

Nuances in the Philosophy of the Cosmomic Idea

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This article comments on Danie Strauss's *Philosophy: Discipline of the disciplines*. It deals with some differences between the author's interpretation of the Philosophy of the Cosmomic Idea and the views of Dooyeweerd and Strauss. I call these differences 'nuances' because our religious starting point is the same. This implies a realist religious view, confessing that God created the world according to laws which are invariant because He sustains them. We know God only through Jesus Christ, who submitted himself to God's laws. Partial knowledge of God's laws can be achieved by studying the law-conformity of the creation. In particular, I shall discuss the relevance of artefacts for the future development of the Philosophy of the Cosmomic Idea.

Nuances in die Wysbegeerte van die Wetsidee. Hierdie artikel lewer kommentaar op Danie Strauss se *Philosophy: Discipline of the disciplines*. Dit behandel enkele verskille tussen die outeur se interpretasie van die Wysbegeerte van die Wetsidee en die opvattinge van Dooyeweerd en Strauss. Hierdie verskille word as 'nuanses' bestempel, omdat hierdie denkers se religieuse uitgangspunt dieselfde is. Dit impliseer 'n realistiese religieuse opvatting, waarin bely word dat God die wêreld volgens wette geskep het wat invariant is omdat God hulle onderhou. Ons ken God alleen deur Jesus Christus, wie homself aan God se wette onderwerp het. Ons kan gedeeltelike kennis van God se wette verkry deur die wetmatigheede van die skepping te bestudeer. In hierdie artikel word veral die relevansie van artefakte vir die toekomstige ontwikkeling van die Wysbegeerte van die Wetsidee bespreek.

Introduction

In this article I want to draw attention to artefacts, a specific kind of object, which should play a much larger part in the Philosophy of the Cosmomic Idea (PCI for short) than is realised up till now. Sections 2–4 deal with modal analysis, knowledge of laws, and analogies. Sections 5–7 concern characters, types of artefact and the philosophy of technology. Section 8 discusses time and history. This choice is inspired by Danie Strauss's *Philosophy: Discipline of the disciplines* (Strauss 2009, to be abbreviated as PDD), a major contribution to the development of PCI in the 21st century, on which I shall make some marginal comments.

Like Herman Dooyeweerd and Danie Strauss, I distinguish general or modal laws from specific or typical laws (Strauss 2009:25–26, 79–82). With respect to a given law, something is called a *subject* if it directly or actively satisfies that law. It is an *object* if it indirectly or passively satisfies that law. The ontological status of an object depends on a subject in a subject–object relationship. Therefore it is acceptable to speak of the 'subject side' of the creation in contrast to its 'law side', but 'subject and object side' may be better. I would not recommend 'factual side' (*ibid*:76–77, 436), because I take a fact to be an objective expression of human knowledge. Within a certain discourse, something is considered a 'fact' (as opposed to a 'hypothesis') if everybody concerned agrees with it. It is a human-made statement about a law or about its correlates. A fact is an object, unfit for naming the subject and object side of reality in which subjects come first.

Modal analysis

A basic axiom of PCI is that both modal laws and typical laws are grouped into mutually irreducible sets. A set of typical laws forms a character, to be discussed below (ss. 5–7). A set of general or modal laws forms a law sphere, a modal aspect of reality and of human experience, for which Dooyeweerd's philosophy is best known. Strauss's PDD is mostly concerned with the critical conceptual analysis of the modal aspects (concepts like 'subject side', 'lawfulness', 'law conformity', 'concept-transcending ideas', the 'core-meaning' of the modal aspects and their 'analogies', 'continuity', 'molecular biology', etc.). Unfortunately, his analysis does not criticise the term 'sphere sovereignty'. Like Dooyeweerd, Strauss (2009:456) calls the mutual irreducibility

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of the modal aspects 'sphere sovereignty', as if there was a sovereign residing in each aspect.

