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The elaboration of a demarcation criterion in reformational philosophy

First submission: 11 November 2010
Acceptance: 15 February 2011

Contemporary philosophy of science has struggled considerably over an apparently simple question: how does one distinguish between scientific and non-scientific knowledge? The search for a criterion of demarcation between science and non-science has been laborious but not very rewarding. This article presents the contribution provided by Reformational philosophy, a relatively small Christian school in which, it is argued, a plausible solution to the demarcation problem was offered. The views of the relevant authors are sketched, with the conclusion that (since its beginnings in the 1930s) the discussion on the demarcation criterion among Reformational philosophers shows considerable consensus.

Die uitwerk van 'n afgrensingskriterium in reformatoriese filosofie

Die huidige wetenskapsfilosofie worstel ernstig met 'n oënskynlik eenvoudige vraag: hoe onderskei 'n mens tussen wetenskaplike en nie-wetenskaplike kennis? Die soeke na 'n kriterium vir onderskeid tussen wetenskap en nie-wetenskap is uitgebreid maar lewer nie veel op nie. Hierdie artikel stel aan die orde die bydrae wat die Reformatoriese filosofie, 'n relatiewe klein Christelike denkskool, maak. Daar word geargumenteer dat laasgenoemde 'n moontlike antwoord op die afgrensingsprobleem bied. Die standpunte van die relevante skrywers word kortliks gegee met die konklusie dat (sedert die begin van die skool in die 1930's) die debat oor die afgrensingskriterium 'n beduidende ooreenkoms tussen Reformatoriese filosowe toon.

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Acta Academica
2011 43(2): 41-65
ISSN 0587-2405

<http://www.ufs.ac.za/ActaAcademica>

SUN MEDIA BLOEMFONTEIN

In a recent article[1] I sketched the process of definition of a demarcation criterion between science and non-science within twentieth-century philosophy of science. The result of that enquiry was that humanist philosophy of science has not succeeded in formulating a clear and plausible answer to questions such as: What is science? (What is it not?) In what way does it differ from non-scientific knowledge, activities, thinking, and so on? The proposed answers have been numerous, but conflicting and limited consensus could be achieved. On the contrary, each new answer usually implied a rejection of the previous proposals, while in the long run a certain disillusion crept in. At the beginning of the 1980s Laudan (1980: 275) wrote: "The fact that 2400 years of searching for a demarcation criterion has left us empty-handed raises a presumption that the object of the quest is non-existent".

Nevertheless, I concluded the above-mentioned article by outlining the contribution of D F M Strauss, a South African philosopher in the Dooyeweerdian tradition who, in my opinion, proposed a clear and solid response to the demarcation problem. I have therefore briefly sketched Strauss' criterion, but hardly any mention was made of the long process leading to the elaboration of that answer. Although Strauss deserves recognition for his specific contribution, he has profited from a long tradition of reflection on this issue and, on that basis, he could refine and sharpen a clear-cut answer.

I would therefore like to outline the elaboration of a demarcation criterion in the reformational tradition. My main purpose is to show that in such elaboration there has been a considerable degree of consensus and gradual improvement.

The term "reformational circles" refers to a specific family within the Kuyperian tradition: the "branch" following the line of Dooyeweerd and Vollenhoven. I will deal only with this circle; one of the reasons being that in other Kuyperian families one cannot find the same clarity or effectiveness in the elaboration of this crucial criterion.

1 Coletto 2011. Science and non-science: the search for a demarcation criterion in the 20th century. *Tydskrif vir Christelike Wetenskap/Journal for Christian Scholarship* 47(1): 63-79.

Admittedly, the degree of consensus achieved on the demarcation issue within reformational circles could not be fully maintained when the reflection penetrated neighbouring domains. In particular, on the question to know how science works (in other words, what happens when we think scientifically, and so on), the discussions have been long and laborious but the positions (though not incompatible) seem to remain relatively different.[2] In the following pages I will focus only on the specific topic of demarcation without discussing the other more complex and controversial issues. I will, however, pay some attention to the different nuances and emphases which emerged in the reformational reflection on the demarcation issue itself.

During this process, I trust my own preferences, and questions will also become apparent. This brief survey does not claim to be complete or to have answered all the questions. I rather consider it an initial survey on a complex topic, and I therefore invite others to contribute to further research on this topic.

I would like to begin this historical-systematic survey from the work of the Dutch philosopher who is considered, together with D H Th Vollenhoven, the founder of the reformational school of philosophy.

