Danie Strauss

Reifying things or relations: substantialism versus functionalism

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Our awareness of a diversity of things as well as a multiplicity of relationships took shape in the history of philosophy and the various academic disciplines, embodied in a constant struggle between allegedly independent substances or encompassing relations. Viewing entities as independent (self-sufficient) substances dominated Greek and Medieval philosophy. Since the Renaissance, a definite shift towards the primacy of relations has taken place. Kant claims that our knowledge about matter is limited to knowledge about relationships. Entities are not independent substances, because through the universal modal aspects in which they function they are related, as embodied in the wave-particle duality.

Reïfikasie van dinge of relasies: substansialisme versus funksionalisme

Ons besef van 'n ryke verskeidenheid dinge asook 'n menigvuldigheid relasies het vorm aangeneem in verskeie akademiese dissiplines en dit is beliggaam in die stryd tussen vermeende onafhanklike substansies of omvattende relasies. Die siening van entiteite as onafhanklike (selfgenoegsame) substansies het die Grieks-Middeleeuse era gedomineer. Sedert die Renaissance vind 'n besliste verskuiwing na die primaat van relasies plaas. Kant beweer selfs dat al wat ons van materie kan ken relasies is. Entiteite is nie onafhanklike substansies nie, want kragtens die wiekslag van universele modale aspekte bestaan hulle in 'n samehangsverband, soos beliggaam in die golf-deeltjie dualiteit.

Prof D F M Strauss, School of Philosophy, North-West University, Potchefstroom Campus; E-mail: dfms@cknet.co.za.

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It appears that human experience is constituted by the awareness of a rich diversity of things as well as a multiplicity of relationships. First of all, we are aware of material things, plants, animals and human beings. In addition, we are also aware of entities formed by plants, structured by animals and produced by human beings – such as spiderwebs, bird nests, anthills, cultural artefacts, and so on. These things or entities are not self-contained since they are related to each other in multiple ways. Henk Hart (1984: 1) explains this by distinguishing between things, properties and relations:

> Our universe, the empirical world of time and space, is populated by little girls, white-tailed deer, yellow slippers, planets and many other things. We can attribute what may be called qualities, or functions, or properties to all of these entities in our world and we can say that they relate to each other. Little girls are cute and have mothers. White-tailed deer are fast and eat leaves. Yellow lady slippers have brown spots on their petals and need light. Planets move around the sun. We can record countless situations that always have these three elements: things with attributes in relation. Little girls feeling warm as they are cuddled by their mothers. White-tailed deer standing motionless as they listen to a sound. Yellow lady slippers hanging low as they bend under the weight of unexpectedly late snow.

The historical fact, from a philosophical perspective, is that the initial phases of Greek and Medieval philosophy gave preference to our understanding of entities in putting relations between such entities on a lower level, while modern philosophy since the Renaissance increasingly pursued the opposite path by subordinating the concept of a substance and a thing to relation concepts.

1. Contours of the Greek-Medieval legacy

Primarily, Plato is not interested in relationality, but in the entities themselves. In the case of the relational predicate "Simmias is larger than Socrates" only 'Simmias' is understood as subject, whereas 'Socrates' is conceived as a part of the predicate (*Phaedo* 102 b), contrary to modern relational logic (see Erler 1992: 579). Conceptions, probably derived from Plato's speech "On the good", include as relatives right/left, above/beneath, and half/double (Erler 1992: 579). Yet neither Plato, nor Aristotle coined a consistent notion of relation. It is known that Aristotle conceptually explored further what Plato held in connection with 'relativa' (see Plato's dialogue

Sophistes 9255 c) and Aristotle's entire *Categoriae*. Aristotle (*Categoriae* 7, 6 a 36-9; Aristotle 2001: 17-8) writes:

> Those things are called relative, which, being either said to be *of* something else or *related to* something else, are explained by reference to that other thing. For instance, the word 'superior' is explained by reference to something else, for it is superiority *over something else* that is meant. Similarly, the expression 'double' has this external reference, for it is the double of *something else* that is meant".

In this instance, Aristotle lists a number of (non-composite) categories, namely "substance, quantity, quality, relation, place, time, position, state, action, or affection" and then gives as examples of relation: "double", "half", and "greater" (Aristotle *Categoriae* 7, 1 b 29; Aristotle 2001: 8). In addition to the individual primary substance, Aristotle introduces (universal) secondary substances, such as the species "man" or the genus "animal" (Aristotle *Categoriae* 7, 2 a 11-8; Aristotle 2001: 9).[1]

While the primary substance is self-contained ('absolute'), secondary substances display a relatedness which entails relativity. Whereas the phrases 'two cubits long' or 'three cubits long', and so on "indicate quantity, the terms 'great' and 'small' indicate relation, for they have reference to an external standard. It is, therefore, plain that these are to be classed as relative".[2]

The subordinate position of the category of relation in the thought of Aristotle is clearly noted in his affirmation that "all categories are posterior to substance" and that "the relative is neither potentially nor actually substance" – "It is [...] rather impossible, to make non-substance an element in, and prior to, substance" (Aristotle *Metaphysica* 14, 1, 1088 b 1-4; Aristotle 2001: 914).

