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Basic concepts and the interconnection between academic disciplines

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The differentiation and specialisation of academic disciplines may create the impression that the various academic disciplines are not truly related. Yet a thorough analysis of the basic concepts employed within these disciplines points toward a particularly intimate and fundamental coherence among the various disciplines. This connectedness, however, does not concern scholarly theories as such in the first place, but rather the ontic status of the aspects of reality which delineate the fields of investigation of these disciplines. These aspects are mutually related in a web of inter-aspectual coherences, as reflected in the basic (analogical) concepts of their respective academic disciplines.

Grondbegrippe en die verbindings tussen akademiese dissiplines

Die differensiasie en spesialisasie van akademiese dissiplines mag die indruk wek dat die verskillende vakwetenskappe nie werklik met mekaar verband hou nie. Nogtans belig 'n grondige analise van die basiese begrippe binne hierdie dissiplines die besonder intieme en fundamentele samehang tussen hulle. Nietemin het hierdie verbondenheid in die eerste plek nie betrekking op die wetenskaplike teorieë as sodanig nie, maar op die ontiese status van die aspekte van die werklikheid wat die studiegebiede van die dissiplines afbaken. Hierdie aspekte hou verband met mekaar binne 'n netwerk van onderlinge verhoudinge tussen hierdie aspekte, soos gereflekteer in die (analogiese) grondbegrippe van die onderskeie vakwetenskappe.

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Within the context of the general *Zeitgeist* of the twentieth and the early twenty-first centuries, the Enlightenment's emphasis on rationality and concept-formation appears to have been replaced by an emphasis on language and the word. Does the famous switch from thought to language not prompt us to suspend all references to concept-formation and rather to speak about the specific language use of a discipline or the peculiarities of its vocabulary, as Rorty chooses to do?

To acknowledge the inevitability of certain conventions and of a particular use of language is not to deny the presence of a conceptual apparatus within the respective disciplines. Language use causes the formulations of scientists to become relative, in the sense that the language employed in any discipline is constantly subject to shifts in meaning, and therefore to the emergence of new semantic nuances. Yet the basic concepts of the disciplines reveal a dimension of multivocality that amounts to more fundamental than accidental shifts in linguistic meaning.

1. The multivocality of the key terms in scientific discourse

Scientists tend to think that their particular disciplines employ concepts that are peculiar to those disciplines. This explains why some scholars want to steer clear of certain "misleading" figures or metaphors, on the one hand, but to demarcate a unique and, if possible, exclusive universe of discourse, on the other.

The German sociologist Fichter, for example, commences by dealing with typical concepts, focused upon the investigation of specific types of entities, types of societal collectivities and types of social processes — such as behaviour, role, institution, culture, and society. He then immediately proceeds to a discussion of what he considers to be basic concepts. In this context he refers negatively to the "imaginative analogies" used to explain "social life", with the "organic analogies" of the nineteenth century particularly in mind. In a similar vein, but not pretending to be as exclusive, Giddens (1986: 163) remarks:

> There are few today who, as Durkheim, Spencer and many others in nineteenth-century social thought were prone to do, use direct organic analogies in describing social systems.

Ironically enough, Giddens repeatedly uses the expression "social life" without acknowledging the fact that the primary (primitive) meaning of "life" is derived from the same biotic domain of reality as the objectionable "organic analogies" of the nineteenth century.

Nor does Fichter reflect critically on the meaning of the phrase "social life" either — which is clear from his straightforward rejection of biologistic, mechanistic, psychologistic and other approaches to sociology (Fichter 1968: 6). He claims with certainty that the reality of the social can not be reduced to biological, physical or psychological concepts.

Remarkably enough, he correctly realises that an analogy refers to partial similarity and partial difference (Fichter 1968: 5). At the same time he holds the opinion that "the social sciences managed to develop their own terminology so well that these analogies are totally dispensable" (Fichter 1968: 6). If this is true, he cannot account for using the expression "social life". Does the term "life" not in the first place refer to living entities in their biotic (organic) functioning? This indeed seems to be the case if one thinks about what biological textbooks normally discuss as the phenomena of life, namely metabolism (anabolism and catabolism), growth (differentiation and integration), adaptation, and so on. If biology concerns itself with vital phenomena, does it have the monopoly on the usage of this term? And how does one explain the everyday practice whereby people speak about social life, cultural life or economic life?

Since life inherently concerns phenomena of growth, we have no problem in contemplating the growth of children, animals, or plants. But are we referring to the same phenomenon when we speak about the "growth" of economies? Hart (1984: 158) comments:

> The newspapers are sure that economies grow; whether slowly, quickly, or hardly at all. Is such talk meant literally? Growing grass makes sense. Is growing in an economic sense anything more than a metaphor? Do we feed or fertilize an economy? Do we give it water, or protect it from too much sun? Do we just have a peculiar use of language here, or does the language point to something more basic?