2 In addition to Dooyeweerd's views (1984), the following texts may be mentioned as an introduction to a rather complex topic. Hart (1985: 150) points out several problems in Dooyeweerd's *Gegenstand* theory. Strauss (1984) and Geertsema (1995) develop similar critical arguments. From an appreciative point of view, Strauss also recommends a few alterations to the ontology of Hart (Strauss 1989: 103-20) and the epistemology of Stafleu (Strauss 1995: 127-38). As pointed out earlier, however, these studies are important especially for an understanding of the mechanisms of scientific theorising, and are less crucial for the present topic. Although closely related, the topics can be distinguished. For example, the fact that metaphors are a crucial element for the operations of science does not help much in the demarcation issue, as metaphors also operate in non-scientific knowledge. In other words, not all the answers concerning "how science works" are also crucial for the present topic.

1. Herman Dooyeweerd

Herman Dooyeweerd started dealing with demarcation issues in the 1930s. Non-scientific (or "naive") thinking is characterised by a focus on concrete entities, events and phenomena. On the other hand, scientific thinking is thinking along modal lines. What are these modal lines? Dooyeweerd identified the basic aspects of concrete reality, their order of succession, their "core" meaning, and so on. In practice, he identified fifteen modalities or aspects. In Dooyeweerd's philosophy a modal aspect, or modality, is one of the fundamental modes of being of created reality. Modal aspects are also fundamental ways of observing reality. According to Dooyeweerd (1979: 214), there are fifteen modal aspects, namely the numerical (referring to discrete quantity, number), spatial (extension), kinematic (motion), physical (energy), biotic (organic life), psychic or sensitive (feeling, emotional life), logical (logical distinction), historical (formative power), lingual (symbolic meaning), social, economic, aesthetic, juridical, moral and pistic (faith-life) aspects. All concrete entities function within all the aspects of reality, in some of them as subjects and in others as objects.[3]

When we consider something from the point of view of a specific aspect, we are dealing with scientific analysis. Mathematicians consider the world through the numerical aspect; biologists select the biotic aspect; historians focus on events that are formative in a cultural sense, and so on. We may to some extent conclude that scientific thinking focuses on a "how". In this process, according to

3 For example, a cat has two eyes (numerical aspect), occupies a certain space, can move, jumps with energy, is a living entity and is emotionally aware of dangers. In the first six modalities cats function as subjects. In the following ones they function as objects. Of course, cats do not debate logical problems, but they can become objects of research. Several new breeds have developed in history. A cat is given a name, can be the "best friend" of an old lady (social aspect), who bought it (economic), so that now it belongs to her (juridical). Cats are loved by children, and they can be considered as products of blind chance or of God's creation (certitudinal aspect). These aspects are not only aspects of the world (of the things that we find in reality). They are also modes of our experience and thinking as well as modes of explanation.

Dooyeweerd, the logical aspect is opposed to the non-logical aspects and the synthesis is operated by the human subject. Such a process reveals the dependence of theoretical thinking on a person and his/her commitment (a position paralleling Polanyi's insights).

By contrast, let us now consider non-scientific thinking. Naive thinking focuses on a "what", on concrete events, relationships or entities (Dooyeweerd 1984, 1: 3, 34-42). In this instance we have an integral, immediate experience of cosmic time in the un-interrupted coherence of all its modal aspects (Dooyeweerd 1984, 1: 34). Our logical function remains entirely accommodated to that continuous coherence. We grasp reality in its typical total structure of individual things and concrete events. Naive concept formation is not directed to the modal aspects but to things and concrete events (Dooyeweerd 1984, 1: 41). The presupposition of this integral character of naive experience is given in the subject-object relation. Objective functions and qualities are ascribed to things in modal aspects in which they cannot appear as subjects. Consequently, water is experienced as necessary for organic life; a bird's nest is an object of life, and a rose has objective beauty (Dooyeweerd 1984, 1: 42).

One may wonder whether one may trace some similarities between Dooyeweerd's and Polanyi's approaches. Polanyi is also inclined to identify the difference between science and non-science as a difference in focus. The distinction between focal and subsidiary awareness informs Polanyi's demarcation criterion. Scientific study is focal and integrates the (pre-scientific) awareness of particulars apprehended in a subsidiary way. One important question, however, is to know whether for Polanyi the scientific focus is modal. One has the impression that he regards the scientific focus as concentrating on a "whole", whose particulars are tacitly assumed (Polanyi 1966: 3-14).

The scholars following Dooyeweerd's approach enjoyed an immediate "bonus" in the form of a practical and very useful application. They could easily detect insufficiencies and distortions in many definitions of the fields of study of the different disciplines. Scholars and lecturers frequently enjoy defining their disciplines as the study of some kind of entity, or "piece" of reality. For example, it is argued

that theology studies the Bible (or God, or the church), psychology studies our behaviour, and history studies past events.