1 Aristotle explains the difference between primary and secondary substance as follows: "All substance appears to signify that which is individual. In the case of primary substance this is indisputably true, for the thing is a unit. In the case of secondary substances, when we speak, for instance, of 'man' or 'animal', our form of speech gives the impression that we are here also indicating what is individual, but the impression is not strictly true; for a secondary substance is not an individual, but a class with a certain qualification; for it is not one and single as a primary substance is; the words 'man', 'animal', are predicable of more than one subject" (Aristotle *Categoriae* 7, 3 b 10-17; Aristotle, 2001:12).

2 Aristotle *Categoriae* 7, 6 b 26-9; Aristotle 2001: 16; Aristotle *Metaphysica*, V, 15, 1020 b 26 ff; Aristotle 2001: 768.

While Augustine re-evaluated the Aristotelian view on relation, Boethius explored it further within his doctrine of the Trinity, as being responsible for multiplicity: "So also the substance implies unity, but relation causes threeness" (Mojsisch 1992: 586). Although John the Scott still worked with the substance-accident scheme of Aristotle, he also elevated the term relation to the level of the absolute by identifying it with God. He then once again weakens his absolutising view through a metaphorical mode of argumentation in which it is alleged that relation has primacy compared to all categories. A relation does not display a thing character and it exists in the mutual interconnection of what it relates (Mojsisch 1992: 587). Thomas Aquinas continued the Aristotelian substance concept – as the union of universal substantial form and (formless) matter. Ter Horst emphasises that Thomas had to change the pagan Greek view of Aristotle, according to which matter, for Aristotle, is an eternal principle of movement and change, whereas form is an equally eternal principle of enduring being (Ter Horst 2008: 28). However, this attempted synthesis of Greek paganism and biblical Christianity resulted in additional unsolvable problems – causing the strong title of the work of Ter Horst *The disintegration of the substance. A deconstruction of the principles of form and matter in the ontology and epistemology of Thomas Aquinas* [*De ontbinding van de substantie. Een deconstructie van de beginselen van vorm en materie in de ontologie en de kenleer van Thomas van Aquino*].

2. The turn towards the primacy of relations

However, it was Campanella who assigned a real, extra-mental nature to relations. Just as whatever exists has its own being, so also relation as relation has its own being. Not only what exists independently has its own being, but also the relation as connecting agent of what co-exists has its own being (Mojsisch 1992: 594). The relativisation of an independent substance is found in the view of Leibniz, namely that nothing is so isolated that it does not still display relationships with all other things – including his famous encompassing *harmonia praestabilita* (see Baum 1992: 597). This shift to relations could be considered a reaction to the traditional Greek and Thomistic views which are still to be found in the thought of Descartes. The latter still continued to define a substance as follows: "By substance we

can conceive nothing else than a thing which exists in such a way as to stand in need of nothing beyond itself in order to its existence" (Descartes 1965: 184; *The Principles of Philosophy*, § LI).

Later on, Hegel interpreted the view of Sextus Empiricus, namely that "everything exists only in relation to something different", in such a way that it only applies to what is finite, because the infinite absolute is relation itself to itself (Baum 1992: 600-1). Hobbes opted for reconstructing all of reality in terms of the functional category, 'moving body'. The interrelatedness of all things also prompted Leibniz to acknowledge the multifaceted nature of things. Leibniz (1965: 433) indirectly refers to "those who have found the essence of bodies to be in extension, alone or together with the addition of impenetrability". He proceeds by conjecturing that "something more than magnitude and impenetrability must be assumed in body" (Leibniz 1965: 440) and then explains that

> all the truths about corporeal things cannot be derived from logical and geometrical axioms alone, namely, those of great and small, whole and part, figure and situation, but that there must be added those of cause and effect, action and passion, in order to give a reasonable account of the order of things (Leihniz 1965: 441).

What he had in mind is admitting "certain metaphysical principles perceptible only by the mind and that a certain higher and so to speak, formal principle must be added to that of material mass" (Leibniz 1965: 441).[3] On the one hand, in this instance, Leibniz approximates the idea of the multi-functional existence of entities (their multi-aspectual structuredness), but at the same time we discern the switch in emphasis towards relations.

The Greek-Medieval legacy of asserting the independence of things, understood as 'substances', amounts to the reification (hypostatisation or substantialisation) of such entities. The slow but certain turn towards function concepts since the Renaissance pursued the opposite alternative, namely the attempt to reduce entities to aspects or functions of reality. In general, this approach

3 Leibniz believes that abstract mathematical entities are not found in nature since they merely serve accurate mental calculations: "But I do not mean that these mathematical entities are realy found in nature as such but merely that they are means of making accurate calculations of an abstract mental kind" (Leibniz, 1965: 438).

is known as being functionalistic. Functionalism reifies (aspectual) relations, thus elevating one or another mode of reality to assume a central explanatory role in our understanding of the universe. When Descartes characterises material things (and the human body), he claims that essentially they are extended – a spatial property. Likewise, he considers thinking to be the essence of the human soul or mind. In both instances, entities are characterised in terms of one aspect or function only, typical of what we have in mind when speaking of functionalism. In respect of the former material things, Descartes states: "That the nature of body consists not in weight, hardness, colour, and the like, but in extension alone" (Descartes 1965a: 200 – Part I, IV). Kant (1781/1787-B: 35) expanded on this understanding in his account of material bodies, for he holds that when

> our understanding leaves aside everything accompanying their representation, such as substance, force, divisibility, etc., and likewise also separates that which belong to sensation, such as impenetrability, hardness, color, etc., then this empirical intuition leaves something else, namely extension and shape.[4]

