theory constitutive metaphor regulate, control, steer and guide the process of theorizing. So-called "non-epistemic" factors such as basic religious metaphors are epistemically internalized in theorizing via the focal analogical moments that acquire a controlling position within a theory impregnated with a theory constitutive

scientific metaphor. The basic metaphorical notions permeate the meaning of concepts utilized in the conveyance metaphors (linguistic projections of theory constitutive metaphors) in science via such focal analogical moments.

* There is a legitimate and illegitimate manner in which such core beliefs can function. Core or control beliefs in science, function legitimately when they steer, guide or control theorizing with respect to a limited facet of reality and illegitimately when they are either implicitly or explicitly employed or declared to be the ultimate explanation of not only of such an aspect but of all of reality. This can often be recognized in the phenomenon of "metaphorical hypertrophy".

* The methodology of metaphorical hermeneutics is illustrated as a useful hermeneutic for the natural sciences by applying it to Michael Faraday's understanding of the concept of "force".

The mediating role of metaphor and analogy in the relationship between science and religion.

Religion (re-) defined.

In order to facilitate an understanding of the way religious commitment and faith influences scientific theorizing, one requires an understanding of **religion** that deviates from the common everyday understanding in which it designates a restricted sacred area of human life in distinction from the profane or the secular. The notion of religion employed in this paper pertains to a commitment to that which is regarded as ultimate. This commitment is a total all encompassing relationship which permeates all facets of human life and comes to a differentiated expression in every single dimension of human life. (Clouser, 1991:21-23 defines religious belief as "..a belief in something(s) or other as divine" or "...a belief concerning how humans come to stand in proper relation to the divine". The "divine" is characterized here as that which can exist independent of anything else). This obviously, requires a redefinition of the standard notion of "religion". One needs to differentiate between religion in the narrower sense of the word (R1) i.e. **certitudinal or confessional** acts pertaining to worship and cultus and religion in the wider sense of the word, pertaining to the ultimate commitment of the totality of human life to that which is regarded as ultimate (R2). This wider definition of religion makes it possible to distinguish between typically confessional or certitudinally qualified acts of worship, prayer etc., but also accommodates the fact that in all aspects of human life there are other typically qualified expressions of a certitudinal or confessional nature, e.g. the

"confessional element" present in the policy statement of any political movement or the "confessional element" in the scientific statement of the "Wissenschaftliche Weltauffassung der Wiener Kreis" (Neurath, 1973). In the latter two examples the certitudinal elements function in an analogical way.

Religion "in" science?

Because of the all encompassing claims of religious commitment (of whatever kind), the domain of science and scientific knowledge is not free from religious commitment. It is important to recognize that the expression of religious commitment in the area of scientific endeavour differs from its expression in other areas of human life. Religion and science must be differentiated, but it is important to acknowledge that religious influence in science is garbed in the robes of the structure of science and when one is pursuing the interrelationship between these two realms both their heterogeneity and analogy have to be taken into account. When religion is defined as a commitment to that which is regarded as ultimate in the totality of human life, then it stands to reason that one will find analogous types of commitment within the structure of theorizing. But can these analogous elements be qualified as **"religious"?**. It is clear that although the analogy between certitudinal and confessional elements in religion and science seem to point in this direction, the claim that religious convictions function or influence science intrinsically and therefore also have epistemic import, requires stronger argument. At least two dimensions have to be emphasized: When science qua science is obedient to the structural norms for scientific theorizing, this already

constitutes a religious act in the wider sense of the word – but this holds too, when science is bad science and practised with ulterior or ideological motives. As human activity it is one of the many forms of human obedience to God's calling in a variety of areas of human life.

In both types of scientific practice a certitudinal element is present and it is this element which channels the religious (philosophical and metaphysical) convictions of a thinker, theory, school or tradition.

Metaphysical and religious scientific control beliefs

Scientific theories are embedded in a network of beliefs of which some are characteristically "metaphysical" beliefs (Cf. Popper, 1965; Agassi, 1975; Botha, 1986a). Some of these beliefs are held in such a manner that one could characterize them as being the certitudinal foothold of a theory. Wherever scientific commitments are held in such an unquestionable sense or protected against possible "falsification" they are candidates for the qualification of "religious" assumptions. Some might prefer to call them "philosophical" or "metaphysical" assumptions, but religious assumptions are actually **philosophical assumptions of a certain kind**. They are the type of religious assumptions that are held in such a way that they do not allow for their dependence on other assumptions. These types of assumptions do not only appear in the realm of organized religion in the form of doctrine or dogma, but analogous assumptions are also found in science, politics and most other areas of human life. Religiously determined basic beliefs in science have to be sought within the scope of **philosophical assumptions** and **metaphysical beliefs** which **guide**

or control research and theorizing. Not all metaphysical beliefs and philosophical assumptions necessarily have this **guiding/controlling** function.