Our conjecture is that there is indeed something "more basic" at hand in these examples, for it cannot be denied that every academic discipline employs terms which are also used by other specific sciences. This acknowledgement entails that the same term is used differently by the

different disciplines, which in turn implies that there is a difference between social life and biotic life, for example, or between economic life and biotic life. If this is the case, two implications follow: the science of biology loses its exclusive "right" to the employment of the term "life", and the non-biological disciplines ought to specify the sense of their peculiar use of biotic terms.

Since alternative usages of particular scientific terms presuppose elements of both continuity and discontinuity, or similarity and difference, we are immediately confronted with a configuration known practically throughout the history of philosophy and the various disciplines, and traditionally designated as an analogy. Even more basic is the fact that human language as such is full of analogies, inducing Schmidt (1984: 7) to say that analogy is not a special case of language or speech, but their normal structure.

In terms of similarities and differences there are three possibilities: a similarity in one respect only; similarities in all respects, and the case in-between. The first option is known as equivalence; the second as equality,[1] while the third constitutes an analogy (cf Sandkühler 1999: 48). On the basis of the nature of an analogy we may observe in composite phrases such as social life and economic life examples of analogies between various aspects of our experience. This means that the original biotic meaning of life acquires an analogical connotation, for example when it is employed in a social or economic context.

One may note that the aspects of reality are not made visible by asking questions about the concrete "what" of entities and processes, for these aspects represent the way (manner) in which such entities and processes function — they relate to the "how". From Latin we have inherited expressions such as *modus operandi* and *modus vivendi*, in which the "how" is represented by the term *modus*. An aspect is therefore to be seen as a specific (unique) mode which, in a general sense, is a *modus quo*, a mode of being. As an equivalent for referring to facets, aspects or

1 Since Leibniz, logical equality is understood to concern what cannot be distinguished with the aid of statements from a well-defined domain of statements (cf Mittelstrass 1974: 671). The indiscernibility criterion entailed in the definition of logical equality given by Leibniz was followed literally by Frege, Peano and Russell, as pointed out by Mittelstrass (1974: 672).

functions, one may therefore also speak about modalities, modal aspects or modal functions. As early as 1910 Cassirer highlighted the importance of this distinction between entity ("substance") and function (cf Cassirer 1953). When entities and processes are resolved into functions, we meet with functionalism; when modal functions are treated as entities, they are reified. An in-depth analysis of the decisive role of functionalism in the development of the modern natural sciences is found in an important work by Rombach (1965-66). Modal aspects belong to a dimension of reality that differs from (natural and social) entities and events. Therefore the universal functional structure of modal aspects co-conditions the existence of concrete entities. Concrete entities have both an individual and a universal side.[2] Consequently the relation between aspects and entities is fundamentally misrepresented when aspects are structurally "degraded" into mere "aspects of individual things" which "require a 'bearer', or 'substratum'" (Van Woudenberg 2003: 1).

Of course the other ‚non-biological disciplines are also entitled to explore legitimate and meaningful usages of biotic analogies in scientific language, for in reality these disciplines indeed use the term "life" (and synonymous terms) in an analogical sense. Two questions emerge: is it not purely accidental that such (biotical) analogies are used in the non-biological sciences, and is it not possible that these examples of analogies are nothing but metaphors?

Suppose that it is provisionally accepted, as a general characterisation, that whenever differences are shown in what is similar (or: when what is similar is evinced in what is different), we have an analogy at hand. Surely, the examples mentioned above are instances of analogies. However, there is something peculiar about them, for the biotic, the social and the economic are not concrete (natural or social) entities, but aspects in which such entities have concrete functions. The next question would be: are similarities and differences not also to be found among the multiple (natural and social) entities within reality — such as material things, plants, animals, human beings and human artefacts?

Of course the answer is affirmative, for human language is inseparable from the metaphorical designation of such (entitary) "similarities-shown-in-their-differences" — we only have to think about metaphors such as

2 This atom (individual side) is an atom (universal side).

the "nose of the car", the "bottom of the hill", the "head of the mountain", the "lion of Western Transvaal" (General De la Rey during the Second Anglo-Boer War), the "elbow of my finger", and so on. Though it is always possible to replace genuine metaphors (analogies between entities) with completely different metaphors, analogies between different modal aspects cannot be replaced; for whenever that is attempted, either a switch is made to a different mode, or the original analogical meaning is merely replaced by a synonym for the initial modal analogy. When the expression "physical extension" is replaced by "physical field" or "domain", we are still dealing with a spatial analogy within the physical modal aspect. In fact, the initial understanding of material entities (physical things) first of all explored our awareness of distinctness and continuity (entailing divisibility).[3]

The difference between (mathematical) space and physical space will now be investigated in more detail.