However, Kant did not understand space in its original ('mathematical') sense, but as the form of our (sensory) intuition through which we represent objects outside us (alongside time as that which determines the relation of representations in our inner condition) (Kant 1787-B: 37, 50). According to Kant (1787-B: 89-90), human understanding must be understood in complete isolation, not merely from what is empirical, but also from every form of sensibility. It is a self-enduring and self-sufficient unity that cannot be increased by any additions from without. Although this mode of expression still reflects an element of the old substance concept, it is at the same time presented in a fully functionalistic way. Sensibility and understanding are opposed to each other, similar to Descartes' *res extensa* and the *res cogitans*. The transcendental motive in Kant's *Critique of pure reason* (CPR) aims at uncovering the *a priori* conditions making possible our experience of phenomena, but it is fitted into the mould of two basic functions of

4 "So, wenn ich von der Vorstellung eines Körpers das, was der Verstand davon denkt, als Substanz, Kraft, Teilbarkeit usw., imgleichen, was davon zur Empfindung gehört, als Undurchdringlichkeit, Härte, Farbe usw. absondere, so bleibt mir aus dieser empirischen Anschauung noch etwas übrig, nämlich Ausdehnung und Gestalt".

reality, the sensitive and the logical-analytical. The former of these two absorbed within itself the spatial denominator of extension, which Kant continued in following the view of Descartes. As noted, material things, according to Descartes, are essentially extended.

The switch to a moving body in the thought of Hobbes reflects the influence of Galileo's new mechanics. Prior to Galileo, the belief was held that a moving body requires a dynamic force in order to continue its motion. Galileo, however, claimed that once a body is in motion, it will continue its motion endlessly. Only when there is some impediment will it change its course of motion (Galileo 1638). Galileo employed a thought-experiment in which he imagined a moving body on an endless horizontal plane. If nothing disturbs this moving body, it will continue its uniform and ever-enduring movement into infinity. In his encompassing work on the role of the mechanistic view, Dijksterhuis (1961) accounts for what became known as the "mechanization of the World Picture".

3. The victory of functionalism

In the development of the natural sciences, in particular, there is the tendency to focus on the functional relationships between things without attempting to explain the what of these entities in their relations. No one less than the influential Enlightenment philosopher Immanuel Kant demonstrates this development more clearly. In addition to positioning space, as the essential characteristic of material bodies, within the context of sensibility (intuition), Kant also surrendered fully to the restriction of knowledge to our concepts of relations. Not things-in-themselves, but their appearances are reduced to relations. The conditions of intuition solely concern appearances: "What we can know of matter are nothing but relationships (that which, what we call the inner determinations of matter, is only inner comparativity" (Kant 1787-B: 341).

From an overall perspective, the most significant effect of giving primacy to relationships and relation concepts is evident in the emergence of monistic isms practically found within all the natural sciences and humanities during the past one hundred and fifty years. In fact, every monistic orientation elevates one mode of explanation to be the exclusive gateway to an understanding of all of

reality. Just consider trends such as physicalism, vitalism, moralism, and historicism. All of them are presenting a negative answer to the problem of unity and diversity. One may designate this problem also as that of the coherence of irreducibles. Bertrand Russell relates this to Hegel in respect of the difference between a so-called 'continuous magnitude' (wholeness) and a 'discrete magnitude' as "different" instances of the "class-concept". He then proceeds to state that he "strongly" holds "that this opposition of identity and diversity in a collection constitutes a fundamental problem of Logic – perhaps even the fundamental problem of philosophy" (Russell 1956: 346).[5]

Although an understanding of the world may benefit from avoiding any attempt at reducing what is irreducible, thus affirming the uniqueness and irreducibility of the diverse aspects of reality, the actual history of the various scholarly disciplines appears to display constant attempts to reduce what is irreducible. The Kantian legacy was continued in the two schools of neo-Kantianism which emerged towards the end of the nineteenth and the beginning of the twentieth century, namely the Baden and the Marburg school. To the former, one may count influential scholars such as Wilhelm Windelband, Heinrich Rickert and Max Weber and, to the latter, figures such as Hermann Cohen, Paul Natorp, Ernst Cassirer and Hans Kelsen.

Rickert (1913: 68-70) clearly explains the implications of reifying function concepts or relation concepts and he does not hesitate to

5 The reason why "identity and diversity" is indeed a fundamental problem of philosophy is that it relates the nature of analysis to the one and the many, the issue of unity and diversity. The traditional understanding of analysis connects it to setting apart, to dividing, that is to distinguishing. However, one can only distinguish between whatever if both elements distinguished are at once identified. Distinguishing a pen from paper therefore requires the concomitant identification of the pen and the paper. Of course the converse is also true. In order to identify one has to be able to distinguish. Naturally the meaning of analysis points to what is identical and what is different. Bradley articulated an understanding of the connection between identity and difference. He holds "that there is no difference without a distinction" because ultimately identity and difference are inseparable, while reality "is the concrete identity of sameness and difference" (Bradley 1935: 640-41). In terms of our understanding of analysis as identification and distinction, one can rephrase Bradley's view by pointing out the all logical-analytical acts of identification and distinguishing rest on the basis of discerning similarities and differences.

point out that the logical ideal of the natural sciences should aim at eliminating all thing concepts by turning them into relation concepts:

> Whatever the role the category of a thing may fulfill in a theory of the thing world, envisaged as closed, at bottom there is no doubt that the natural sciences have to strive to resolve the rigid and fixed things increasingly, [...] and this means nothing else but transforming as far as possible all thing concepts into relation concepts. [...] Our theory is valid for the logical ideal of natural scientific concepts, because this ideal solely concerns relation concepts.[6]

This widespread view is also found in Dilthey's *Introduction to the humanities*, where he argues that the modern natural sciences slowly replaced the metaphysical substance concept (Dilthey 1933: 360).