Often those definitions would fit several sciences simultaneously. For example, when psychology is defined as the "study of human behaviour", it is clear that the definition could apply with similar plausibility to ethics, history, sociology and a few other disciplines. In fact, all of these are to some extent exploring "human behaviour" and its results. By introducing a modal qualification the reformational school could show that psychology is only interested in examining such behaviour from the perspective of this aspect. And this demarcates precisely the field of study which is unique to psychology.

When compared to the Dooyeweerdian model, the Vollenhovian approach does not present particular differences. We can now therefore move to another author within the same reformational tradition.

2. Hendrik van Riessen

Admittedly, Van Riessen was not satisfied with Dooyeweerd's explanation of the *Gegenstand* relation characterising science. Such relation entails, as mentioned earlier, an opposition between the logical and non-logical aspects of our experience with a subsequent synthesis. According to Van Riessen (1970: 119), scientific thinking should not be regarded as a matter of "opposing" modal aspects, or creating syntheses between them. He even asks the question whether such a process is at all possible. This, however, forms part of the broader question concerning the mechanisms and functioning of science. On the specific topic of demarcation, Van Riessen expresses considerable agreement with Dooyeweerd's position.

In fact, when Van Riessen (1970) traces the main characteristics of scientific and non-scientific thinking, they correspond, to a considerable extent, to Dooyeweerd's approach. Van Riessen (1970: 82-3) distinguishes between two types of non-scientific knowledge, namely factual and practical knowledge. Non-scientific experience (including both factual and practical experience) maintains the

cohesion among modal aspects. On the other hand, theoretical assertions "concern one abstracted mode of reality" (Van Riessen 1970: 93).

Van Riessen simultaneously deepened the exploration of some important issues. He asked an interesting question: how it is possible to include philosophy among the sciences if the scientific approach consists in thinking along modal lines? (Van Riessen 1970: 118) One might indeed notice that philosophy does not seem to take one particular modality as its "point of entry" and to observe the world through a specific window. Philosophy is a science of comprehensiveness; it deals with history, society, art, politics, education, and so on. It deals with the modal aspects themselves, being interested in all of them and their relationships, connections or analogies. In other words, philosophers do not simply select one modality as the "binoculars" through which they observe the world. They seem to have many binoculars. In addition, as part of their task, philosophers study the binoculars themselves. Is philosophy a science?

Van Riessen asked a second important question, related to the previous one: what type of "object" is the proper target of science? His answer is that science deals specifically with laws: science is *weten(schap)*. Science deals with laws holding for the specific realities which are studied. If this is true, then Van Riessen provided the beginning of an answer to the previous question. Philosophy should be included among the sciences because (like any other science) it deals with laws. I will return to this problem later.

In the meantime, we should pay some attention to Van Riessen's analysis of the long Western tradition of mis-placement of the law either in the objects of research or in the (human) subject. We may call these approaches objectivism and subjectivism, and argue that they are related to realism and nominalism. Both realism and, to a larger extent, nominalism are affected by the problem of the "incongruence between science and reality" (Van Riessen 1992: 48-9).

Briefly stated, while it is widely accepted that scientific knowledge aims at the universal, according to the nominalist, in reality we only meet individual entities. Apparently, science and reality miss

each other. The realist, on the other hand, includes the universals within reality. The universals, however, are conceived in terms of entities and the latter are related to concrete reality (Van Riessen 1992: 33-7, 48). In other words, the nominalist mis-places the law in the human subject (the only "place" where universal names or concepts are available), while the realist mis-places the law within (in some cases above) the objects of concrete experience.

In all these instances the incongruence between science and reality emerges, an incongruence which is solved only when one is prepared to acknowledge that science deals with laws, with the structural order for reality. Van Riessen regards these laws as God's laws, and he suspects that this explains the reticence of humanist philosophy in recognising this state of affairs.[4]

Another important contribution by Van Riessen (1970: 98) is that he recognises abstraction as a crucial characteristic of scientific thinking. Abstracting means focusing on a particular target while simultaneously "disregarding" the rest (this is also indicated as "lifting out" something from its context).

According to Van Riessen (1992: 73), "abstraction is the distinctive approach of science". He distinguishes three types of abstractions, in which one modality is abstracted from the others, the scientific "object" is abstracted from the knowing subject, and the law is abstracted from concrete reality. Although modal abstraction is "evidenced in the terminology of many sciences", according to Van Riessen, this type of abstraction is not the most typical of science (unlike Strauss). In his opinion (Van Riessen 1992: 70) scientific abstraction is about "lifting out" the law-order from the unique and concrete reality, from the researcher, and from the modal coherence

4 For example, Van Riessen (1992: 55) is surprised that the nominalists, who were so closely associated with the developments of physics, did not consider exploring the idea of a universal order. After all, the knowledge of physics is expressed in laws. Why was this fact not sufficient to suggest the idea of a law-order? Van Riessen (1992: 55) considers a few possible answers. "But it seems to me", he concludes, "that recognition of a law or structure [...] would run counter to the subjectivist program, for which reality and the scientific, thinking subject were sufficient and heteronomy was rejected".

of reality. Van Riessen (1992: 69) argues that "Science begins with wonderment at some thing or another". This generates a scientific problem. Scientific abstraction then focuses on a problem concerning the law-order and disregards the researcher, the concrete (unique) reality and the modal coherence of reality.