The term 'sphere sovereignty' was put forward by Abraham Kuiper in the 19th century (and by others before him, Strauss 2009:22, 24), to defend the thesis of the mutual independence of organised associations such as church, state and university, using their mutually irreducible typical character as an argument (Stafleu 2004). Like many other people confusing Kuiper's argument with his thesis, Herman Dooyeweerd interprets the political view of sphere sovereignty as the ontological principle of *creational diversity*. For example, Dooyeweerd (1953–1958, I:101–102) applies the term 'sphere sovereignty' to the mutual irreducibility of the modal aspects, ignoring the fact that no modal aspect is ruled by a sovereign. He puts sphere sovereignty at the law side of reality, applying it to both modal aspects and types. However, a sovereign is a political *subject* (whether a person or a government), even if they translate normative principles into laws or rules. If we define an association or corporation as an organised human community having a leader or a governing board (Stafleu 2004, 2011:s. 4.0), the political principle of sphere sovereignty applies to all associations. It expresses their being subjects besides individual people in all normative relation frames. According to Dooyeweerd, *the university* (as a type) would have sphere sovereignty with respect to *the state*, whereas I believe that types do not have sovereigns or sovereignty. The principle of sphere sovereignty implies that *any university* (as an individual association) should have sphere sovereignty with respect to *any state*. Contrary to Dooyeweerd's view, mine has the consequence that two universities have sphere sovereignty with respect to each other. However, I fully agree that *the university* as a type is irreducible to the type of *the state*.

Dooyeweerd and Strauss distinguish 15 modal aspects. To these I have added the political relation frame preceding the juridical one (Stafleu 2004, 2011:s.1.8). Strauss summarily rejects this proposal (Strauss 2009:506, where he refers to Basden 2005, but does not consider my reply; Stafleu 2005). However, several arguments in its favour can easily be found in his discussion of the structure of the state (Strauss 2009:534–559) and the above discussion of sphere sovereignty.

About the linear order of the six natural aspects most PCI investigators agree. Strauss (2009) accepts Dooyeweerd's order of the normative aspects, but otherwise opinions, including mine, differ widely (Stafleu 2004, 2011:ch. 1). He observes that I have misquoted him on the position of the logical aspect (see Strauss 2009:258–259 in relation to Stafleu 2007). I concede my mistake and apologise, although my comment was a paraphrase. His rebuttal seems to imply, however, that his original argument says nothing about the position of the logical aspect immediately after the natural ones, as I understood it was intended to do.

Contrary to Dooyeweerd and Strauss, I always stressed (and not only recently [see Strauss 2009:459; Stafleu 1970])

that the modal laws concern *relationships*, both *subject–subject relationships* and *subject–object relationships*. Dooyeweerd's *A new critique of theoretical thought* (1953–1958) only discusses the latter, but elsewhere he also considers the former. Because of these relationships, I prefer to call the modal aspects 'relation frames' (Stafleu 2002:ch. 1, 2011:ch. 1; Strauss 2009:456–457).

In my experience, the mutual irreducibility of the modal aspects is difficult to be argued by the designation of their 'core meaning' like 'energy effect' or 'life' (Strauss 2009:89–92). It can better be made clear by paying attention to the modal subject–subject relationships. If one recognises that all physical subject–subject relationships are expressions of *interaction*, it is almost obvious that physics cannot be reduced to mathematical relationships, because mathematical things such as triangles do not interact. However, physical interactions can be projected on kinetic, spatial and quantitative relationships, allowing them to be measured. Interaction now generally takes the form of current, force and energy (Stafleu 2002:ch. 5; Strauss 2009:466). Therefore it is confusing to consider 'energy effect' or 'energy operation' to be the core meaning of the physical aspect, as Strauss (2009:89–90, 457) maintains in line with Dooyeweerd, and ascribes to me (Strauss 2009:398), though I have objected to it. He refers to the original meaning of the Greek *energeia*, ignoring the changed meaning of *energy* in the physical sciences, in technology and, in fact, in our whole culture since the second half of the 19th century. So it may appear as if antique Greek disciplines Strauss's philosophy.

In the biotic aspect one easily recognises the *genetic relationship* as the modal subject–subject relationship, between individual living beings, between the cells of a growing plant or animal and between different species. Descent and heredity do not occur in physical relationships, and this provides an argument for the thesis that the biotic and the physical aspects are mutually irreducible. But the genetic relationships can be projected onto physical and chemical relationships between molecules such as DNA and RNA. In the biological theory of evolution, the assumption that every living being descends from another is fundamental. Therefore this theory is not applicable to physical and chemical development, in which heredity makes no sense, nor can it explain the emergence of the first living beings on earth.