2. Physical space and mathematical space

The Greek atomists, Leucippus and Democritus, were convinced that there are indeed final indivisible units, which they called atoms. After Descartes, the modern conception switched to the (functionalist) conviction that physical space is both continuous and infinitely divisible. By the end of the nineteenth and the beginning of the twentieth century, however, a distinction between mathematical space and physical space became necessary. Whereas the former — in a purely abstract and functional perspective — is both continuous and infinitely divisible, the latter is neither. Since physical space is bound to the quantum structure of energy[4] it cannot be subdivided *ad infinitum*. Energy quanta represent the limit of the divisibility of energy.

3 The relationship between modes and entities, as well as that between modal aspects themselves, can always be captured in metaphorical language. For example, physical space and emotional space may be designated by metaphorical phrases such as "the space is squeezing me out" and "the space is full of pain". Yet the original modal analogies between aspects remain unaffected by such metaphorical expressions, for the latter actually presuppose the basic reality of modal analogies.

4 Planck discovered the quantum of energy h — portraying the fundamental discontinuity of energy. In order to account for the discrete nature of the emission

From the very beginning, in Greek culture, our attempts to arrive at a scientific understanding of "matter" remained burdened with mystery. At most, scientists succeeded in advancing partial perspectives from the angle of distinct modes of being which were employed as modes of explanation. For that reason Stegmüller is certainly justified in stating that even for the science of the twentieth century the concept of matter is one of the most difficult and most mysterious concepts.[5]

In his reflections on the notion of infinity, Hilbert looks first of all at the discipline of physics. He remarks that instead of the old principle *natura non facit saltus*, we might even assert the opposite, namely that "nature makes jumps" (Hilbert 1925: 164).[6]

> Therefore physical space and mathematical space are extended (their similarity), but within this shared property the difference between both evinces itself in the way just explained.[7]

or absorbtion of energy, Planck postulated that radiant energy is quantised, proportional to the frequency v in the formula $E = hnv$ — where n is an integer, v the frequency, and h the quantum of action (*Wirkungsquantum*) with the value 6.62 x 10^{-34} joule sec.

5 "Und daß auf der anderen Seite ausgerechnet der Materiebegriff der schwierigste, unbewältigste und rätselhafteste Begriff überhaupt für die Wissenschaft dieses Jahrhunderts blieb" (Stegmüller 1987: 90).

6 He says: "In addition to matter and electricity, there is one other entity in physics for which the law of conservation holds, viz, energy. But it has been established that even energy does not unconditionally admit of infinite divisibility. Planck has discovered quanta of energy. Hence, a homogeneous continuum which admits of the sort of divisibility needed to realize the infinitely small is nowhere to be found in reality" (Hilbert 1925: 164). More recently his co-worker, the mathematician Paul Bernays, advances a similar view: "Erst durch die zeitherige Entwicklung der Geometrie und der Physik tritt die Notwendigkeit hervor, zwischen dem Raum als etwas Physikalischem und dem Raum als eine ideellen, durch geometrische Gesetze bestimmten Mannigfaltigkeit zu unterscheiden" (Bernays 1976: 37). ["Only through the contemporary development of geometry and physics did it become necessary to distinguish between space as something physical and space as an ideal multiplicity determined by spatial laws."]

7 In e-mail correspondence (27 July 2005), the physicist M D Stafleu remarked: "[A]s far as I know in concrete physically qualified 'things' (like molecules), energy cannot be infinitely divided, for within such a thing energy is always quantized." One can of course revert to a modal functional (mathematical) description of processes involving energy (with reference to a continuous variable), but then

These remarks gain in weight and effect when we realise that Stegmüller is making the abovementioned observations on the basis of an acquaintance with the most advanced technical physical and mathematical theories in this context. The disciplines focusing on the largest bodies in the universe, namely astronomy, astrophysics and cosmology, remain dependent upon "knowledge of what is the smallest" — and it is often not possible to decide whether or not the scientific mysteries which present themselves here are to be mastered by means of these macro-disciplines, or through a combination of them and the sciences of matter:

> One can defend the vicious thesis that the current 'matter experts' are in a certain sense, forced into a worse situation than Goethe's Faust. They are not only 'not wiser than before' — namely at the time when they started their research — for they have not once become cleverer than those first thinkers of 2000 years ago who attempted to find a foundation for their understanding of matter in a purely speculative way. Even the two basic concepts concerning the nature of matter are currently, as before, open for discussion, although frequently camouflaged behind mountains of formulas. These two basic conceptions could be designated as the atomistic view and the continuum view of matter (Stegmüller 1987: 90-1).[8]

The fundamental issue underlying these two views concerns the difference between physical space and mathematical space, for it addresses the question of whether or not matter is endlessly divisible. In addition to the exploration of the numerical and the spatial aspects as modes of explanation (atomism versus continuum),[9] these two theories

recourse is taken to a functional mathematical notion — where it is indeed meaningful to maintain that such a continuous variable entails infinite divisibility.