Contrary to general opinion religious factors are not per definition non-epistemic in nature. Their epistemic or non-epistemic character depends on the function they fulfil within the context of theorizing. Any scientific, philosophical or metaphysical notion can acquire a dual epistemic function in theorizing, viz. when it functions as the cognitive framework within which meaning is discerned and when it is promoted to the status of **control belief** (Wolterstorff, 1984) within a specific theory. The rejection of the Copernican heliocentric view of the world is an example of an ecclesiastical religious belief fulfilling an epistemic function within the weighing of a theory. But the actual regulating or controlling function within the Church's theory as such is fulfilled by the status and sanction awarded to the geocentric Ptolemaic interpretation of the world. This is the "religious" notion epistemically at work within the structure of the theory. This means that religious notions could function both externally and internally or non-epistemically and epistemically in scientific theorizing. But this is also true of any other type of notion which might not be regarded as typically epistemic in nature. Philosophical, scientific and various other types of ideas and notions can, under certain circumstances, become epistemic in nature and even more specifically become epistemically-regulative and act as epistemic control beliefs. They can therefore have a theory constitutive and intrinsically epistemic character.

The epistemic penetration of science by religious beliefs.

The nature of the "influence" of religion (R1 and R2) on science varies. It can function as the **source or origin** of creative and innovative ideas for theorizing (Cf. Funkestein, 1986). Religious considerations, notions, ideas and concepts can **externally contextually condition** theories but can also **penetrate, pervade or permeate** theories **internally** via a set of basic or core beliefs. In the latter sense the term "religion" does not connote the origin or source of the notions which function in theories, but refers to **"the manner in which these notions function", or the way in which these beliefs are held.** What we have in mind is the **pervasive and permeating** influence of a set of basic or core beliefs, assumptions or presuppositions which are given privileged and priority status in the process of theorizing. When such basic beliefs, assumptions or presuppositions of science are held in such a manner that they are protected against all possible falsification they could be characterized as scientific beliefs acting in a "religious" manner, (i.e. pertaining to **the manner in which they are held, not to their content**). Such beliefs are often called a certain type of "metaphysical belief" or absolute or paradigmatic presuppositions (Burtt, 1954; Collingwood, 1940; **Cf. Luckman,John. 1986;** Brown,1975).

Beliefs either originating from religion or having religious notions as content can also function as scientific control beliefs within the internal belief structure of a scientific theory, but internal scientific control beliefs need not necessarily be "religious" in either origin or content in order to function "religiously" (i.e. analogous to religious belief) within the belief structure of scientific cognition. Any belief within the belief structure of scientific knowledge can be

'elevated' to the status of a control belief.

Basic categories or schemata, rootmetaphors and conveyance metaphors

"Scientific" worldviews and broader cultural worldviews often develop on the basis of the same **basic metaphor or basic analogy** about the structure of the world or experience, but differentiate as pre-theoretical (or unsystematic) and theoretical (or systematic) articulations of these worldviews respectively. The basic image or picture of reality (scientific world"view"/ Weltbild) provides the **basic categories (categorial system) or schemata** in terms of which the (scientific discipline or theory's) "world" is seen. It provides an account of the purported **structure** of the domain of discourse (and all the entities, processes and laws claimed to be present in it) and its relationships to other areas/domains of reality. It conditions the **metaphors and analogies** which are regarded as acceptable in order to approximate and articulate the structure of the entities, laws and processes under discussion in the domain. Such a basic view, provides both the **basic- and conveyance metaphors** (MacCormac, 1985) which structure the generation of hypotheses and the formation of concepts in theorizing. For this reason metaphor is such an appropriate site for studying the broader cultural dimensions of science. Cantor (1987:124-143) shows how the fluid, sand and ballistic metaphors provide examples of how the language of optics was impregnated by theological discourse and theological values. This also holds true for language in general which is often impregnated with the changing ideologies of the wider cultural milieu (Hesse, 1980:252).

Basic metaphor (closer to the sense of Kuhn's (1977) "global" notion of a "disciplinary matrix") is used as a more encompassing term than **rootmetaphor** which is often used either in a wider (Pepper, 1982; 1942) or a more restricted (McMullin, 1978; Cantor, 1987) sense. It provides a conceptual tool for the configuration of domain assumptions based on a rootmetaphor, and makes it possible to distinguish it from the more specific "metaphorically constituted" (Soskice, 1985:102) theory terms. The latter type of metaphors could also be called **conveyance metaphors**. They are the articulation of basic metaphors, are more restricted in scope than basic metaphors and often "grow out of" basic metaphors. Such a basic analogy comes to expression in conveyance metaphors, which in turn can be **epiphorical (expressive) and/or diaphorical (suggestive)**.