Knowledge of laws requires the application of artefacts

Because human experience fully depends on relationships, the relation frames constitute aspects of human experience. This includes our experience of laws, both modal and typical. Dooyeweerd assumes that a knowledge of modal laws requires a transcendental approach, including the so-called *Gegenstand* relationship, in which the logical aspect is intentionally opposed to all modal aspects. Strauss rejects this relationship, and I agree with him. In contrast, Dooyeweerd assumes that natural or naive experience lies at the basis of our awareness of typical structures. I believe that any kind of law can only be found in an empirical way

(Strauss 2009:432). We have no direct knowledge of laws. But because individuals and their mutual relationships can be experienced both naturally and indirectly via scientific investigation, their lawfulness or law-conformity warrants the possibility of finding laws from scientific investigation (Strauss 2009:436). Generally speaking, characters are found by induction and modal laws for relationships are arrived at by abstraction (Strauss 2009:81, 422). In both cases, science works with hypothetical statements about laws, trying to corroborate these statements by confronting them with states of affairs considered as facts and by relating them. This means that our knowledge of laws is always tentative and liable to correction.

Statements of laws made in theories are human artefacts and must therefore be distinguished from the laws themselves. Nominalists do not recognise laws apart from these statements (they only recognise individuals, Strauss 2009:446), whereas realists assume that statements of laws refer to real laws (Strauss 2009:432–436; Stafleu 1999). PCI's realist religious view implies the assumption of the reality of invariant laws, which, though they are not rational or intelligent, are nevertheless intelligible, that is, knowable and understandable. Laws are not to be conceived as the cause of regularities in a physicalist sense, nor as expressing God's will in a psychologistic sense. Nominalist philosophies such as logical positivism dominated the philosophy of science during two-thirds of the 20th century. Physicists even avoided calling their discoveries 'laws', taking refuge in a number of terms such as 'principle' or 'postulate'. (I have not recommended this use, as Strauss [2009:435] claims.) Biologists often believed that laws can only be physical. However, during the last third of the 20th century, philosophers of science tended to become more realistic.

My view of theoretical work is much simpler than that of Dooyeweerd and Strauss (see Stafleu 1987). Both humans and some or all animals (in a limited sense, see Stafleu 2002:s. 7.5) experience their world as being lawful, but only people use theories to explore these. Therefore I would start from the assumption that theories are logically qualified *artefacts*, human products. Theoretical thought is nothing but thought aided by theories, which in turn depend on artefacts such as statements and concepts. Therefore, whereas natural or naive thought is directly related to individuals and their relationships, theoretical thought is indirect, mediated by artefacts, just as viewing a microbe is an act that has been aided by an artefact, a microscope.

An obvious objection to this view could be that theories are products of theoretical thought, and for this reason cannot be its starting point. I reject the 'transcendental idea' (of Immanuel Kant and pursued by Dooyeweerd) that it would be possible to start theoretical thought from something that is not theoretical, an *a priori* Archimedean point of view transcending human thought. Human beings happen to use theories, and philosophers are able to investigate the structure of thought, but only by applying theories. If this is a circle, then the point is to get into it. The transcendental idea

was an attempt to justify theoretical thought and to arrive at certain knowledge, which I don't believe is possible.

Accepting the realist view that natural laws were functioning before human beings entered the world, conditioning their existence, including their ability to think naturally, means to accept that these laws *transcend* human experience in an *ontological* sense. However, this does not mean that there is a transcendental way to achieve knowledge of the laws (either natural or normative). These can only be *discovered* in an empirical way, and are tentatively formulated with the help of theories and other artefacts. In my view, this applies both to modal and to typical laws, both to natural laws and to normative principles, even if the methods for arriving at reliable results differ considerably.

Dooyeweerd identifies theoretical thought with science and philosophy. However, science not only uses theories, statements and concepts, but many other kinds of artefact as well. For instance, modern natural science makes use of a large variety of technical apparatus. Natural science and the humanities apply statistics. Each of them has its own method of applying artefacts. On the other hand, people who cannot be called scientists also use theories, although the development of theories may be called scientific. In this, I define science and the humanities as activities (theoretical or otherwise) directed at achieving knowledge about laws.