8 "Es ließe sich die boshafte Behauptung verfechten, daß die heutigen 'Materie-Experten' in einem gewissen Sinn zu einem schlimmeren Eingeständnis gezwungen sind als Goethes Faust. Sie sind nicht nur 'nicht klüger als zuvor', nämlich als zu der Zeit, da sie zu forschen anfingen, sondern sie sind nicht einmal klüger geworden als jene ersten Denker, welche vor über 2000 Jahren die Materie rein spekulativ zu ergründen versuchten. Selbst die beiden großen Grundkonzepte über die Natur der Materie stehen heute nach wie vor zur Diskussion, wenn auch mannigfaltig verschleiert hinter Bergen von Formeln. Diese beiden Grundkonzepte kann man als die atomistische Auffassung und als die Kontinuumsauffassung der Materie bezeichnen."

9 Laugwitz (1997: 293) mentions that D'Alembert adhered to a widely accepted eighteenth-century interpretation of Leibniz's view, according to which only "continuous" functions occur in the solution of physical problems.

were also involved in attempts to solve the problems relating to two other modes of explanation:

> Before anything else, both theories were therefore engaged in solving two problems — the apparent or real immutability of matter and the apparent or real limitless transformability of matter (Stegmüller 1987: 91.[10]

This formulation highlights the relation between constancy and change (dynamics) and thus introduces two other modal aspects, namely the kinematic (uniform motion, constancy) and the physical (energy-operation, change, causality). The core meaning of these two aspects also frequently appears in multiple analogical contexts. The term "force" may be selected to illustrate this point.

3. Analogical usages of modal terms: force, validity, causality and life

Once modern physics had transcended the limitations of its mechanistic orientation at the end of the nineteenth century, it acknowledged the concept of force as a necessary physical term. A physical force normally presupposes the kinematic meaning of constancy, since it can be associated with deceleration and acceleration. But this does not mean that one can elevate the term force above any specific aspect in order to "float" in "thin air." The naturalistic sociologist, W R Catton (1966: 233-4), advances an understanding of the general concept of "force" elevated above any modally specific meaning:

> If a force is that which produces an acceleration, then a physical force is that which accelerates material bodies in physical space, and a social force is whatever accelerates social processes. It makes sense to use the term 'force' in both contexts because both physical forces and social forces are special cases of the general concept.

In its "floating" generality the notion of "force" may assume any modal specification — as if it does not "reside" in some or other aspect where it displays its original or primitive meaning. And the only "place" where the term "force" can be located is within the physical aspect. Speak-

10 "Beide Theorien waren darum bemüht, vor allem zwei Probleme zu lösen: das der — scheinbaren oder wirklichen? — Unvergänglichkeit der Materie und das der — scheinbaren oder wirklichen? — unbegrenzten Verwandlungsfähigkeit der Materie."

ing about "social force" will thus always designate a physical analogy within the structure of the social aspect.

The development of modern biology has also utilised the term "force". At the beginning of the twentieth century modern biology was for some time under the spell of the vitalist biology of Hans Driesch, who advocated the idea that a living entity is an equi-potential, harmonic system (cf Weber 1999: 267 ff). He spoke of an immaterial vital force (to which he referred as entelechy or psychoide). Driesch attempted to apply the (determinist) concept of natural law to biotical phenomena. Eventually his ideas were further elaborated by various biologists. Rainer Schubert-Soldern defends the vitalist position with a range of biochemical arguments. As the functional and formal unit of life, the existence of the cell would, according to Schubert-Soldern (1962: 102), depend on the actualisation of a double potential:

> (a) the 'form' or order of the cell, and (b) the chemical laws governing molecules … This principle of order may be called the 'active potentiality' of the material parts.

His view of the principle of order links up with those of Aristotle:

> Hence the Aristotelian concept of entelechy corresponds exactly with the principle of order, which we see at work making the cell into a whole. It is a principle of wholeness which forms a unity from parts which would otherwise go their separate ways. Thus a hologenous system is born (Schubert-Soldern 1962: 113).

Whereas Aristotle, Thomas Aquinas, and even Driesch still account for individuality in terms of material components, Schubert-Soldern (1959: 285) chooses another way:

> Since the form brings about the individualization of something which previously had been poli-substantial or poli-individual, it must be the form, which expresses the individuality, which itself must be the individuality.

In his view the form of a body "brings about a real entity with a non-material character, concerning a substance which in its essence possesses its dynamic character" (Schubert-Soldern 1962: 286).

By contrast, the neo-Darwinist thinker Simpson chooses the term "organisation" to indicate the essential distinctive characteristic of living things. In neo-vitalist circles organisation is understood in terms of a

particular understanding of form (order). The botanist E W Sinnott (1972: 51), for example, writes:

> Uexküll and others have emphasized this idea and regard organic form as essentially an independent aspect of an organism, parallel with its matter and energy [...] Indeed, the concept of organization as something independent of the inner and outer environment implies that form must be a basic characteristic of all living things.