In order to understand the meaning of the term 'relation', we have to explain what the whole-parts relation is all about. When all the parts are given and connected, we have a (continuous) whole. This shows that the term 'relation' can only be understood in terms of a dual embeddedness: it embodies continuity (or: the continuum) and, in achieving this, it reflects the connection of the whole-parts relation to the original numerical meaning of the one and the many. Dewey realised that relations are intertwined with the one and the many (Dewey 1935: 630). He discusses relations in the context of feeling and experience, and points out that a relation is not its terms, because a relation is between terms (while the latter must be particular or individual). When the situation has become relational as a whole, the relation "has become no more than one of its parts" (Bradley 1935: 636). Yet, as a neo-Hegelian, Bradley (1935: 649-50) believes that the ultimate and absolute can only be found in what is super-relational.

Surely the term 'relation' entails the idea of relatedness, of coherence, or of interconnectedness. If all the parts are given and connected, we have the whole. This shows that relationality actually displays elements of our quantitative awareness of multiplicity (the one and the many), as well as elements of the whole-parts relation which embodies spatial continuity (with its implied infinite divisibility).[7]

6 Functionalism reduces entities to functions, while substantialism reduces functions to entities.

7 Particularly Brouwer and Weyl, in their intuitionist mathematics, defend the view that it is not in the relationship of *element* to *set* but in that of the *part to the whole* that one finds the essence of the continuum (Weyl 1966: 74).

Two closely related issues surface in this instance:

- The reality of concretely existing entities exceeds any single relational context (aspect) in which it functions. Therefore neither can one reify[8] relational coherences (aspects) into pseudo-entities, nor can one functionalise entities (surrendering their existence to some or other functional aspect).
- The multiple functional relations within which entities exist imply that these aspectual functions are primitive and irreducible. If this were not the case, they would have collapsed into one all-encompassing mode of existence. Therefore, exploring any one of them as a distinct (and irreducible) mode of explanation presupposes the implicit acknowledgment of other equally primitive and irreducible modes of explanation.

Dewey does acknowledge irreducible traits of reality but, unfortunately, he did not explicitly explore the distinction between entities and relational aspects. Instances "of ultimate, or irreducible, traits" (Dewey 1960: 215) are found in "diversity, specificality, change" (Dewey 1960: 216). Yet the distinction between diversity, specificality and change presupposes the distinction between entities and relations, and it also approximates the fact that concretely existing entities do function in a specific way within all the different functional or modal aspects of reality. However, these three terms merely reflect modal aspects. The quantitative meaning of the one and the many is employed in the idea of unity and diversity.[9] But, in addition to the numerical relational mode, there are many others such as the spatial,

8 Since entities are interconnected with other entities through their functioning within the universal modal relations in which they exist, no entity can ever be seen in isolation from the inter-modal coherence in which they exist. For this reason we may employ a phrase that is almost tautological when we criticize the traditional substance concept, because this concept indeed aims at cutting things off from their structural and functional relationships. We employ the word *reify* therefore in a *broad sense*, covering both the "thing-like" way of understanding functional aspects and the elevation of "some-THING" of all its functional and structural interconnections. In this sense one can "reify" both things and functions.

9 Strictly speaking one should here distinguish between conceptual knowledge and concept-transcending knowledge. Counting multiple things or establishing numerical properties of particular things employs the meaning of number in a conceptual way, whereas using this numerical intuition to refer beyond

the kinematic, the physical (where the term 'change' has its seat), the biotic, the logical-analytical, the social, the aesthetic, and so on.

When the term 'diversity' is understood in the unspecified sense of a multiplicity of functional relationships, no mention is made of the specific way in which different types of entities function within all the relational aspects of reality. Such an account enters the domain of the second primitive mentioned by Dewey, designated by him as "specificality". Since Kant, those thinkers who wrestled with this problem distinguished between thing concepts and pure concepts of law. The latter are meant to designate universal (and unspecified) relational laws or aspectual (modal) laws. For example, when Cassirer, in his work on substance concept and thing concept, analyses the concepts of chemistry, he remarks that physics only apparently is involved with thing concepts for its aim and its true domain are constituted by pure concepts of law.[10] Rudolph Berlinger (1969: 2) highlights this view of Cassirer in his characterisation of the epistemological orientation of the Marburg school: "The Marburg school eliminates from Kant's transcendental idealism the things-in-themselves as realities existing independently of consciousness. The thing concept is replaced by the law concept".

Ultimately, Dewey also adheres to this view by pointing out that there is a "growing recognition that scientific objects are purely relational and have nothing to do with the intrinsic qualities of individual things and nothing to say about them". For example, Dewey (1960: 232) argues that as far as the findings of science "are concerned, independent of the intrusion of metaphysical ideas, mass is inertia-momentum and these are strictly measures and relations". Even the long-standing distinction between primary and secondary qualities has to surrender to the relational perspective:

> Using the older language, it was seen that so-called primary qualities are no more inherent properties of ultimate objects than are so-called secondary qualities of odors, sounds, and colors, since the former are also strictly relational; or, as Locke stated in his moments of clear

the boundaries of the quantitative mode may explore them in the concept-transcending idea of *unity* and *diversity*.

