

CHURCHLAND, KANDEL AND DOOYEWEERD ON  
THE REDUCIBILITY OF MIND STATES<sup>1</sup>

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*Abstract*

This article is devoted to the conceptual analysis of two texts of leading scholars in cognitive neuroscience and its philosophy, Patricia Churchland and Eric Kandel. After a short introduction about the notion of reduction, I give a detailed account of the way both scientists view the relationship between theories about brain functioning on the one hand and consciousness and psychopathology, respectively, on the other hand. The analysis not only reveals underlying philosophical mind/brain conceptions and their inner tensions, but also the conceptual relevance of distinctions that are fundamental in the work of Dooyeweerd, such as the distinction between modes and entities, between law and subject and between subject function and object function. After a brief clarification of the way these distinctions function in Dooyeweerd's theory of the body as an 'enkaptic structural whole', I try to explain how the conceptual framework, developed here, could be applied to brain functioning and leads to greater clarity in neuroscientific theorizing.

1. *Introduction*

There is no doubt that the rapidly expanding field of cognitive neuroscience belongs to the most intriguing areas of contemporary science. Neuroscientific findings not only challenge longstanding views about the working of the brain, they also have important conceptual and philosophical implications. Even consciousness, till recently considered as inaccessible for scientific study and, therefore, as merely a matter of speculation, has become a hotly debated subject in both empirical science and philosophy of mind. The new developments also invite philosophers in the reformational tradition to rethink their conceptual framework and to account for the anthropological implications of cognitive neuroscience.

In this article, I first give a detailed conceptual analysis of two texts of leading scholars in this field, Patricia Churchland and Eric Kandel. In doing so, I will explore whether fundamental distinctions of the reformational philosophical tradition bear relevance for the subject under discussion.

Then, I will proceed by highlighting how a more fully elaborated Dooyeweerdian conceptual framework works out when it is applied to brain functioning and neuroscientific theorizing. This more elaborated framework is derived from Dooyeweerd's theory of the human body as an enkaptic structural whole. It may help to evaluate new hypotheses and theories.

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<sup>1</sup> This article is based on a paper delivered at the second international conference *Science in Theistic Contexts. Cognitive Dimensions*, organized by the Pascal Centre for Advanced Studies in Faith and Science, in Hamilton (Canada), July 21-25, 1998.

I begin, however, with some remarks about reduction and reductionism. In my reconstruction of the position of both neuroscientists, it will appear that they move forth and back between reduction and reductionism. It is this moving forth and back which reveals underlying assumptions, even at the level of worldview. So, let us begin by clarifying what is meant with terms like reduction, reductionism and abstraction.

## 2. *Abstraction, reduction, and reductionism*

Many questions about the implications of neuroscience boil down to the issue of abstraction. The term abstraction refers to the cognitive process of isolating and scrutinizing a particular aspect (or aspects) of the object under investigation. Abstraction in itself does not preclude any view about the nature of the subject under investigation. It simply means to isolate a particular aspect of reality, in order to gain scientific knowledge. It is for this reason that I am inclined to prefer the term abstraction beyond the term reduction. The latter term is associated with an ontological claim: the factual reduction of a piece of reality (the *explanandum*), into (a theory about the functioning of) another piece of reality (the *explanans*). The less popular term abstraction, at least in the sense it is used here, lacks this ontological connotation. The artificial isolation of a particular piece of reality implies only a temporary *epochè* of knowledge of other aspects of reality. This *epochè* is only methodological. It remains restricted to the experimental situation and to scientific discourse. Accordingly, abstraction is an epistemic notion. As such it does not imply any ontological claim; it is not identical to reductionism.<sup>2</sup>

It should be admitted, however, that the distinction between methodical and ontological abstraction has very often been blurred. Epistemological abstraction, it seems, could not strictly be separated from ontological isolation, nor from absolutizing or substantializing. Looking back, one can say that this, in its turn, gave rise to the so-called –ism’s, such as materialism, naturalism, evolutionism, psychologism, and so on.<sup>3</sup> Accordingly, the –ism’s gained the status of worldviews. Unmistakably, these worldviews had religious or quasi-religious overtones in numerous cases.