Analogies

The modal aspects or relation frames are supposed to be mutually irreducible. Nevertheless, they are intimately related by referring to each other. In the order of the modal aspects, forward references are called 'anticipations' (or 'antecipations', as Strauss prefers); backward references are called retrocipations. In his conceptual analysis, Strauss (2009:430) applies his distinction of 'concepts' relating to a modal aspect and the preceding ones, and 'transcending concepts' or 'ideas', including the succeeding aspects. Contrary to Dooyeweerd and Strauss, I avoid the term 'analogies' for these references, for the following reasons.

Firstly, analogies are not peculiar to the modal aspects. Also characters (see below) are often analogous. The theories of sound and of light are very much analogous, having the same character types, yet sound and light are different phenomena, having differing characters and being subject to different laws.

Secondly, Strauss defines analogical concepts correctly as having similarities and differences. Clearly, 'analogy' is a *logical* relationship, as its name suggests, and it serves Strauss's conceptual analysis of the modal aspects very well. However, the relationships between the modal aspects are first of all *ontological*, not logical.

Thirdly, the connections between the modal aspects are much more than analogies. For example, they allow the projection of physical relationships onto quantitative, spatial and kinetic

ones, such that these become measurable. This accounts for the mathematisation of the physical sciences in a way that cannot be comprehended as a mere analogy (Wigner 1960). My view of the modal aspects as relation frames implies that subject–subject relationships and subject–object relationships in one relation frame can be projected onto those in another frame in such detail that the laws from one frame can be applied in another one in a very fruitful way. The history of physics shows that physical laws can be expressed in mathematical formulas, and that mathematical laws can be applied to physical relationships. Besides relationships, physical structures such as crystals can be projected onto mathematical ones, such as groups. Therefore I suggest that the term ‘retrociption’ be replaced by ‘projection’; to maintain ‘anticipation’; and to avoid ‘analogy’, except in conceptual analysis.

Characters

Besides the modal aspects, Dooyeweerd introduced typical structures of individuality. It is not always clear whether he speaks of the law side (structure *for* individuals) or the individual side (structure *of* individuals, see Strauss 2009:26, 399, 450–451, 458). Dooyeweerd also did not sufficiently stress that individuals always satisfy a *set* of specific laws. He did not recognise that typically different individuals may share some specific laws, whilst differing with respect to other specific laws. For instance, electrons share several typical laws with neutrinos (both are involved in beta-radioactivity), but also have some different laws (electrons are electrically charged, and therefore subject to Coulomb’s law, which neutrinos are typically not). Therefore these individuals belong to different though related *kinds* (Stafleu 2002:s. 5.2).

In order to avoid these misunderstandings, I proposed the term *character* for the law side of typicality (Stafleu 2002:ch. 1, 2011:s. 0.1; Strauss 2009:459–463). A character is a set of typical laws *characterising* a specific kind. It determines both a subjective class of individuals and an objective ensemble of possible variations within a kind.

At the subject and object side of characters one finds individual things, events, plants, animals, humans, acts, artefacts and associations. The modal subject–subject relationships and subject–object relationships concern all these typical individuals. They also include the relationships of persons and their associations with their God. Christians believe that these relationships are mediated by Jesus Christ, who became a man observing God’s laws, in order to restore humankind, God’s image-bearers, in all these relationships. Therefore, in order to know God and to love him, one does not need to transcend temporal reality or the order of the modal aspects. In fact, one’s relationship to God is fully temporal and expressed in all relation frames.

Apart from the correlation of the law side and the subject-and-object side, the modal aspects and the characters are also correlated. In this respect, the relation frames take priority

above the characters. Like Dooyeweerd and Strauss, I assume that each character is primarily typically qualified by one of the relation frames. Like Dooyeweerd and Strauss, I assume that each character is secondarily founded in a preceding frame (with the obvious exception of characters qualified by the first one). It turns out to be difficult to define the exact meaning of ‘foundation’. Moreover, in the investigation of some character, it is not always easy to find its founding relation frame.