Theory constitutive scientific metaphors (i.e. metaphors which propose models) often reflect and are permeated by deeper basic metaphorical notions intrinsically religious in nature. Such basic metaphorical notions determine which analogical moments of a theory constitutive metaphor regulate, control, steer and guide the process of theorizing. So-called "non-epistemic" factors such as basic religious metaphors are epistemically internalized in theorizing via the focal analogical moments that acquire a controlling position within a theory impregnated with a theory constitutive scientific metaphor. The basic metaphorical notions permeate the meaning of concepts utilized in the conveyance metaphors (linguistic projections of theory constitutive metaphors) in science via such focal regulative analogical moments.

Scientific concepts: Conveyors of meaning

One avenue in which the relationship between science and religion becomes apparent is the **meaning** of scientific concepts. Contrary to the current juxtaposition of the radical distinction between theory and observation and the radical theory-ladeness of observation-theses, which both assume a reductionist theory of meaning in which the meaning of theory is reduced to observation or vice versa, it is argued here that a correct view of the interrelationship between science and religion requires a different theory of meaning. This is one that takes into account both epistemic and so called non-epistemic factors (such as inter alia the dimension of discovery and the representational resources that are part of the scientists culture) in the process of concept formation.

This approach assumes a **network theory of meaning** (Suggested by Nersessian, 1987 in conjunction with Quine's theory. Cf. Leplin-Nersessian discussion, Philosophy of Science, vol. 55:4, 1988 and vol 58:4, 1991b, which discusses the feasibility of such a theory of meaning); requires rejection of the radical distinction between literal and metaphorical language (Hesse, 1984 a & b; Botha, 1986b) and also implies that the distinction between observation and theory in science is relative and contextually determined.

Scientific concepts are embedded in a network of beliefs in which metaphysical beliefs are as constitutive as any other type of belief present in the network. Scientific concepts are regulated, determined and conditioned by the choice of ontological strata and conceptual schemata, which limit their parameters of meaning. These ontological strata and conceptual schemata are closely related to (not causally determined by) a **basic metaphor** (MacCormac, 1985) - often, but not necessarily,

of religious origin – which dictates the choice of analogical emphasis present in the scientific metaphor functioning as **control belief** (Wolterstorff, 1984) in the cluster of beliefs that make up a theory. E.g. the choice of either an organic, mechanistic or cybernetic systems model for the interpretation of phenomena dictates the type of analogies and metaphors regarded as acceptable within the parameters of a theory. Once a choice has been made for a basic metaphor, e.g. the mechanistic understanding of a system, this choice provides a set of regulative control beliefs which prescribe the meaning of the concepts employed in theorizing, e.g. "inertia", "system equilibrium" in Talcott Parsons' Structural Functionalism.

Literal and metaphorical meaning in science and religion

A difficult issue to resolve in the interrelationship between religion and science and the relationship of religious and scientific metaphor is the differentation between the so called "literal" and "metaphorical" meaning of concepts within these two domains of discourse. In religious discourse such as e.g. Psalm 23 the metaphorical meaning of the Psalm is actually the "literal" certitudinal meaning of the Psalm. The metaphor of the shepherd is meant to be interpreted literally in a certitudinal context. This applies to most other Biblical metaphors, e.g. the Church as the Bride of Christ, although a metaphor, is certitudinally literally true, although we know that a bride is "literally" something else in the context of a marriage.

In scientific discourse on the other hand the literal and the metaphorical differentiates between various disciplines. Force is a polyvalent term found in many natural and social scientific disciplines, but it's literal or metaphorical meaning is qualified by the scientific realm of discourse within which it

is found and it's meaning is furthermore determined by the extent to which it answers to the typical structural norms for science such as predictive control and explanatory power. An analogy expressed in a metaphor which proves its predictive fruitfulness and explanatory power in a theory acquires the epithet of realism or "literal". This poses the question as to the criterion for differentiating between the illegitimate and legitimate employment of metaphors in scientific and religious discourse.

Legitimate and illegitimate control beliefs

There is a legitimate and illegitimate manner in which core beliefs can function in science. Core or control beliefs in science, function legitimately when they steer, guide or control theorizing with respect to a **limited facet of reality**. When such beliefs are either implicitly or explicitly employed or declared to be the **ultimate explanation** not only of such an aspect but of **all** of reality, it is a clear indication that intrinsically **scientific control beliefs** have been overextended and "elevated" to the plane of religious beliefs pertaining to all of reality. This can often be recognized in the phenomenon of "metaphorical hypertrophy".

When does a metaphor function illegitimately in religion? Let's resort once more to an example form the Bible. the "exodus motive" is a core revelation of God in the Old Testament. The literal, historical exodus of the Israelites can also be interpreted metaphorically as the journey of Gods'people through history. There is a **limited analogy** at work here and the context and qualification is religious (pertaining to the relationship of God to the universal people of God). The moment this limited analogy is overlooked and a **full identity** is claimed between the

historical journey of people of God (Israel) and a limited ethnic or national grouping, then the religious metaphor of the exodus is literalized.