10 "Die Physik hat es zuletzt doch nur scheinbar mit *Dinbegriffen* zu tun; den ihr Ziel und ihr eigentliches Gebiet bilden die reine Gesetzesbegriffe" (Cassirer 1910: 271).

> insight, are 'retainers' of objects in their connections with other things (Dewey 1960: 233).

Dewey (1960: 234) defends the view that "the subject matter of scientific findings is relational, not individual". He proceeds by relating the relational view to the "very method of physical science", accompanied by acknowledging the "primary standard units of mass, space, and time", which are "concerned with measurement of relations of change, not with individuals as such" (Dewey 1960: 233).

4. Relationality and specificality

The issue at hand needs a different distinction. While relationality (grasped in relation concepts) is nothing but that trait of reality displaying the fundamental ways or modes of being within which entities exist, specificality reflects the specific or typical way in which entities function within the various modal aspects of reality. Formulated in terms of the distinction between law and subject, the obvious phrases to be introduced are 'modal laws' and 'type laws'.

Modal laws hold for all possible classes of entities, while type laws hold for a limited class of entities only. Even Kant had to distinguish between supposedly universally valid *a priori* thought categories, on the one hand (the pure concept of law of Cassirer) and so-called empirical laws of nature, on the other. In his *Prolegomena*, Kant (1783 §36: 320) writes.

> We rather have to distinguish empirical laws of nature, which always presuppose particular perceptions, from the pure or general natural laws, which, without having a foundation in particular perceptions, only contain the conditions of their necessary connection in an experience. In respect of the latter nature and possible experience are entirely the same; and since within these the law-conformity of the necessary connection of appearances in an experience (without which we are totally incapable of knowing any object of the world of sense), actually is based upon the original laws of the understanding, so it initially does sound strange, but it is nonetheless certain, when I state with respect to the latter: understanding creates its laws (a priori) not out of nature, but prescribes them to nature.

This distinction drawn by Kant is equivalent to the earlier distinction between modal laws and type laws. The unspecified nature of modal laws could be captured by the phrase 'modal universality'. Kant's classical quest for the synthetic *a priori* actually discovered the nature

of modal universality. Positivism and neo-positivism deserve to get credit for their emphasis on experimental testing and confirmation in this regard, for it is only by studying the orderliness or law-conformity of entities that one can understand the type laws holding for the limited class of entities conforming to their peculiar type laws. In the case of physics, it requires empirical research through experimentation. However, despite this merit, it was caught in a functionalistic perspective by reducing the source of knowledge to 'sense data'. In addition, most neo-positivists adhere to a materialist view of nature which explores a physicalist perspective.

In order to better appreciate Kant's position in this regard, one must examine the historical background of the distinction between modal laws holding for whatever there is and type laws applicable to a limited class of entities only.

Whoever modally abstracts a particular aspect gains access to the (unspecified) universality of modal-functional relationships. Since modal aspects are not concrete entities or events, they cannot be treated as if they are entitary in nature, because this would simply amount to functionalism, a reification of modal functions. A widespread and well-known example of such a reification is the reference to the origin of 'life'. Of course, the intention is to refer to living things, yet no single living entity is exhausted by its biotic (life) function since, among others, living entities also display a physical aspect, and both physicists and biologists know that the physical-chemical constituents of living entities are not alive.

Von Weizsäcker (1993: 128) maintains that modal laws such as those of quantum physics hold for all possible 'objects': "Quantum theory, formulated sufficiently abstract, is a universal theory for all Gegenstandklassen (classes of objects)". When he explains, on the next page, that one cannot deduce the kinds of entities of experience from the universal scope of quantum theory, he implicitly alludes both to universal modal laws and to type laws (the latter with their specified universality). Weyl (1966: 192) also implicitly appeals to the distinction between modal universality and typicality: "But what is connected with the a priori construction is experience and an analysis of experience through the experiment".

Discussing the nature of an *a priori* synthetic element in the "empirical sciences", Stegmüller (1969: 316) raises the following possibility – alluding to the same issue:

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

5. Functionalism and the humanities

By and large, the nineteenth century was in the grip of the organic mode of thinking. It gave birth to the term 'functionalism' which, in turn, was situated within the terminological context of the whole-parts relation, that is to say system and subsystem. This practice was related to disciplines such as biology, psychology and ethnology (Phillips 1977: 80-112), thus transcending the confines of sociology as a scholarly discipline. A basic assumption of functionalism is already found in the thought of Radcliffe-Brown who was concerned with the supposedly functional unity of society. The qualification 'functional' accounts for the unity of the social system, because it is supposed to be a functional unity. Clearly, a functional unity presupposes a particular relation between a totality (a whole) and its parts. Timasheff (1955: 220) summarises the basic position of functionalism as follows:

> "A social system [...] is a real system in which the parts perform functions essential for the persistence (eventually, the expansion or strengthening) of the whole and therefore are interdependent and more or less completely integrated".

Clearly, functionalism draws upon the nature of the whole-parts relation, which as such, as we have noted, is located within the aspect of space. Yet the after-effect of nineteenth-century thought mainly directed its attention to the spatial analogies within the biotic aspect. Merton (1968: 75) remarks: "This usage is more often explicitly adopted from the biological sciences". In his own approach, however, Merton (1968: 82) questions the "assumption of the complete functional unity of human society", since it repeatedly turned out to contradict the facts.