Against mechanistic atomism Sinnott in neo-vitalist fashion emphasises the dynamic-creative and indivisibly continuous form of living things: "Form [...] is changing and creative [...] It is a category of being very different from matter" (Sinnott 1963: 199).

The neo-vitalist biologist J Haas (1974: 336) emphasises that in the elaboration of the course of its life every living thing obeys an inherent law or programme, designated by him as its life-plan:

> The life-plan contains as components the blueprints of each of its expressions; the genetic plan for their succession; the functional plan for carrying out its activities; the behavioral plan for all its 'acts'.

In Haas's view life-plans (like norms and laws in general) have an ideal being (*ideales Sein*) (Haas 1974: 338), and cannot be explained in physical-chemical terms:

> Physical-chemical forces and laws are in themselves unable to bring forth the structures of meaning which we identify as the life-plan, and even less can [they] produce a non-material bearer of life-plans (Haas 1974: 355).

However, in general the (neo-)vitalist idea of an immaterial "vital force" is contradictory, because the term "force" is in the first place derived from the physical domain which is characteristic of material things.

Within the discipline of law the controversy between theories of "natural law" and the theoretical stance of legal positivism is centred in an alternative appreciation of the concept of legal force (juridical validity). What is shared by theories of natural law in their modern shape is the conviction that — founded in human reason — there exists a universally valid system of juridical stipulations holding for all possible times and places. Natural law is supposed to be valid law independent of positive law. Eventually Hobbes, Thomasius, Rousseau and Kant altered

this position by advancing the view that natural law can only have a juridical validity when it is realised within positive law.[11]

The rise of the historical school of law of Von Savigny at the beginning of the nineteenth century challenged the rationalist assumption of natural law and claimed that over and above positive law there simply is no universally valid system of (pre-positive) law — law is always embedded in a changing reality.

This controversy cancels the insight that legal principles are not valid in and of themselves, since they are always dependent upon human intervention, upon the normative task of competent jural organs to give a positive shape to them in order to make them valid; to enforce them.

Derrida understands this issue in his own way when he says that there "are a certain number of idiomatic expressions" in the English language that "have no strict equivalent in French," such as the phrase "to enforce the law," or the phrase "the enforceability of the law" (Derrida 2002: 232). The fact that the "enforcement" of law requires human acts of formation (shaping, making valid) is also explicitly noted by Habermas (1996: 71) where he refers to "the positivization of law".[12]

Particularly in modern (symbolic) logic, the "force" of an argument is explained in terms of the validity of an inference, which must be distinguished from the truth or falsity of the premises or conclusions of arguments — therefore once more analogically employing the term force within a logical context.

Without a theory of the analogical connections between different aspects of reality, the difference between force in its original (non-analogical) physical sense and analogical occurrences of the term — as in expressions like "vital force," "logical validity," "jural force" (the "force of law") — would be inexplicable.

11 Hommes (1961: 55) summarises the traditional concept of natural law as follows: "natural law in its traditional sense is the totality of pre-positive (not brought into existence through the declaration of will of the human formation of law) immutable, universal and *per se* valid legal norms and eventually subjective natural rights and correlating duties, based upon a natural order (whether or not traced back to a divine origin), such that the human being can derive it from the natural order aided by natural reason".

12 Compare Habermas 1998: 101 where he discusses "die Positivierung des Rechts".

The original meaning of physical energy-operation underlies the reality of (physical) causes and effects — for the operation of energy always causes certain effects. This physical relation between cause and effect, also known as causality, caused not only prominent physicists to part ways (Einstein's determinism and Heisenberg and Bohr's indeterminism) since within the discipline of law, too, different schools of thought are found as a consequence of alternative accounts of the meaning of the elementary (analogical) basic concept of jural causality.

The general assessment of the nineteenth century regarding the meaning of causality was exclusively in terms of a physical necessity, stripped of every element of normativity. The "philosophical" concept of causality used in this context is derived from J S Mill. It acquired the label of the (*conditio*) *sine qua non* theory — from which Traeger claims that every juridical theory of causality has to proceed.[13] The well-known theories developed on the basis of this (determinist) concept of causality are those of the *conditio sine qua non* (von Buri) and those of the adequate cause (von Kries, Traeger) (cf Hart & Honoré 1985: 442ff, 465ff). The shared shortcoming of these theories is that they deny the possibility of a normatively qualified form of causality, such as the basic legal understanding of jural causality. Of course in terms of a determinist (naturalistic) approach this option will be considered to be antinomic. Nonetheless, there are significant jural phenomena that would be unaccounted for if causality only had meaning in the natural sciences. The nature of a jural omission is worth considering. No physical concept of causality can ever explain an omission which, in a jural sense, can cause a juridically significant effect without the presence of any action in a physical sense.