It is obvious that Van Riessen very nearly identified modal abstraction as the crucial characteristic of science (cf Strauss). Yet he preferred to combine three types of abstraction and to regard them as constituting scientific abstraction. Personally, I suspect that abstraction of the object from the knowing subject and of the law from reality may not be totally unknown to pre-scientific thought. On this specific point of Van Riessen's approach, it would be interesting to have Strauss' comments.[5]

In summary, Van Riessen tested Dooyeweerd's formulation of the demarcation criterion and introduced several important distinctions and new insights. He also acknowledged the continuity of his approach with Dooyeweerd's view of demarcation:

> Although Dooyeweerd's view that a scientific discipline is limited by the boundaries of modalities seems somewhat simplified, I nevertheless support him insofar as the entitary nature of reality can only be perceived indirectly by science, via the modalities (Van Riessen 1992: 65).

After all, the modalities have everything to do with laws. All modalities have a law aspect and are often indicated as law spheres. They constitute the structural order for created reality.

We may therefore state that Van Riessen re-oriented scientific analysis towards the law, and emphasised that the law should not be confused with the objects. But at the same time, within reformational circles, a parallel view was often present, namely that entities should also be recognised as a proper target of scientific study. Perhaps it was an attempt at balancing the emphasis on modality with an emphasis on entities. I cannot trace precisely when or in which author (or circle) this idea originates, but there are regular traces of

5 Strauss himself, as editor of the *Tydskrif vir Christelike Wetenskap/Journal for Christian Scholarship*, promoted the publication of Van Riessen's (1992) text.

its presence through the years. As early as 1966, for example, Van der Laan (1966: 25) wrote that "... the physical sciences are concerned with things which are qualified by the energetic aspect and are founded in the numeric, spatial and kinematic aspects". In the 1990s Van der Walt (1994: 580) explains that theology, while observing the world via the pistic "window", focuses on entities such as the church and the Bible which are qualified by the pistic modality. In addition, I have "encountered" the same idea during personal dialogues with lecturers of the Potchefstroom campus. Hendrik Hart has provided a few important comments on this issue. But before returning to this specific topic, let us outline a general description of Hart's approach.

3. Henk Hart

In many respects (and in philosophy of science, in particular) Hart often walked on the path traced by Van Riessen, and this was the case from the early years of his philosophical development (*cf* Hart 1976, 2: 644). In an important text on demarcation, Hart (1985) proposed to "reconstruct" Dooyeweerd's approach by utilising the materials provided by Dooyeweerd himself.

The difference between scientific and non-scientific thinking, argues Hart, is not simply located in the distinction between modal and entitary thinking. In pre-scientific thinking we also approach the modalities, while in scientific thinking we also deal with entities.

In this he follows Van Riessen: science deals with the laws, with "structures", in other words with "... our understanding of structures, our grasp of general patterns, our insight into laws, kinds and properties" (Hart 1985: 155). The demarcation criterion is not to be found in the distinction between modalities and entities. One should rather consider the distinction between the law and what is subjected to that law. In this instance, a few questions emerge. Does pre-scientific thinking have nothing at all to do with laws? Is scientific thinking totally severed from what is subjected to conditions? Are conditions themselves not experienced via the functors (Hart's term for entities) which are subjected to them?

I am under the impression that Hart realised fairly soon that his proposal was not incompatible with Dooyeweerd's basic approach. The emphasis on the law is still an emphasis on modalities, which are "law-spheres". On this basis, Hart continued to link science and modality, explaining that even sciences such as education, agriculture or medicine (whose modal perspectives are not immediately grasped intuitively) are also linked to modal aspects (Hart 1984: 177).