It should be borne in mind, however, that it is also possible to overestimate the numerical analogy within the functional structure of the biotic aspect. Spencer (1968: 76-8) advances an atomistic organicism and explicitly gave preference to a purely relational understanding of this analogical moment.[11]

Habermas (1984: 100) acknowledges entities within the "objective world" and distinguishes it from the "subjective world" of experiences. But the social world is perceived as the totality of all legitimately regulated interpersonal relations. Although Habermas does acknowledge institutions within the "social life-world" of human beings (Habermas 1996: 24), he does not have multi-aspectual societal entities in mind, because at most he speaks of "the symbolically structured life-world, mediated by interpretations and belief" (Habermas 1996: 36).

Another influential sociologist, Leopold von Wiese, explored the implications of a functionalistic approach. He even designates his sociological orientation as a sociology of relationships (*Beziehungssoziologie*). From the fact that the term 'relation' in a modal sense originally has a spatial meaning, it speaks for itself that his view is controlled by the idea that the "next to each other with the accompanying connecting and dissociation essentially constitutes the social" (Von Wiese 1959: 76). From the "horizontal" relational orientation, it is to be expected that Von Wiese holds that all super- and subordinational relations are reducible to this "next to each other" of inter-human relationships. As a result, he (Von Wiese 1959: 76-7) maintains that the basic concept of sociology is that of social distance. In a similar relationalistic fashion, Max Weber attempted to resolve social communities into a formal system of relations (Dooyeweerd 1997-III: 251).[12]

11 Isajw stresses that the assumptions of *functional analysis* refer to certain *generalized facets* of *biotical entities*, thus showing continuity with the older organicistic trends of thought (Isajw, 1968: 117-18).

12 This view is intimately connected to Weber's atomistic orientation in terms of which social structures are reduced to *individuals-in-interaction*: "Concepts such as 'state', 'club' ... signify specific kinds communal human actions ..., that could be reduced to 'understandable' ('verständliches') actions, and that means that they can, without an exception, be reduced to the actions of the individual human beings (*Einzelmenschen*) concerned" (Weber 1973: 439).

A revival of the initial science ideal of modern philosophy is found within the Marburg school of neo-Kantian thought. This school developed their ideas in a functionalistic sense. Hermann Cohen laid the foundation for the contribution of this school and Kelsen carried it through in all its consequences in his theory of law. The first work in which he pursued this path was in his work on sovereignty (see Kelsen 1920). He identifies state and law. Understood as a social community, the state is constituted by a normative ordering with which it is identical.[13] This legal ordering is a system of jural norms (Kelsen 1966: 47).[14] By identifying the state with the (normative) jural function, a one-sided functionalism is advanced – in the sense of identifying a function (the jural) with an entity (the state). In addition, this sphere of 'ought' is separated from the domain of 'is' (*sollen* and *sein*) by an unbridgeable divide. The normative ordering of law is also captured by the word *Rechtssatz* and, within the framework of a 'scientific world view', which only has room for a positivistic theory of law, the distinction between natural law and *Rechtssatz* must emphatically be upheld (Kelsen 1960: 80). The idea of a pure theory of law aims at analysing the meaning of the jural in isolation from all the non-jural aspects of reality, thus contradicting the very meaning of the jural, because this aspect (like every other aspect) can only reveal its meaning in coherence with all the other aspects of reality. For Kelsen (1960: 80), the idea of a "natural law" embodies the connection of cause and effect (causality) which is independent of the legal authority of a norm posited by an act of will in its connection to the *Rechssatz*.

Kelsen delivers factual reality (the domain of *sein*) to the rule of the law of causality which is supposedly separated from the domain of *sollen*. However, he does not realise that the terms *Geltung* and *Kraft* (validity and force) which, according to him, inherently belong to the domain of 'ought', also reflect the meaning of the physical aspect where causality has its seat. The Kantian dualism between 'is' and 'ought' (*sein* and *sollen*) receives its ultimate motivation from the dialectic between nature (causality) and freedom. Appleby *et al*

13 "Wird der Staat al seine soziale Gemeinschaft begriffen, kann diese Gemeinschaft, ..., nur durch eine normative Ordnung konstituiert sein. Da eine Gemeinschaft nur durch *eine* solche Ordnung konstituiert sein kann (ja, mit dieser Ordnung identisch ist), ..." (Kelsen, 1960: 290).

14 "Die Rechtsordnung ist ein System von Rechtsnormen."

display a significant understanding of this dialectic which, within postmodernism, coincides with the switch from concept to word (cause to meaning).[15]

6. Transcending the opposition of substantialism and functionalism

If the distinct scope of laws delimits their unique areas of validity, it is not recommended that the concept of a natural law be allowed to degenerate into an amorphous collection of predicates, such as found in Stafleu's proposal. Stafleu (2002: 39) mentions that a law is sometimes hidden behind the name axiom, constant, proposition, rule, relation, thesis, symmetry, theorem, design, pattern, connection, prohibition, compassion, phenomenon, or prescription. This list contains elements referring to the law aspect and the factual aspect of reality, as well as a mixture of ontic phenomena and products of human activity. For the sake of convenience for example, Stafleu (2002: 39) calls a mathematical law-conformity (*wiskundige wetmatigheid*), such as the theorem of Pythagoras, a natural law.