In general the basic (analogical) concepts of all special sciences testify to the interconnectedness between their fields of investigation. We will now examine in more detail how the sociologist Fichter accounted for basic concepts.

13 "Als ein nicht unterschätzender Gewinn für das Verständnis der Kausalitätsfrage im Recht muß die sich immer mehr Bahn brechende Erkenntnis betrachtet werden, daß jede juristische Kausalitätstheorie von der condition *sine qua non* auszugehen hat" (Traeger 1904: 38).

4. Fichter's unsuccessful attempt to avoid the use of analogical basic concepts

Fichter claims that sociology had to liberate itself from outdated organic metaphors by developing its "own terminology". However, it soon turns out that he is not at all aware of the following two considerations:

- that the basic terms introduced by him, which are supposed to be exclusively sociological in nature, are in fact not original terms within the sociological field of investigation, and
- that the same terms are widely used by various other academic disciplines as well.

Which terms does Fichter have in mind?

Having argued for the dispensability of analogies, Fichter next pays attention to the problem of constants (Fichter 1968: 7). The term constancy, however, originally belongs to the domain of the kinematic aspect of uniform motion. The implication is that it can be used by other disciplines only in a non-original, analogical way. Fichter writes here that the basic concepts analysed by him represent "the constant and everywhere appearing elements" (Fichter 1968: 7), but once again he does not realise that the term "everywhere" stems from the meaning of the spatial aspect of reality (every place — consider the equivalent spatial term: universal). Similarly, the term "elements" reflects the unique meaning of the numerical aspect since it is related to multiplicity: the one and the many. This implies that Fichter necessarily had to use numerical and spatial terms in order to explain his employment of the (kinematic) term "constancy". This demonstrates that an analysis of the elementary basic concepts of a special science is in itself a complex undertaking involving multiple analogical terms (which may be partly analysed or not yet analysed). In other words, the analysis of any specific analogical basic concept is only possible by (implicitly or explicitly) using other (analysed or not yet analysed) analogical structural moments within the modal structure of the aspect concerned.

Therefore it should come as no surprise that, on the basis of his introduction of "social constants", Fichter (1968: 8) proceeds to speak about social dynamics and social change. A few pages later he also refers to social causes (Fichter 1968: 12). We have noted above that the relation between cause and effect manifests itself in the first place within the structure of the physical aspect of reality (causality). Analogously, sociology

employs the (basic) concept of social causation (compare the book by this title written by McIver in 1942). In other words, although Fichter believes that he can dispense with the "imaginative analogies" used by sociologists by means of the development of his "own terminology," he continues (albeit unconsciously and unintentionally) to use certain analogical concepts — including those derived from the biotic aspect (such as "social life").

As a result, Fichter's philosophical prejudice, convincing him that sociology does not need any (modal) analogies, does not prevent his continued unconscious use of such analogies. Particularly within post-modern circles we find something similar, for postmodernists try to steer clear of employing analogical terms derived from mathematical and physical theories. Sometimes they claim that "modernist" thinking is linear while post-modern thought is non-linear. Quantum mechanics would be an instance of non-linear thinking, while chaos theory is supposed to be in opposition to the determinist Newtonian legacy in physics.

However, the well-known second order differential equation of Schrödinger in quantum mechanics is absolutely linear — and chaos theory is nothing but an extension of Newton's classical mechanics (cf Sokol & Bricmont 1998: 164 ff). Sokol and Bricmont themselves struggle to come to terms with the connections between the different scholarly universes of discourse. Unfortunately they only consider analogies between different disciplines or theories (such as between the theory of relativity and social theories), without addressing the real issue, namely that the employment of analogical concepts does not in the first place concern relationships between scientific disciplines, since they call for the recognition of connections between different "ontic domains" within reality itself ("ontic coherences").

It may be the case that the theory of relativity, for example, does give us a better understanding of the nature of the kinematic meaning of uniform movement by highlighting the core meaning of kinematic constancy (the velocity of light in a vacuum). When sociology, for example, cannot avoid references to the notion of social constancy, we do not discern an analogy between the discipline of sociology and the discipline of physics (kinematics or phoronomy in particular), but merely an analogy between two modal functions of ontic reality (the kinematic and the social), that are placed in mutual coherence prior to any scholarly reflection.

Of course our argument thus far rests implicitly upon a particular theoretical account of the nature and coherence of the various aspects of reality. Yet this acknowledgement does not circumvent the inevitability of multivocal terms being employed by the various disciplines.