From a historical point of view, therefore, reification and absolutizing seem to be the inevitable by-products of scientific thinking. In the end, this could only lead to a re-introduction of worldview-like elements into scientific discourse, in spite of the reductionist methodology of most sciences. According to this reconstruction, the irony of the Enlightenment project would be that,

<sup>2</sup> Cf. A. Plantinga, ‘Methodological Naturalism?’, in J.M. van der Meer, *Facets of Faith and Science*, Vol. I, Lanham 1996: University Press of America, 177-222.

<sup>3</sup> For a contemporary introduction and critique on the nature and weaknesses of these –ism’s see R. Clouser, *The myth of religious neutrality. An essay on the hidden role of religious belief in theories*, Notre Dame/London 1991: University of Notre Dame Press. According to Clouser the worldview-element emerges inevitably as soon as the abstracted part of reality is seen as having an-existence-in-itself. That which has an-existence-in-itself does not depend on anything else, nor on God. Given the a priori conception of creation as reality that depends in all its aspects and in every instance on God, reification implies deification.

notwithstanding its emphasis on unprejudiced thinking, methodical rigor and value-neutrality, this project ultimately resulted into new dogmatisms.

We are confronted here with two contrasting views of scientific methodology, one arguing for the innocence of scientific method and emphasizing the cleft between ontology and epistemology, and the other pointing to the elusiveness of the distinction between reduction (or abstraction) and reductionism and to the inevitability of absolutizing and reifying tendencies in science. This contrast, among others, reflects the well-known distinction between epistemic and ontological conceptions of science's reductionist strategies.<sup>4</sup>

I admit, that the general picture remains ambiguous. On the one hand, there is the overwhelming relativism and pragmatism of contemporary philosophy of science. On the other hand, many scientists (and lay-people) hold strong convictions with respect to the genesis and the order of the world. Big-bang cosmology and evolutionary theory provide the images and metaphors not only for the modernist worldview, but also for the modern scientist. One may question whether these images and metaphors form an intrinsic part of science. Should they not be considered as extra-scientific aggrandizements, filling in the gaps in human's search for meaning? Or, are we confronted here with a modern variant of old metaphysical desires? Scholars have shown that there exists an age-old connection between the ideal of theoretical purity on the one hand and a longing for metaphysical certainty on the other hand. In Aristotelian philosophy, this longing for metaphysical certainty was even associated with human's striving for immortality.<sup>5</sup> Pure theoretical thought is immortal thought, detached from the world of the senses.

These general remarks may serve to highlight two points, which will be relevant for our further reflections. In my view, the contribution of Christian scholarship to the sciences should be sought precisely here, in the borderline area between methodical abstraction and illegitimate extrapolation, in the space between reduction (abstraction) and reductionism. This scholarship should consist of the careful and detailed analysis of central concepts; in fleshing out the factual and potential implications of these concepts, both epistemic and ontological. Such a conceptual analysis brings us into the domain of the philosophy of the various scientific disciplines — systematic philosophy meanwhile operating at the background. If anywhere, it is here (and not at the level of worldviews or one particular research project) that we have to look for possible links between background ideas and the cognitive content of neuroscientific theories. Extrapolated to the level of worldviews, one may expect head-on collisions between the different views. At the level of individual research projects, on the other hand, the scope and intentions of worldviews are simply too broad and/or general.

The remainder of this paper, therefore, will be devoted to the analysis of two texts of leading scholars in neuroscience and its philosophy; to the

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<sup>4</sup> S. Sarkar, 'Models of reduction and categories of reductionism', *Synthese* 91 (1992), 167-194.

<sup>5</sup> Cf. R. Boehm, *Kritik der Grundlagen unseres Zeitalters*, Chapter I, par. 5-7 (Dutch translation: *Kritiek der grondslagen van onze tijd*, Baarn 1974: Wereldvenster, 35-51).

detection of background ideas and the implications of these ideas at the level of worldviews; and to the development of a conceptual framework that may help to evaluate new theories in cognitive neuroscience.