Stafleu introduces a new term for entities, namely 'character', but states explicitly that it is not his intention to designate "the essence or nature of things" or processes; What he wants to emphasise is that a cluster of laws determines the mutual relations between things and processes (Stafleu 2002: 9). It seems as if Stafleu, in his fear for what he calls "essentialism", underplays the thingness of things by focusing on relations. This emphasis comes dangerously close to functionalism. Stafleu's new emphasis on relations – also reflected in the title of his 2002 work – substantiated by 'degrading' a mode of speech in which it will be possible to mention the nature of things, continues the above-mentioned long-standing functionalistic approach particularly

15 As a consequence, we can speak about a general shift from *concept* to *meaning*, from t*hought* to *language*. Introduced by Wilhelm Dilthey before the end of the 19th century, this transition is still popular a hundred years later. In a book on K*nowledge and Postmodernism in Historical Perspective*, the combined *Introduction* says that the most recent spiritual climate is marked by a "shift" away from "documentation to interpretation, away from reconstructing a chain of events to exploring their significance. ... Using a conceptual shorthand, we could say that meaning has replaced cause as the central focus of attention" (Appleby *et al* 1996: 1).

prominent in the intellectual development of the natural sciences since the Renaissance. In fact, in support of his relational approach, Stafleu calls upon the development of the modern natural sciences in their reaction to the essentialistic philosophy of Plato and Aristotle. He mentions that the question regarding the essence disappeared from modern natural science and that, therefore, it also should not find shelter in a "relational philosophy" (Stafleu 2002).

However, an integral and encompassing idea of the universe in its unity (coherence/relatedness) and diversity (uniqueness/irreducibility) has to affirm both sides of the coin – uniqueness and coherence. One implication of the idea of uniqueness and coherence entails an alternative for the problem of substantialism as opposed to functionalism. What is needed is to acknowledge both concrete entities and processes and the equally real presence of diverse aspects within which all concrete entities and processes invariably function.[16] No entity is ever a self-contained substance "in need of nothing beyond itself" as Descartes asserted in his (earlier quoted) statement from *The principles of philosophy*. The idea of uniqueness and coherence, when applied to entities and their mutual relations, eliminates both substantialism and functionalism.

The nature of material entities such as atoms, molecules, macromolecules and macrosystems, for example, are individually distinct and, therefore, one could refer to them in the plural – evincing their function within the numerical aspect. Multiple elementary particles are integrated in the unified functioning of atoms as individual wholes. When physicists talk about these particles, the original meaning of space (combined with numerical analogies within space), is prominent. In other words, the aspects of number and space are first explored in what physicists say about elementary particles. In addition, atoms function within both the kinematic and the physical aspects, which means that their many-sided existence exceeds any specific aspect in which they function.[17]

16 In passing we may note that the idea of *uniqueness* and *coherence* finds another instantiation in the distinction between the irreducibility of each modal (functional) aspect and the coherence between all of them, reflected in backward-pointing (retrocipatory) and forward-pointing (anticipating) structural features.

17 The nucleus of the atom (constituted by protons and neutrons) has a certain size, and its diameter, multiplied by 100,000, specifies the distance between

There are different ways in which one can explain the connection between physical entities and the four aspects mentioned earlier. Initially, modern physics restricted itself to number, space and movement as modes of explaining physical reality. This view is found from Galileo to Herz. Galileo assumed numerical, geometrical and kinematic properties as primary qualities of matter.[18] Hertz still adhered to the same mechanistic view in his posthumous work, *The principles of mechanics developed in a new context* (1894), in which he continues the restriction of Galileo. Katscher explains that he attempted to deduce his mechanics from the basic representations of mass, space and time, thus rejecting the (physical) concept force which, according to Hertz, is inherently antinomic.[19] Even Heisenberg believed that merely three constants were needed. While accepting two universal constants (Einstein's postulate of the velocity of light and Planck's quantum of action), he was seeking a third universal constant, which he sought in a universal length. His claim is that one must have at least three units – be they length, time and mass, alternatively length, velocity and mass, or even length, velocity and energy (Heisenberg 1958: 165).

Nonetheless, by distinguishing four units of measurement in his protophysics, Paul Lorenzen (1976: 1) does acknowledge the physical function as a legitimate mode of explanation, because his units of measurement are mass, length, duration and charge. Clearly, these units of measurement bring to expression the uniqueness of the first four aspects of reality, namely number (mass), space (length), the kinematical aspect (duration), and the physical aspect (change). Weinert (1998: 230; Lorenzen 1989) alludes to the distinction between

the nucleus of an atom and its (circling) electrons. It is currently assumed that quarks, which are apparently not "free," are the ultimate "building blocks" of these elementary particles. The size of electrons and quarks is point-like, smaller than 10-18 (see Kiontke 2006: 27). More information on this micro-dimension is found in Penrose (2005: 645 ff).

18 "G. Galilei zählt als primäre Qualitäten der Materie arithmetische (Zählbarkeit), geometrische (Gestalt, Größe, Lage, Berührung) und kinematische Eigenschaften (Beweglichkeit) auf" (Hucklenbroich 1980: 291).

19 "Das 312 Seiten stärke, pusthum erschienene Buch ist der Versuch, ein System der Mechanik unter Ausschaltung des widersprüchlichen Begriffs der Kraft allein aus drei unabhängigen Grundvorstellungen Zeit, Raum und Masse und unter Zuhilfname eines eizigen Grundgesetzes aufzubauen" (see Katscher 1970: 328-9).

fundamental and conventional units and then lists the kilogramme (number), the meter (space), the second (the kinematic), and temperature (the physical).