5. Logical analysis in its inter-modal coherence with non-logical aspects

In order to proceed with an illustration of this inevitability we may also look at the central role of terms like constancy and change (variability) within (mathematical) logic. This discipline simply introduces the terms "constants" and "variables" intuitively, without even addressing the question of analogical concepts. The numerical meaning of multiplicity did surface in the discussions of the role and place of logic in mathematics. Logicism attempted to find a basis for the concept of number in the logical class-concept. Russell, for example, wanted to define the number "2" as the logical class of all "couples" in reality, the number "3" as the logical class of all "trios" in reality, and so on. Frege, Dedekind and Russell advanced a logicistic approach to the foundations of mathematics. Dedekind started from an actual infinity of "objects" within one's "Gedankenwelt" — translated by Rucker (1982: 47) with the descriptive term "mindscape". Russell claimed that it is possible to reduce mathematics to logic. For example, he "defined" the number "2" in the following way:

> 1 + 1 is the number of a class **w** which is the logical sum of two classes **u** and **v** which have no common terms and have each only one term. The chief point to be observed is, that logical addition of numbers is the fundamental notion, while arithmetical addition of numbers is wholly subsequent (Russell 1956: 119).

The irony, however, is that Russell had to make use of the quantitative meaning of number in order to distinguish between different ("logical") classes. After all, he speaks of the sum of "two" classes where each of them contains "one" element. This presupposes an insight into the quantitative meaning of the numbers "1" and "2." Consequently, the number "2", which was meant to appear as the result of "logical addition," is in fact presupposed by it. In his discussion of number and the concept of class, Cassirer offers a clear understanding of this circularity (Cassirer 1953: 44ff).

Although Dedekind asserted that the idea of infinity should form part of the logical foundation of mathematics, it soon turned out that the meaning of infinity precedes logic. In contrast to the early attempts of Frege and Dedekind, Hilbert is convinced that as a precondition for the possibility of scientific knowledge, certain intuitive representations and insights are indispensible and that logic alone is not sufficient. Myhill mentions the fact that the axioms of *Principia* do not determine how many individuals there are: "the axiom of infinity, which is needed as a hypothesis for the development of mathematics in that system, is neither provable nor refutable therein, *ie*, is undecidable" (Myhill 1952: 182).

Every attempt to deduce the meaning of number from the meaning of analysis runs into a vicious circle. Cassirer is quite explicit in this regard. He claims that a critical analysis of knowledge, in order to sidestep a *regressus in infinitum*, has to accept certain basic functions which are not capable of being "deduced" and which are not in need of deduction.[14] David Hilbert also notes this "Catch 22" situation entailed in the logicist attempt to deduce the meaning of number from that of the logical-analytical mode. In his *Gesammelte Abhandlungen* Hilbert (1970:199) writes:

> Only when we analyze attentively do we realize that in presenting the laws of logic we have already had to employ certain arithmetical basic concepts, for example the concept of a set and partially also the concept of number, particularly as a cardinal number [Anzahl]. Here we end up in a vicious circle and in order to avoid paradoxes it is necessary to come to a partially simultaneous development of the laws of logic and arithmetic.

The inevitability of employing analogical basic concepts is embedded in a key ontic feature of the various aspects of reality frequently applied in our preceding examples, namely the fact that the meaning of every aspect comes to expression only in its coherence with other aspects. This coherence is revealed through the analogical structural moments which appear within each aspect as they point backwards (retrocipations) and forwards (anticipations) to the other aspects.

Scholarly thinking throughout the history of philosophy and within all the disciplines has constantly stumbled upon this reality, but has

14 "Denn die kritische Analyse der Erkenntnis wird, wenn man nicht einen *regressus in infinitum* annehmen will, immer bei gewissen Urfunktionen Halt machen müssen, die einer eigentlichen 'Ableitung' weder fähig noch bedürftig sind" (Cassirer 1973: 73).

never attempted to arrive at a systematic and comprehensive analysis of the state of affairs. Although the building blocks for such an investigation are present in the various projects to develop a "categorial framework" for the understanding of reality — from the Aristotelian theory of categories (he distinguished 10), through the medieval transcendental determinations of being (unity, truth, beauty and goodness), the table of categories of understanding in Kant's *Critique of Pure Reason* (the categories of quantity, quality, modality and relation — each containing three concepts), up to more recent designs — such as the theory of categories developed by Hartmann — none of these traditions have even come close to a systematic perspective on the problem of multivocal (analogical) concepts.[15]

6. The general significance of acknowledging analogical interconnections

The diverging schools of thought found in the history of the various disciplines can often be traced back to an over-emphasis on some analogical structural moment within a specific aspect. Each one of these one-sided trends will have discerned something worthwhile, but distorted its meaning. Avoiding such distortions does not mean that the coherences at stake are to be ignored or pushed aside. For example, if reality had not displayed a biotic function, fitted in an inter-modal coherence with all the other aspects of reality, it would have been impossible for organicist trends to distort the meaning of the biotic (and view society as if it were an organism). Merely by looking at one-sided emphases one can write a fair deal of the history of the sciences. In conclusion,