Hart's emphasis on the law is linked to Popper's notion that we can have science only in the presence of universal laws. For Popper the laws of nature exist and are universal in scope. The phrase "laws of nature", however, is for Popper a synonym of "physical laws" (Popper 1961: 5). He denies that there are historical or social laws but only "trends and patterns" (Popper 1961: 115). He is thus inclined to regard the humanities as "spurious sciences" and is determined to avoid any "appeal to the sociological (or psychological or historical) lunatic fringe" (Popper 1970: 57-8). As Stafleu (1987: 201, 204) observes, Popper ends up reducing the range of modal laws to the physical and logical ones. As Popper (1963: 118) links universals to dispositions, and dispositions to law-like behaviour (1963: 278), Hart (1984: 21) writes:

> Popper restricts these genuine universals to the world investigated by the natural sciences [...]. Just why he makes this distinction is hard to see. If we say that glass has a disposition to break under certain conditions, why wouldn't we also say that people have the disposition to raise families under certain conditions? Why should natural dispositions be more real than social dispositions? Wouldn't social dispositions also be natural in the case of people?

For Hart (1984: 173-98) the range of scientific disciplines is broader because the range of universal (modal) laws is broader.

Hart also provides an indirect comment on the notion (mentioned earlier) that science should focus on the objects qualified by a certain modality. In fact, Hart (1984: 284) argues that social institutions (including the church institution) should not be regarded as being qualified by any specific modality. I am not suggesting that this refutes the above proposal, but Hart helps realising that the issue of qualification is not an easy one, and in this he is followed by a few others.

For example, after mentioning Hart's position on this point, Geertsema (2004: 58-9) discusses Dooyeweerd and Chaplin. While Dooyeweerd's position is too complex to be included in our brief survey, we can mention that Chaplin (1995: 21) does not ascribe all aspects to social structures. In addition, Clouser (2005: 264) reminds us that human artefacts are qualified by two modalities: the foundational and the "leading" functions.[6] All this poses some complications to the notion that science simply studies the objects qualified by a certain modality. As far as artefacts and social institutions are concerned, the issue is not exactly simple.

I would like to add that, although we may find it desirable, for whatever reason, to "set apart" certain objects (the churches, the banks or the plants, for instance) as the special concern of some disciplines, we must remember that no single discipline will ever study those realities from all points of view (in other words, modalities). This means that the church, the cows, and so on will remain the object of study of several other sciences, from other points of view. In this respect, it is not accurate to present such objects as the particular concern (field of study) of a specific discipline (cf final notes in the section on Dooyeweerd).

For a last remark on this issue, my impression is that by limiting the field of study of any discipline to the items qualified by a certain modality we adopt a rather artificial approach which is inclined to consider more or less "unconventional" whatever lies beyond the most typical or traditional "items" of a certain discipline. Yet theology, for example, is not dealing with anything unusual when it deals, from its own modal perspective, with ecological, economic, social, artistic or juridical issues. In fact, this type of research should be encouraged.

6 In other words, in a human artifact the foundational function is the aspect qualifying the process of transformation through which the artifact was produced. The leading function is given by the aspect qualifying the plan or purpose governing the process (Clouser 2005: 268). For example, a house has a historical (cultural) foundational function and a social leading function (Clouser 2005: 266).

To conclude this section, what can be said about the preoccupation of Hart (and Van Riessen) concerning the proper target of scientific investigation? They have indicated especially in the law(s) (Hart: nomic conditions) the proper target of scientific thinking, while what is subjected to the law would not constitute a proper target. All this was, to some extent, opposed to the approach identifying science with thinking along modal lines.

It appears that the two approaches are not incompatible. In agreement with Van Riessen, Strauss (2006: 78-9) reminds us that the modalities do not constitute the object of investigation of the special sciences but only the perspective, the "point of entry" to reality.[7] Once that "entry" is selected, the identification of the proper target of science is a different and successive problem. Will it be laws or entities? Could we perhaps answer that it is "reality", thus including both nomic conditions and what is conditioned? On this point it appears that it is important not to exclude the law, and not to misplace it or identify it with what is subjected to the law (both objects and human subjects). On this point Hart and Van Riessen have made an important contribution.

But perhaps what is subjected to conditions should not be totally excluded from the scope of scientific thinking. True, individual objects (entities) cannot be the target of science, yet those objects have a universal side, and they help us understand the conditions holding for them. One might even wonder: can conditions be understood without reference to the functors subjected to them?

Bearing this question in mind, let us consider another author who is important for the present topic. One might rightly argue that Stafleu is particularly qualified to deal with the demarcation topic because his academic work focused on philosophy of science, in particular. One might also wonder whether the consensus highlighted up to this point is still maintained in the specialist work of this scholar.

7 According to Strauss (2006: 71), Van Riessen introduced terms such as *toegangspoort* (gateway, point of entry).

4. Marinus Stafleu

Stafleu does not follow the traditional reformational distinction between scientific and naive thinking; he prefers to speak of "artificial" and "natural" thinking (Stafleu 1981: 165). Artificial thinking is theoretical thinking,[8] yet what Dooyeweerd called "theoretical" is, according to Stafleu (1981: 167), only one type of theoretical thought (Stafleu would call it analytic thought). There are three other important types of theoretical thinking: objective, synthetic and applied thought (Stafleu 1981: 167). Together, they correspond to the four directions in which a field of study is "opened up" after a period of "isolation", after being recognised as a field of science (Stafleu 1979: 1-15). These four directions are: mathematisation, technical application, integration by abstraction and integration by synthesis (Stafleu 1982: 27), corresponding to the four types of theoretical thought mentioned earlier.