Finally, I assume that each character has the tertiary disposition to be interlaced with other characters. Dooyeweerd calls this phenomenon *enkapsis* (Strauss 2009:356, 466), that is, encapsulation. Contrary to Strauss (2009:467–468), I assume that this is the case both on the law side and the subject-and-object side. I consider the former a condition for the latter. A proton and an electron can become interlaced into a neutral hydrogen atom only because their characters determine that both have exactly the same but opposite electric charge. Interlacement should play an important part in the discussion of the emergence of new individuals belonging to new kinds with sometimes entirely new properties (Stafleu in press). For example, molecules are primarily physically qualified, secondarily founded in the spatial aspect (because of their typical spatial structure), having the disposition to become typically interlaced in the character of living cells.

Along these lines, a theory of types is developed, both for natural and for normative characters (Stafleu 2002; 2011). By way of example, in sections 6–7 (‘Types of artefact’ and ‘Philosophy of technology’), I review the character types of technical things, events and processes.

Types of artefact

Like Dooyeweerd and Strauss, I distinguish natural relation frames from normative ones, and natural kinds from normative kinds. On the law side, natural frames are sets of natural laws; normative frames are sets of values and norms. I suppose values or normative principles to be universal and invariant. Norms then take shape in human life as historical and cultural products arising from relationships between humans and within human associations. In the normative frames, only individual persons and organised associations (which I distinguish from unorganised communities with a network structure) can be subjects, everything else being an object in the normative aspects. Both individuals and associations develop norms to be applied in associations or in communities. In the first case, the norms become compulsory on the authority of a governing body; in the second case, on the authority of the state. However, many norms are not compulsory.

Artefacts have a character of their own, a set consisting of natural laws, normative principles and norms (Stafleu 2011:ch. 3). A norm is a human-made culturally and historically determined artefact, characterised by the normative principle from which it is derived. Norms are very flexible and so are all artefacts. Also associations and communities differ widely because of their history and

culture (Stafleu 2011:chs. 4, 5). It appears possible, however, to find character *types* of artefacts and associations consisting of natural laws and normative principles only. For instance, one may recognise the universal character type of the state or the church, although the application of culturally determined norms leads to a large variety of different characters of states and churches. These can be compared with the help of the supposedly invariant normative character types.

I define artefacts as objects having a character primarily qualified by one of the normative relation frames. Technically qualified artefacts, like tools, have a single character, secondarily founded in one of the natural relation frames. Other artefacts (like paintings) have a dual character (Stafleu 2003). Their *generic* character is qualified by a relation frame such as the aesthetic one in the case of a painting, and founded in the technical one. It characterises a painting as a piece of art. Its *specific* character makes a distinction between different types of art. This leads to a typology of artefacts, just as there is a typology of associations and of communities.

Philosophy of technology

One consequence of my alternative view of history is to replace the 'historical aspect' by the 'technical' one, as is done by several adherents of PCI. Like Dooyeweerd, Strauss objects to the designation 'techno-formative', 'for then its meaning is restricted to subject-object relations only' (Strauss 2009:95). However, the Greek *techne* means *skill*, and people learn new skills from each other, implying a subject-subject relationship (Stafleu 2011:s. 2.1). For the development of a philosophy of technology within the framework of PCI, an analysis of technical artefacts is crucial, though by no means sufficient. Philosophy of technology requires an investigation into technically characterised processes (Verkerk *et al.* 2007); into labour associations like a household, a farm, a factory or a school (Stafleu 2011:s. 4.1; Verkerk 2004); and into the technical infrastructure of any society (Stafleu 2011:s. 5.1). Last but not least, it requires a thorough knowledge of the history of technology and of its relevance to society at large.

A technical artefact is an object, designed, made and used by people in their technically skilled labour, individually or working in a group. It is secondarily typified by one of the natural relation frames. Projections of the technical relation frame onto the preceding natural frames define six secondary types of technical activity. The following impression may illustrate that skilful activity is as old as humanity, almost everywhere present, historically grown, and showing enormous progress, especially since the 20th century.