In the light of the preceding considerations, acknowledging the physical or any other aspect of material entities can never encompass the full multi-aspectual existence of such entities. For this reason, the idea of an individual, multi-aspectual whole (individual entity) in principle exceeds the knowledge which one can obtain from the perspective of one aspect only. The term 'idea' is, in this instance, meant in the technical sense of the German word *Grenzbegriff*, that is to say, as concept-transcending knowledge.

The idea of a multi-aspectual individual whole sheds new light on the so-called 'dualism' of quantum physics. Returning to a particle theory regarding the nature of light (Einstein) became significant when interference phenomena suggested that it is always also possible to ascribe a wave-character to elementary particles. By contrast, the Compton effect – regarding the interaction of a photon and an electron – provided evidence to support the idea of distinct particles. Although it turned out to be impossible to establish experimentally both the particle and the wave nature simultaneously, Bohr (1968: 41) claims that these two perspectives are complementary. In the light of the generalisation provided by De Broglie, one may ask: if it is possible to describe or explain entities qualified by energy-operation in terms of two apparently mutually exclusive experimental perspectives, namely as particles and as waves, is it then still meaningful to speak about their unitary structure? Stegmüller (1987: 100) refers to Margenau and Murphy who hold that it is a monstrous (*ungeheuerliche*) assumption, namely that something contradictory exists, a thing which is at once a particle and a wave.

This objection exactly hits the point where special scientific description reaches its limits and needs to fall back on a philosophical perspective transcending the confines of a single mode of explanation. What is required, in this instance, is one or other philosophical account transcending the mere combination of one or more (modally delimited) special scientific points of view or modes of explanation. The idea of the unity and identity of an entity could never be provided to us merely by explicating various modal functions theoretically,

because this underlying unity is presupposed in all theoretical explanations. In a strict and technical sense, this idea of an entity in its totality – preceding the analysis of its modal aspects – refers to an individual whole embedded in the inter-modal and inter-structural coherence of reality. Such an entity is immersed in the depth layer of an all-embracing temporality transcending genuine concept-formation and, therefore, can never be identified with one or other modal aspect – as if it is nothing but a particle or a wave. As argued earlier, it can only be approximated in a concept-transcending idea.

In their relation to functional aspects, concepts such as particle, field, and wave are not type concepts, but modal functional concepts. They belong to the elementary basic concepts of physics. Consequently, the terms 'particle' and 'wave' analogically reflect retrocipatory (backward-pointing) elements within the structure of the kinematical aspect, namely movement multiplicity (numerical analogy) and movement extension (spatial analogy). These facets are deepened in physically qualified entities and could be approximated in physical theory from the perspective of mathematical anticipations to the physical aspect.[20] The decisive point is given in the fact that De Broglie has shown that with each and every moving particle (atoms, molecules, and even macro-structures) one can associate a wave (Eisberg 1961: 81, 151).

Since number, space and movement remain irreducible aspects regardless of the nature and type of entities functioning within them (their modal universality), it is also from this perspective understandable why the functionally distinct concepts 'particle' and 'wave' cannot be reduced to each other – a state of affairs supported by experimental data. Irreducible modal perspectives indeed also serve as modes of scientific explanation, without being able to identify the trans-modal existence of an individual whole with any of its modal functions.

The habit of speaking of a 'dualism' in quantum physics, owing to this duality between particle and wave, is therefore questionable. In their alternative approach, Born *et al.* are justified in rejecting the apparent struggle with a dualism in this regard. They hold that it increasingly becomes clear that "nature could neither be

20 See Shrödinger's wave function formulated in terms of differential equations.

described by particles alone, nor solely through waves", because a proper understanding cannot toggle between a "particle image [*Teilchenbild*]" and a "wave image [*Wellenbild*]". This leads to a unitary view of physical systems.[21] What we have called modes of explanation, these authors designate as *Darstellungen*, as ways in which one can represent something (*representations*) – and they specifically mention three distinct, but simultaneously present, modes of explanation: an *Ortsdarstellung* (spatial representation), a *Wellendarstellung* (a wave representation – impulses or velocities – kinematic explanation), and an *Energiedarstellung* (the physical mode of explanation) (Born *et al* 1967-1968: 416-7).

7. Conclusion

Although the history of philosophy and the various academic disciplines constantly struggled with the difference between entities and aspects and with a way to understand how they can be related, we have noted that, by and large, this struggle resulted in a one-sided solution – first by reifying entities into independent substances (dominating Greek and Medieval philosophy), and subsequently by reducing entities to relations or functions (the functionalism dominating the modern natural sciences and humanities since the Renaissance). However, the mystery of an individual whole, exceeding its multiple modal functions, continued to escape the grip of conceptual knowledge. Stegmüller (1987: 109) is correct to point out that physicists cannot give anyone a guarantee that they will be capable of providing us with the ultimate explanation of the nature of matter. Only when we realise that the issue at stake is one that can solely be approximated by means of concept-transcending knowledge, will we also understand why the idea of an individual whole accounts for the multi-aspectual nature of concrete (natural and societal) entities. Such entities are not independent substances, because through the universal modal aspects in which they function they are related, even though they are not reducible to this relatedness – as functionalism claims. The multiple monistic orientations practically present in the history of every academic discipline, including the natural sciences and the humanities, testify to the fact

21 "Mit der Quantentheorie erfaßt man so alle Systeme einheitlich, ..."

that, like substantialism, functionalism has left an inerasable [or indelible] trace within philosophy and the special sciences.

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