In summary, Stafleu distinguishes theoretical thought (using theories, concepts and statements as man-made artefacts) from natural thought (including animal thought). He also distinguishes science (the active and systematic investigation of the laws for creation) from non-science (therefore he appears to work with at least two types of demarcation). Non-scientists often apply theories. Scientists apply observation, experiments, statistics, and many more methods besides theoretical thought.

In reformational philosophy "opening-up" refers to the links (analogies) of a modal aspect with later aspects in the modal structure. These analogies "anticipate" the higher modalities and are therefore called anticipations.[9] Higher aspects open up lower ones via analogies. For example, in the case of the logical aspect (which qualifies the act of thinking), the historical aspect opens up thinking and creates artificial thinking. In fact, Stafleu (1982: 166) notices

8 Nevertheless, Stafleu (1982: 27-8) clarifies that theories are not necessarily scientific; they can also be pre-scientific.

9 While Dooyeweerd discusses the "opening-process" only in its anticipatory direction, Stafleu insists that the opening up caused by retrocipations is at least equally important. Strauss proposes "ante-cipation" as a better term, highlighting the prefix *ante* (Latin: before, pointing forward).

that while artificial thinking has a history of ideas, this cannot be the case for natural thinking. Therefore "theoretical thinking is natural thinking opened up by the historical aspect. It is artificial thinking" (Stafleu 1982: 166). It should be noted, however, that Stafleu (2008: 154-69) recently questioned the existence of a historical aspect of reality and one may assume that he will thus also re-formulate his previous views on artificial thinking.

As a result of the above considerations, Stafleu does not accept Dooyeweerd's definition of theoretical thought as "modal" thought. He prefers to define theoretical thought as "opened-up" thought. He indicates that Dooyeweerd is ambiguous on this point: "first he describes it as 'opened up' thought, later by being characterised by modal analysis" (Stafleu 1981: 167). In this instance, Stafleu refers to his *New critique* (*cf* Dooyeweerd 1984, 1: 29; 2: 120, 581 with 1984, 1: 38). However, Stafleu gives the impression that modal and "opened-up" thought are not too "far" from each other, when he notices that Dooyeweerd did not "make clear that these two characterisations are equivalent" (Stafleu 1981: 167).

Some important questions arise. The first question: Does Stafleu reject the reformational elaboration of the demarcation criterion? In my opinion this is not the case. Although he would like to improve on the Dooyeweerdian view of theoretical thinking, he acknowledges that "the logical objects of natural thought are concrete things, events and relations" (Stafleu 1981: 166). Theoretical thinking, on the contrary, is "abstracting thought, by forming concepts it focuses on a limited number of aspects of concrete things" (Stafleu 1981: 167).

The second question: When mentioning the isolation of a field of science, or mathematisation, technical application, and so on, Stafleu seems to have in mind mainly the natural sciences. If so, what about the other sciences? I am convinced that Stafleu does not regard the natural sciences as the only sciences. But is it not necessary to enlarge the picture in order to face the demarcation problem? On this point, I am sure Stafleu could help us understand more in detail what it means to think scientifically in the humanities, in the social sciences or in philosophy.

Danie Strauss (1984: 54) was among the first authors who valued Stafleu's view of theories. In his view, regarding theories as (historically disclosed) logical artefacts was worthy of serious consideration. Strauss' own contribution is sketched in the next section.

5. Danie Strauss

Unlike Van Riessen, Strauss does not distinguish between several types of pre-scientific knowledge. He simply distinguishes between scientific and non-scientific knowledge, focusing on the two main ontological ingredients, namely aspects and entities, respectively.

Strauss discovered the equivalence of analysis and abstraction. The essence of science lies in analysis, which has two "legs": identification (in other words, synthesis) and distinction. Abstraction, too, operates by identification and distinction. Therefore abstraction corresponds to analysis, which is the core-meaning of the logical aspect of reality.

Contrary to the rationalist tradition, naive thought is also a form of knowledge and is also rational (Strauss 1989: 104), but it focuses on concrete events, properties and things. In the naive attitude of thought we do not make abstractions according to modal aspects. Does this mean that abstraction is totally absent from naive knowledge? Strauss admits that it is not absent, but argues that scientific and non-scientific thinking utilise two different types of abstraction: entity/ary abstraction in the case of naive thinking and modal abstraction in the case of scientific thinking (Strauss 2009: 145 & 2001: 29-30).