Counting and calculating are secondarily quantitatively characterised skills: As a science, mathematics researches the quantitative and the spatial relation frame with the characters qualified by these frames. Mathematics is also a skill, the technique of counting and calculating. From earliest times, children have learned to count with their fingers or using a bead frame. In mental arithmetic they apply all kinds of technical tricks, such as the multiplication tables and

long division. An early application of arithmetic was book-keeping. Later on, mathematics was applied to the sciences and the humanities and in many practical situations. In order to solve a problem one makes a mathematical model, allowing calculations and providing quantitative insight. Statistics is a well-known example of this. For making models and exerting calculations we use an abacus, a slide rule, an adding machine, a calculator, a till or a computer.

Orientating, measuring, forming and building are secondarily spatially typified acts: Labour leads to formation, transformation, and reformation, usually with the help of tools. Philosophers of technology sometimes restrict technical labour to material transformation, to production. However, forming refers to the spatial relation frame and is therefore unfit on its own and by itself to characterise all technical labour. People try to bring order to their perceptions and so orient themselves in spatial terms. For both they use instruments, such as a compass or a measuring rod. The science of space is called 'geometry', having arisen long ago from surveying areas where large rivers regularly overflow the adjacent countryside. The aim of measurement is to collect quantitative data fit for calculations, for instance for the collection of taxes. This is possible only if some kind of law conformity exists for the magnitudes to be measured, for example, a metric system. In the 19th century measuring instruments were mainly based on optics and mechanics, nowadays mainly on electronics, including finding the position of aeroplanes, ships, cars and mobile telephones with the aid of a global positioning system.

People move mostly with carriages: Human beings have much more freedom of moving around than any animal. The most natural motion of people is walking, but even that is learned and technically supported by shoes, pavement and staircases. A person may master many more ways to move, think of the motions required for a sport such as basketball. More often we move on a bicycle, in carriages, boats, aeroplanes, in lifts and on escalators. The wheel as the archetypal invention dates from about 3400 BC, but it was not until the 16th century that the Spaniards could introduce it to Central America. Navigation is a technical problem for sailing rivers and seas, since the 17th century it has been greatly improved by the development of clocks. Modern traffic came about when natural energy sources such as running water, wind and animals were replaced by steam engines in trains and ships, petrol engines in cars and aeroplanes, and electromotors everywhere else. Besides moving themselves, people transport goods and energy. Images, opinions and information move around the earth, and nowadays such transportation occurs electronically, by telephone, radio, television and the internet.

With machines people transform energy or matter: Many people associate technology with the use of machines. Therefore, the transformation of energy and matter, as in the chemical industry, seems to characterise technology. Nevertheless, this kind of transformation determines only one of six secondary types of technology. The use of fire is one

of the oldest human skills. The inventions of processing stone, bronze and iron mark the beginning of the archaeological eras. In physical labour, too, people transform matter and energy. Corporeal labour is a physically founded technical act, even if supported by tools and machines. Tools are presumably much older than we have data to confirm their use, but machines to transform natural energy into a form useful for people date from the Middle Ages. Watermills and windmills were not invented in Western Europe, but were applied there for the first time on a large scale for grinding corn, sawing wood, making article and draining swamps. The Industrial Revolution started when the working of iron and the winning of coal made the construction of steam engines both possible and necessary. The first steam engines were put to work in coal mines.

Agriculture is a biotically founded technology: Agriculture as the development of living nature has experienced several reforms, recognisable as such only after the fact (Jonas 1979:192). The first land reform was the transition from nomadic cattle breeding to agriculture. The prosperity of the later European Middle Ages is reducible to a second land reform (Duby [1961–1962:13] 1984). Meanwhile, in China agriculture developed in a no less revolutionary way (Landes 1998:41–46.). In about 1100 agricultural production increased strongly, partly because of an improved climate, but in particular because of improved methods. One of these was the invention of deep ploughs, vehicles on wheels, which could till the land with greater efficiency and more effectively than hitherto. Another method is crop rotation. By alternately cultivating a field and letting it lie fallow the next year, one prevents plant disease and the exhaustion of the soil. An improved method turned out to be a cycle of three years: to grow one harvest in the spring of the first year, a different one in the autumn of the second year and to let the field lie fallow during the third year. This increased production by one-half. A third improvement was the introduction of shoes and a breast harness for horses. The older method of a harness around the neck is suited to oxen, but not for horses. Horses are not much stronger than oxen, but they are faster and able to work longer, in fact for about two more hours a day. Especially the latter attribute meant that the transition from oxen to horse traction did not occur everywhere without protests, for the labourers had to work longer. In southern Europe oxen remained more common. One reason is that horses need different fodder (oats), which the farmers first had to learn to grow, but which fitted into the three-year cycle. Increasingly, farmers started to grow materials such as flax for the emerging fabric industry as they continued to cultivate food for their own use as well as for sale in the growing centres of population.