### 3. Patricia Churchland: 'Can neurobiology teach us anything about consciousness?'

#### 3.1. Churchland on reduction

Patricia Churchland belongs to those very few philosophers who combine a thorough knowledge of neuroscience with philosophical acumen. She, moreover, is one of the strongest defenders of philosophical naturalism of our time. We will concentrate on a recent paper devoted to the reductionist account of consciousness.<sup>6</sup>

Can neurobiology teach us anything about consciousness? The answer is affirmative. Neurobiology is — and will prove to be — one of the major sources of knowledge about consciousness. It is the cornerstone of the physicalist approach to mental phenomena. Physicalism is not an a priori insight, nor a faith, says Churchland. She considers it as a hypothesis, albeit a highly probable one. This ontological physicalism is coupled with epistemic reductionism. Reductionism is defined as: “..trying to explain the macro levels (psychological properties) in terms of micro levels (neural network properties)”. In her earlier book *Neurophilosophy*, she qualifies this approach as a form of intertheoretic reduction.<sup>7</sup> This qualification should not mislead us. Intertheoretic reduction as such is a primarily epistemic program. It has led to many conceptual and practical difficulties.<sup>8</sup> Churchland's claims, however, reach beyond the epistemic domain. These claims, and their argumentation, can be summarized in three steps.

The first step requires a translation of the language in which phenomena at a particular level A are described, into the theoretical language by means of which these phenomena are explained at level A.

The next step consist of the reduction of theories at level A in terms of theories at some underlying level B. This intertheoretic approach is, in Churchland's view, a variant of explanatory or causal reductionism. This is

<sup>6</sup> P. Smith Churchland, 'Can Neurobiology Teach Us Anything About Consciousness?', in N. Block, O. Flanagan, G. Güzeldere (Eds.), *The Nature of Consciousness. Philosophical Debates*, Cambridge 1997: MIT Press, 127-140 [cf. also <http://www.phys.uni.torun.pl/~duch/umysl/churchland.html>]. For background reading cf. also P. Smith Churchland, *Neurophilosophy. Toward a Unified Science of the Mind/Brain*, Cambridge 1986: MIT Press, chapter 7 and 8 (277-348).

<sup>7</sup> Churchland, *Neurophilosophy*, 279: “Similarly, when we entertain the question of whether light is reducible to electromagnetic radiation, the fundamental question really is whether the theory of optics is reducible to the theory of electromagnetic radiation. Hence, when we raise the question of whether mental states are reducible to brain states, this question must be posed first in terms of whether some theory concerning the nature of mental states is reducible to a theory describing how neuronal ensembles work, and second in terms of whether it reduces in such a way that the mental states of Tr [reduced theory, GG] can be identified with the neuronal states of Tb [basic theory, GG].”

<sup>8</sup> Cf. F. Suppe (Ed.), *The Structure of Scientific Theories*, Urbana & Chicago 1977: University of Illinois Press.

because intertheoretic reduction is directed at explanatory unification. Theories are meant to explain a particular state of affairs. Intertheoretical reduction means that explanatory theories at level A are reformulated in terms of explanatory theories at level B. Ideally, this reductionist strategy will lead to explanatory unification. One mechanism, or causal process will then explain both higher-level phenomena and lower-level phenomena. Explanatory reductionism exceeds, therefore, the claims of intertheoretic reductionism in that it aims at explanatory unification.

This brings us to the third step: ontological simplification.<sup>9</sup> Unification of theories will lead to the acceptance of a scientific worldview and to the rejection of so-called folk-psychology (common-sense psychology), according to Churchland. Explanatory reduction is, therefore, not an epistemic safe haven for those who wish to avoid the ontological claims of other reductionist strategies. On the contrary, it is a necessary part in the program of unification of theories on the mind/brain. The success of this program of unification is a measure for its truth. Coherence, thus, becomes the central criterion for truth.<sup>10</sup>

Favorite analogies, in this respect, are the reduction of classical optics to the theory of electromagnetic radiation and the reduction of heat to molecular motion. Phenomena that had been analyzed with the conceptual tools of classical optics, became more intelligible after the establishment of electromagnetic radiation. After this event, scientists understood that light is electromagnetic radiation. The same holds for theories about mental phenomena. These theories will be reduced to theories about neuronal processes. Churchland predicts, that it will be proven, ultimately, that phenomena like perception and memory are certain neuronal processes. Successful reduction is the kind of reduction that leads to identification of the higher level with the lower level processes. As will be clear, this reformulation implies a much stronger version of reductionism than explanatory reductionism only. Explanatory reductionism restricts itself to the reduction of theories at level A to more encompassing theories at level B. Churchland's materialism, however, is eliminative, in the sense that it involves a "non-trivial revision and even replacement of existing high level descriptions by neurobiologically harmonious high level categories". Psychological properties, in this way, are understood as properties of the neuronal system.