Abstraction in itself is not unique to science. Strauss (2009: 15) gives the example of a child abstracting the different parts of a bird (beck, tail) and later on identifying different types of birds on that basis. This type of abstraction "lifts up" certain entities (wings, feathers, and so on) and focuses on them. We can therefore call it entitary abstraction and we can safely argue that it is not typical of science. Science, on the other hand, is always dealing with modal abstraction in the sense that it observes animals, plants or anything

else via modal aspects. We can observe animals, for example, via the biotic, the economic or the juridical aspect. With this response Strauss provided, I believe, the correct criterion.[10]

The problem with verification (positivism), falsification (Popper) or puzzle-solving (Kuhn) is that they fail to provide a valid demarcation criterion because they are available both in a scientific and non-scientific form. Modal abstraction, on the contrary, is to be found only within science. This is indeed an outstanding contribution on a problem which has been vexing Western philosophy for centuries.

In the meantime, an answer to the question (*cf* Van Riessen) concerning the scientific status of philosophy was gradually and indirectly emerging from a related topic, namely the realisation that certain sciences "use" more than one modality as their "point of view". The idea was seminally present in several authors. Dooyeweerd (1984, 2:55, footnote 1) mentioned the existence of sciences which are "not specific". Botha (1971: 62) agreed that anthropology and sociology belong to that category. Skillen (1988) argued that politics studies state relationships from more than one point of view, or modal perspective.

There is what Stoker (1971: 42 ff & 1976: 152) used to call the "intermediary sciences", such as physical chemistry, chemical physics, biochemistry, social psychology, and so on. In some instances, curricula and courses are composed of modules in which the different modal perspectives need to be combined to focus on a certain topic. For example, in education we may have combinations of psy-

10 Apart from Van Riessen, a few others came close to this result. For example, Clouser (2005: 64) observes that when we are looking for a green book on a shelf we focus on the colour while disregarding size and other characteristics. In this respect Clouser speaks of different levels of abstraction, more precisely of low and high abstraction. In this instance, the problem is: if abstraction is not a unique characteristic of science, can it still function as demarcation criterion? One might posit high abstraction as the unique characteristic of science, but if the levels (or degrees?) of abstraction are gradual, can we still hope for a clear demarcation? It appears to me that the risk of a "graduality-approach" is that it may blur the difference between science and non-science.

chology and sociology. These are all instances in which the (modal) perspectives must be integrated.

In my opinion, Strauss (2009: 48-53) added his own contribution to this debate by arguing that a plurality of aspects is always taken into account at the level of the special sciences. As modal abstraction entails both identification and distinction of aspects, we can only identify a certain aspect by simultaneously distinguishing it from all the others. In other words, modal abstraction requires the lifting out (identification) of an aspect by distinguishing it from at least one different aspect. In order to do this, the existence of more than one aspect is required (Strauss 2009: 54). In itself, this basic insight first questions the nature of reductionist modes of thought and, secondly, points towards the necessity of a more-than-special-scientific perspective in science (in other words, the necessity of philosophy as a foundational discipline, which is the main theme of Strauss 2009).

Along this direction it is not difficult to observe that philosophy itself may make use of different points of entry in its study of history, art, science, society, and so on. Of course, the modal aspects remain irreducible ("integrated" and "combined" do not mean unified or melt together). Yet nothing prevents philosophers (and other scholars) from looking from different "windows" at the same fountain in the centre of the garden.[11]

The reformational criterion of demarcation has, of course, some consequences for the question: Which disciplines are scientific? Finally, I would say, in the reformational approach an old prejudice concerning the superior scientific status of the natural sciences with regard to the humanities is abandoned. True, the natural sciences deal with "laws" and other sciences deal with "norms" (Strauss 2001: 33). Norms, unlike natural laws, can be transgressed. Norms such as justice require a "positivisation" by human beings, while "natural"

11 The latter idea was suggested by Strauss during a visit to Potchefstroom (excluding the image of the garden-fountain for which I am the only one to blame!). It is strange that I cannot trace Strauss' idea in any written text, because the question concerning the scientific status of philosophy has been on the table of reformational debates for decades and not many solutions were proposed.

laws are valid independently of human intervention. Nevertheless, all modal aspects serve as points of entry for scientific explorations of the world in which we live, and as a consequence the disciplines using those points of entry are to be regarded as having scientific status. This is equally true of mathematics, physics, history, law or theology.