Further agricultural reform followed in the 19th century and 20th century, influenced by industrialisation; and so we have seen the mechanisation of agriculture and the introduction of artificial fertilisers. Through scientific research and schooling, agriculture and cattle raising received a better theoretically justified basis. The ‘Green Revolution’ (about 1960–1980) meant the introduction of a new agricultural technology in

the Third World, so much so that there is sufficient food for the whole world population. Where there is still a shortage of food, it is said to be caused by faulty distribution, disasters, wars, corruption, exploitation, managerial impotence and plain poverty (Achterhuis 1988:311–328).

In the final decades of the 20th century, information technology was introduced into modern agriculture. Fertilising, irrigating, draining land, feeding cattle, milking cows and processing agrarian products are now automated to a large extent. Although all agricultural technology is biotically founded, the term *biotechnology* now refers in a more restricted way to genetic manipulation. Improving plant and animal species is as old as mankind, but the genetic influencing of breeding is specifically a 20th century technology. Since the second agrarian revolution the number of agrarian labourers has decreased, but only since the second half of the 20th century has less than half of the working population been employed in agriculture.

Control is a psychically typified technical act: People have always used animals as a source of food and clothing, as a means of transport, to exert labour and to support various kinds of activity, such as hunting or safeguarding. Except for food and the production of clothes, animals cannot be used directly; they first have to be tamed and trained, domesticated and controlled. Cattle breeders try to increase the products of animals in the form of meat, milk, eggs or labour performances. The genetic manipulation of animals is not modern: only some methods, such as artificial insemination, are. In terms of their use in transport and as a source of labour, animals have almost disappeared in modern countries. Increasingly, they can be found as domestic animals and in many kinds of sport.

Besides animal behaviour, all technical acts are controlled. This receives special attention if control is a separate part of a technical process. In particular, during the 20th century this has led to the introduction of automated processes of many kinds. Automation is not only an instrumental phenomenon; it also occurs in individual human acts. Several kinds of activity or skill (such as cycling) we have to learn first, with all the inevitable pains that go along with mastering such skills and forming bodily habits and instincts. We develop skills by habituation, so that they become automatic responses, imprinted fixed-action patterns in our brains.

In a tradition related to PCI, a Christian philosophy of technology has been developed by Henk van Riessen, Egbert Schuurman and others (Verkerk *et al.* 2007). Though they occasionally refer to PCI, they do not make use of its fundamental distinctions as described above. A philosophy of technology within the framework of PCI – including analysing technical artefacts according to the sketch given in the present section – does not yet, in my opinion, exist.

Time and history

From the start, it has been my aim to develop Dooyeweerd’s challenging idea of cosmic time. Only recently, I discovered

that my conception of time differs considerably from Dooyeweerd's, and by implication from that of Strauss (2009:206–211). Two trends are discernible in Dooyeweerd's view of time (see Stafleu 2008).

According to the first trend, time expresses itself in the transcendental *serial* order of the modal aspects, anticipating religion via the aspect of faith. In his or her heart, the religious centre of his existence, a human being transcends all temporal diversity. I reject this transcendental conception of time, supposed to transcend reality (which Dooyeweerd 1960:137 weakened considerably), because I believe that only the eternal God transcends temporal reality, albeit that in the person of Jesus Christ God is immanently present in the creation and its history. In this trend Dooyeweerd considers each modal aspect to be an aspect of time, because in the retrocipations and anticipations the temporal order of the modal aspects is *simultaneously* present in all aspects.