Churchland does not mean that a reductionist research strategy per se implies the adoption of a purely bottom-up strategy; nor does she mean that there is something disreputable about high level descriptions as such. It is, she says, wisest to conduct research on many levels simultaneously. However, the ultimate goal remains a revision of ordinary psychological language into the

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<sup>9</sup> Churchland, *Neurophilosophy*, 280.

<sup>10</sup> Churchland, 'Can neurobiology teach us', 133: "... I am predicting that explanatory power, coherence and economy will favor the hypothesis that awareness just *is* some pattern of activity in neurons".

language of neurobiology. This revision would imply a destruction of folk-psychology.

Churchland does admit that the ideal of a ‘complete’ reduction is utopian. Explanations are always incomplete. We should, therefore, perhaps eschew the expression ‘reduction’ in favor of ‘reductive contact’, she says. However, this should not go so far as to repudiating the reductionist ideal. Folk-psychological experiences are appearances, they have a reality behind them. Brain activity is the reality behind the appearance of experiences. Laying bare neuronal reality does not in and of itself change experience; nor does it “allow me to view my brain as an MR scanner or a neurosurgeon.”<sup>11</sup> Characteristic for the working of our brain is that it allows ‘appearance/reality discoveries’, i.e., that it has the capacity of laying bare what is really going on in the brain when a person has a particular subjective experience. The brain does not have a privileged access to objective facts. This holds true, both for the external world and for the brain’s model of the internal world. When we look at the sun, we do not know the sun as it is known by a physicist. In the same vein, we do not know ourselves, our inner private world, in the way a neurophysiologist may know the neuronal reality behind conscious states, according to Churchland.

### 3.2. Churchland on the reducibility of consciousness

It is along these lines that Churchland attempts to account for, both, the apparent experiential reality of conscious states and for the validity of the reductionist program. The brain does not have immediate access to realities behind experiences; however, it is the same brain that enables us to undo this imperfection. Neuroscience is, so to say, the great endeavor of a multitude of brains to remove the veils that brains have wrapped around themselves. As will be clear from this discussion, subjective experience is not a reality in its own right. It is rather an epiphenomenon of some underlying mechanism or process.

In her discussion of criticisms of this reductionist approach, Churchland concentrates first on reservations that are based on common sense, intuition and use of language. Failure to imagine or to conceive that pain, perception and/or emotion consist in some pattern of activity of neurons in the brain is merely a psychological fact. It is a reflection of the current state of one’s ignorance. The same holds for all intuitions scientists and philosophers may have about how the world really is. These intuitions do not say anything deep or metaphysical about reality, nor do they say something decisive about the empirical or logical possibility of the reductionist approach of the phenomena of consciousness. Dooming the reductionist research strategy because of the categorical confusion, which threatens potentially any inter-level reduction, does not seem to impress Churchland very much. It is of all ages that scientists have said ‘funny things’ about the world. To say that the earth is a planet and that it moves, sounded funny in Copernicus’ days; to say that physical space is non-Euclidean and that parallel lines may converge, sounded funny up until

<sup>11</sup> Churchland, ‘Can neurobiology teach us’, 133.

some sixty years ago. It is, in other words, “rather far-fetched to suppose that intuitions in the philosophy of language can be a reliable guide to what science can and cannot discover about the nature of the universe”.<sup>12</sup>