With Strauss the reformational reflection on demarcation has reached, in my opinion, a remarkable condition of both simplicity and solidity. The same is not true, however, of all the neo-Calvinist circles. The following few examples are meant to show that in some Kuyperian families the definition of a good demarcation criterion is still an urgent and unfulfilled task. In the next section I will indicate how the missing criterion does not fail to create some problems in the work of some well-known authors.

6. Excursus (to close-by circles)

6.1 Nicholas Wolterstorff

A few clues from Wolterstorff's famous book, *Reason within the bounds of religion* (1976), show that the demarcation issue was far from solved. Generally speaking, Wolterstorff does not seem to be much interested in the formulation of a sound demarcation criterion. Nevertheless, when it comes to theology he wonders: "How can the line be drawn between biblical scholarship and the careful, faithful reading of the Scriptures" (Wolterstorff 1976: 86)? He is not sure "that no part of the content of faith confession and dogmatic theorizing is shared" (Wolterstorff 1976: 84). Similarly, "the results of the work of the biblical theologian also frequently enter into what is regarded as belonging to the authentic Christian commitment" (Wolterstorff 1976: 84). This is not something to be indifferent about if theologians, as Wolterstorff (1976: 83) argues, "may lead people astray".

One should then recognise that some distinctions are necessary. For example, to distinguish the norms and sources of faith (like Scripture) from the human response encoded in a confessional tradition or

in theological reflection. In this sense, a sound distinction between science and non-science would be a first step in the right direction.

Yet, as mentioned earlier, Wolterstorff does not seem to be much interested in the demarcation issue. Unfortunately this does not mean that the problems simply vanish. For a brief example, let us examine the following sentences:

> That man is a free and responsible being is indeed a philosophical theory, and perhaps also a high-level psychological theory; and it is something contained within the biblical teaching. But the detailed psychological theories which fall under this high-level psychological or philosophical theory are not to be found in the Bible (Wolterstorff 1976: 74).

In other words, Wolterstorff suggests that a proposition such as "man is a free being" is a philosophical and psychological theory (therefore scientific?). In fact, it is a "high-level" theory and it is also contained in the Bible (therefore the Bible contains scientific theories?) The "detailed" theories that "fall under" this high-level theory are missing in the Bible. Perhaps the confusion is only apparent and the above riddle can be explicated in a way that makes sense. My impression remains that the lack of a clear distinction between scientific and pre-scientific never fails to generate difficulties.

6.2 The Vantilian circles

The Vantilian movement stems from the work of Cornelius van Til (1895-1987), the famous apologist of Westminster Seminary in Philadelphia. Although in Van Til's work (to my knowledge) the pronouncements on this issue are not frequent, in Vantilian circles, resistance against a clear demarcation criterion dates back to the 1970s (*cf* Frame & Coppes 1972: 6-19, Poythress 1976: 175-89). In the 1980s Frame (1983: 312-3, footnote 24) still regarded the reformational attempt at distinguishing between scientific and non-scientific thinking as a form of dualism.

The cost of this attitude is that theology is constantly confused with all sorts of pre-scientific norms, presuppositions or epistemic frameworks. De Chirico and Bolognesi confuse theology with

religious ground motives, with worldviews and other presuppositional frameworks (*cf* De Chirico 1997: 10 & 43, Garrone & De Chirico 2002: 63, Bolognesi 1991: 85-8 & 2002: 55). Frame even confuses theology with the "word of God" when he complains: "the comprehensiveness of philosophy has often led philosophers to seek to rule over all other disciplines, even over theology, over God's Word" (Frame 1987: 86).

In the case of the Vantilian group, unfortunately, I am convinced that the main reason to resist a clear demarcation criterion lies in the determination to keep theology in some kind of "top" position within Christian scholarship (Coletto 2009a & 2009b). In fact, as long as theology can be confused with its pre-suppositional and pre-scientific basis, there is a chance to keep theology (and theologians with it) in a "superior" position. Now, I am of the opinion that this is not an achievement at all for Christian scholarship.

7. Conclusion

In my opinion, in its debates concerning the demarcation issue reformational philosophy has been characterised by a considerable degree of consistency and long-term improvement. While endorsing these provisional results, however, I would like to renew my "call" to further clarification and research on this complex topic. It may be that I have been too "optimistic", and deeper penetration in these issues may reveal that the reformational consensus is not deeply rooted. It might also be that some of my thoughts and statements need clarification or re-elaboration. More research may also ultimately contribute to an improved knowledge of the mechanisms and functioning of science, both in a descriptive and prescriptive sense.

However, if my conclusion is plausible to an acceptable extent, my modest proposal is that the results of reformational research could be seriously considered by other like-minded families who are involved in the promotion of Christian scholarship. Having considered the difficulties encountered on the demarcation issue by all philosophi-

cal circles, the invitation is of course extended to all philosophers of science, toiling in all traditions.

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