Metaphorical hermeneutics a methodology for the natural sciences?

It has become clear that so called "non-epistemic" factors are often as epistemically constitutive of the process of scientific concept formation as the so called "epistemic" factors (Nersessian, 1987; Tweney, 1989b). Moreover there is often a direct link between the basic metaphor chosen as model of interpretation of reality and the type of root- and conveyance metaphors chosen in scientific theorizing. The metaphorical focus of a scientific theory becomes apparent when the control beliefs that are safeguarded by a theory are identified. The analysis of the structure of metaphor above provides a hermeneutic for both the social and the natural sciences. Moreover, it can also provide valuable insights in the relationship between religion, metaphysics and scientific theories. The analysis of Michael Faraday's use of the religious and scientific metaphors "force" will demonstrate this thesis. a This I shall deal with in a separate paper. The final question that needs to be addressed is whether the abovementioned hermeneutics could actually elucidate the problems of conceptual meaning in the natural sciences.

The function and presence of metaphor in natural scientific theorizing has been argued extensively (Bradie, 1980; Hoffmann, 1980). In the last section of this paper I would like to argue not only that metaphor is as constitutive of natural science as it is of social science and the humanities, a claim also defended extensively by others, but that natural science is as

hermeneutic as the social sciences and humanities (Hesse, 1980: 185; Heelan, 1983a; 1983b) and Hesse, 1980: 185; Heelan, 1983a; 1983b) and that comprehending the role of metaphor in natural science provides access to the understanding of the constitutive role played by religious convictions in scientific theorizing.

According to Boyd (1979), Hesse,1980, J.Martin, R.Harre, 1982, et al, metaphor performs three functions in science (Cantor, 1987:127):

The first is its generative function. This implies a far stronger role than only in the logic of discovery. Metaphors are theory constitutive – any worthwhile theory is constantly being extended through the articulation of its underlying metaphors. They are essential to the development of scientific theory. The second is the role it plays in the framing of scientific terminology. This has to do with the reference function of metaphor which functions both in immature and mature theories. These two functions thus operate at the level of theory generation and in research. The third role of metaphor has to do with teaching. Often metaphors are used in a didactic context in order to convey or demonstrate new insights in terms of already existing insights. Cantor (1987:128) shows that many of the optical metaphors used in eighteenth century light theory originated from theological discourse. As argued above the origin of such a metaphor does not make its function within the theory as such "religious".

What is of interest in this section of the paper is the fact that scientific instrumentation and apparatus is often what Cantor (1987:140) calls "a reification of metaphor". The role metaphor plays in instrumentation and experiment is twofold:

It is often exactly in so called "crucial experiments" that the

instrumentation is employed as an experimental extension of a metaphor in order to "get at" as yet unknown aspects of reality. Metaphorical extensions, Cantor says, occur when the existing apparatus and instruments are used in non-standard situations. An example is the experimental attempts at "weighing light" which was the implementation of the materialist metaphor for light.

A second more explicitly hermeneutic role is played when it is recognized that any experiment as reification of a theory constituted by a metaphor needs to be "read", "interpreted" as any other text in either literature, science or reality in general within a horizon of meaning provided by the symbolic universe of discourse provided by the parameters of the dominant disciplinary matrix. This is why Heelan (1972:495) can say: "...science is a hermeneutic of man-made signals produced in experimental situations and these get their meaning from and through the community of scientific enquirers". This hermeneutical aspect is located in the heart of natural science: in observation and perception (Heelan, 1983:181).

But there is also a wider context which provides the context of meaning within which the instrumentation, apparatus and experiments as "texts" are read: This what Heidegger (1962) calls "Vorhabe", i.e. the culturally acquired background of embodiments, skills and practices in which we hold/have the object of our understanding, even before we can recognize and name it as an object. It is metaphor which provides the connecting link between this "Vorhabe" of the wider culture and the context of meaning within which the scientist often works. For this reason it will also be one of the most fruitful avenues to provide access to the interrelationship between deeply

imbedded cultural religious convictions and those scientific beliefs which are elevated to the status of religious control beliefs. Mary Hesse (1980:186) says: " ...theories have always been expressive of the myth or metaphysics of a society, and have therefore been part if the internal communication system of that society. Society interprets itself partly by means of its view of nature"

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* Research for and preparation of this paper was supported by a Senior Research Grant of the Human Sciences Research Council in South Africa; was made possible by leave granted by the Senate Commitee for Reformational Scholarship of the Potchefstroom University for Christian Highjer Education and a Research Fellowship of the Pascal Centre, Redeemer College, Ancaster, Ontario, Canada.