In the second trend, each modal aspect has its own order of time. Now the *serial* order is the quantitative order of before and after, and *simultaneity* is the spatial order of time. (Dooyeweerd 1953–1958, I:31–32; II:79, 85; I:28; II:102 briefly mentions kinetic, biotic, and logical time.) I interpret time according to the second trend as an ordering that directs relationships. In each relation frame, time expresses itself on the law side as a directive order, on the subject and object side as relationships between subjects and objects, as discussed above (Stafleu 2011:ch. 1). This relational nature of time is absent in Dooyeweerd's work. He calls the 'factual' side of time 'duration', different for various individualities (Dooyeweerd 1953–1958, I:28).

Dooyeweerd (1953–1958, II:181–365) considers history to consist of the 'opening up' of the modal aspects, to begin with the 'historical' or 'cultural' modal aspect (which I call the 'technical relation frame'). This process is guided by the aspect of faith as opened up by religion. In Dooyeweerd's conception of history, the serial order of the modal aspects or law spheres with their anticipations and retrocipations plays an important part. In this context, Dooyeweerd pays no attention to his thesis that each law sphere is itself an aspect of time. Because that is precisely what I want to do, my treatment of the philosophy of history differs significantly from Dooyeweerd's (see Stafleu 2008, 2011).

Like natural evolution, history is much more concentrated in the realisation of typical structures than in the opening up of modal aspects. Yet, both evolution and history are directed by the temporal order expressed at the law side of the relation frames. At the subject-and-object side, the engine of biotic evolution is heredity. The engines of history appear to consist of asymmetric subject–subject relationships expressing the transfer of experience in each normative relation frame (Stafleu 2011:ch. 2). The above mentioned artefacts act as instruments and objective witnesses of history. Besides individual persons, associations are actors in the historical theatre, the public domain, consisting of

subjective and objective networks of relationships. All this is missing in Dooyeweerd's philosophy of history.

Artefacts are highly relevant to the philosophy of history (Stafleu 2011:ch. 3), if in each relation frame we distinguish between artefacts being characterised by that frame and other objects which are not. Whereas people and associations always act as subjects in all normative relation frames, all things, events, situations and processes can be objects in these frames. For instance, each thing and each event can be a *sign* as an object in the semiotic relation frame, if a person or an association recognises it as such. Only if it is specifically made by humans, can we speak of a *symbol* as a semiotic artefact (Stafleu 2011:s. 3.3). Also words, sentences and texts in any language are semiotic artefacts. Because theoretical artefacts like theories are always expressed in language without being reducible to these, I believe that the logical relation frame presupposes the semiotic one, the 'sign aspect', as Strauss (2009:95–96) calls it. Artefacts are not merely relevant for the relation frame by which they are characterised. They also play an objective and instrumental part in all normative relation frames. Without signs, symbols and language, the historical investigation of technology, science, social relationships, commerce, government and justice would be impossible.

Conceived as human-made objects or events caused by people, artefacts have an objective meaning for the history of humankind, functioning as instruments in the transfer of experience. Artefacts are subjected to the normative order of time in the relation frames by which they are characterised, like pieces of art, normatively showing aesthetic renewal. Because the technical relation frame characterises all artefacts either primarily or secondarily, artefacts should at least satisfy objectively the historical norm of technical progress (Stafleu 2011:s. 1.1). Artefacts have a history of their own, constituting an important instrument for historiography as the interpretation of signs from the past. Indeed, each artefact is an objective sign of the history of the activity of human beings as subjective makers and users. Artefacts are objective witnesses of the past.

My view of directive time as order for relationships leads to a theory of history entirely different from Dooyeweerd's. In PDD, Strauss does not discuss the philosophy of history extensively. This makes me wonder whether, regarding this topic, he shares Dooyeweerd's views.

Conclusion

Strauss's PDD is a fascinating and challenging critical update of Herman Dooyeweerd's philosophy. However, an analysis of theoretical thought in the framework of PCI requires the insight that concepts, propositions and theories are logically characterised artefacts. Also, the development of a philosophy of history and a philosophy of technology needs the application of artefacts. This insight seems to be absent in the works of Dooyeweerd and Strauss. In their analyses of theoretical thought, both are too much focused on the modal aspects, neglecting the typical structures of reality. This focus

led Dooyeweerd to his view of time and history, and both Dooyeweerd and Strauss to almost ignoring technology, for which their view of the 'historical' aspect also seems to be responsible.

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