15 Hartmann, for example, introduces basic categories supposedly valid for all spheres and levels of being. A closer study of Hartmann's philosophy, however, does not reveal anything close to what we have in mind with modal (functional) aspects of reality. Hartmann in fact distinguishes 24 principles of being, arranged in pairs. Merely enumerating them reveals the randomness of his choices: principle-concretum; structure-mode; form-matter; inner-outer; determination-dependence; quality-quantity; unity-multiplicity; unanimity-conflict; antithesis-dimension; discreteness-continuity; substrate-relation; element-system (cf Stegmüller 1970: 237). The works of Lowe (1998) and Loux (2002) deal with the problem of universality (universal categories), but neither develops a systematic theory of modal aspects in order to account for the phenomena discussed in this article or those analysed in Dooyeweerd (1954).

by way of illustration, we mention the history of theoretical designs in sociology.

As a distinct scholarly discipline, sociology is not very old — it surfaced during the early nineteenth century. Comte initially advanced an organicist holism in which the spatial whole-parts relation was absorbed in a biologistic perspective. Later in the nineteenth century Spencer (cf Spencer 1968) advanced an atomistic organicism oriented to the classical liberal idea of the state (Locke and the classical school of economics). However, during the later nineteenth century sociologists with a physicalist orientation also emerged (compare Ward 1906: 331-2, where he claims that as a true science, sociology engages in studying natural forces where all phenomena obey the laws of motion of Newton's physics).[16]

After the rise of historicism and the linguistic turn, new options were explored in the course of the twentieth century. Tönnies (1957, 1965, 1972) had an ambiguous attitude towards sociological atomism and holism, but in his work *Gemeinschaft und Gesellschaft* (1887) he does opt for the assignment of priority to an organic view of community. Simmel (1908), by contrast, reverts in his formal sociology to an atomistic view while Durkheim, Oppenheimer (1922, 1926) and Spann (1930: 97) advocate a holistic approach (also designated as sociological universalism).

Von Wiese (1926, 1955, 1959, 1966) and Weber (1921, 1949, 1964, 1973) both considered the idea of a supra-individual societal collectivity as unacceptable. Only from 1951 onwards did Parsons develop his (holistic) system theory and what became known as structural functionalism (cf Parsons 1952, 1961, 1967, 1969, 1977a, 1977b), which dominated the scene during the middle of the twentieth century with the development of action theory and eventually holistic system theory. The dialectical materialism of Marxism was radicalised in the neo-Marxism of the Frankfurt school (Adorno 1970, Horkheimer 1981, Habermas 1970). A revival of the system theory of Parsons is to be found in the neo-functionalism of Alexander and Münch (cf Alexander 1985, 1987, 1988, 1990a, 1990b, 1990c and Münch 1985, 1990, 1994).

The freedom to give positive shape to underlying principles (designated above *à la* Habermas as acts of positivisation) implicitly plays an

16 Stewart (1948: 23) and Catton (1966) continued this naturalistic legacy in the twentieth century.

important role in Giddens's theory of structuration (cf Giddens 1982, 1983, 1984, 1986, 1996, 2002).

Revitalising Parsonian system theory, Habermas also transformed and developed some of his own insights in opposition to Parsons (cf Habermas 1984, 1995-1, 1995-2, 1996, 1998). Giddens took a different route with his theory of the structuration of human society (as a dynamic process enacted and reproduced by human beings over time — cf Giddens 1982, 1983, 1984, 1986, 1996, 2002).

Sociological conflict theories — Rex (1961) and Dahrendorf (1961), in the footsteps of Hegel and Simmel, as well as the Iowa and Chicago schools of symbolic interactionism (with numerous subdivisions) — also deserve mention. The former struggles with social contradiction and conflict (versus identity and consensus) as well as with the reality of power relations which are considered to be inherently conflict-generating (*ie* with the logical-analytical and cultural-historical analogies within the structure of the social aspect).[17]

7. Concluding remark

While most of these sociological trends share either an individualistic (atomistic) or a holistic (universalistic) orientation — derived from a one-sided emphasis on quantitative analogies and spatial analogies (the whole-parts relation) — they differ mostly insofar as they in addition elevate one or a number of other analogical concepts in their theoretical orientation. Although this is not the place to argue the point in detail, the same holds for all the other academic disciplines found within the encyclopaedic diversity of the special sciences.

The opening up of the domain of elementary (analogical) basic concepts within the disciplines invites the scholarly world to consider the liberating perspective entailed in a systematic analysis of this web of ontic functional interconnections, for through such an analysis one-sided "ismic" orientations may be appreciated on their relative merits and at the same time questioned in terns of their mutual exclusivity. As a result, a more integrated basis for theory formation in the various disciplines may emerge.

17 An encompassing analysis of the analogical basic concepts of the discipline of sociology is to be found in Strauss (2006).

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