I think, this rejoinder does not hit the point properly. First, some would argue that the examples just given do not concern clear-cut inter-level, but intra-level types of reduction. That this may not be self-evident, is a reflection of the fact that there exists some confusion in the literature about what the notion of ‘level’ could mean. Many scientists, Churchland included, view the hierarchy of levels as a constellation of structures which are ordered from macro- to micro-entities; they see it as a hierarchy of part-whole entities in which the parts at a certain level become wholes at the underlying level. According to this view there exists indeed a reductive relation between, roughly speaking, heat (as measured by a thermometer) and molecular motion; and between classical optics and the laws of thermodynamics. However, from another point of view, these are only intra-level reductions. For, the reductive explanations just mentioned remain explanations at the level of physics; and the predictions that are based on these explanations, can be substantiated with the tools of physics. ‘Level’ is referring, here, to the qualitative distinctiveness of aspects or modalities of reality; the term level does not refer to entities here, but to modes of being or modes of functioning. It is this qualitative distinctiveness between modes of reality — and their underlying structures — that accounts for the fact that explanations of mental events, for instance the reasons for one’s thoughts or feelings, qualitatively differ from the explanations of the neural machinery in which these thoughts and feelings are embodied. These explanations are typical biological and refer, for instance, to a particular neuroendocrine or neurophysiological process. From these few preliminary remarks, it may be gathered that the confusion between entitary and modal-functional points of view bears relevance to the distinction between reduction and reductionism; and between abstraction and reification. When the modal analysis of an aspect of reality is fundamental in the process of abstraction, then the entitary reformulation of this modal (or functional) point of view may become a first step into the direction of reification and undue substantializing. I will return to this point in the final section.

There is another reason for questioning Churchland’s rejection of the appeal to intuition, common sense and ordinary language. Churchland apparently thinks that intuitions derived from common sense and ordinary language may, and in fact do, preclude all kinds of reductive research strategies. This is, however, a misperception. Defenders of the categorical distinctiveness of psychological and neurobiological concepts do not, in general, resist reduction and/or abstraction. Most of them will acknowledge that their position is compatible with the investigation of phenomena at a certain level with the conceptual and experimental tools from lower levels. They feel not coerced to ontological reductionism when they study visual perception with the tools of radiology, neurobiology and molecular biology.<sup>13</sup> This is, however, precisely

<sup>12</sup> Churchland, ‘Can neurobiology teach us’, 130.

<sup>13</sup> By reductionism I mean, here, the ‘nothing-but’-kind of (ontological) reduction, accord-

what Churchland suggests. She, in other words, incorrectly identifies legitimate (epistemic) reduction with illegitimate (ontological) reductionism. One may wonder, why this is. The only explanation, I can imagine, is scientism; i.e. an almost unshakable belief that ultimately science, which almost by definition is bound to reductive strategies, will provide the most solid answers on our questions about the universe. In spite of the inherent fallibility of scientific theories and hypotheses, the truth and trustworthiness of propositions based on scientific evidence raises far above common sense and linguistic convention.

Of course, this puts a heavy burden upon eliminative physicalism as a scientific program. Granted that there is, and perhaps never will be, a complete reduction, which degree of success or lack of success must there be to count as confirmation or refutation of this program, especially in the field of consciousness? Churchland's position with respect to these questions becomes clear in her discussion with Searle and Dennett.

### 3.3. Churchland's discussion with Searle and Dennett

John R. Searle belongs to those philosophers who, in the footsteps of Thomas Nagel, have put the phenomenal quality of conscious experience on the philosophical agenda. In his *The Rediscovery of the Mind* he argues for the impossibility of ontological reduction of first-person features of subjective experience.<sup>14</sup> There is no reductionist program that will succeed in reducing the first-person phenomenal quality of feelings and sensations. This quality is related, but not identical to the well-known secondary qualities of British empirism. Secondary qualities, like the subjective experience of heat, solidity, sound, and color, have an objective reality behind their subjective appearances, according to Searle. However, in the case of consciousness, the reality is the appearance. There are of course the neurophysiological facts, but these facts do not reveal anything about consciousness: "... unlike solidity, consciousness cannot be redefined in terms of an underlying microstructure".<sup>15</sup>

Thus stated, Searle's position is vulnerable to the objection that consciousness should be considered as a 'thing' with an existence apart from brain processes. However, Searle does not hold this dualist position. Rejecting all variants of Cartesianism, he rather adheres to the kind of emergentism which says that emergent properties must be explained as a result of underlying

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ing to which phenomena at some level A are 'nothing but' phenomena at the underlying level B (for instance, the subjective experience of pain *is* nothing but a pattern of neuronal activities).

<sup>14</sup> J.R. Searle, *The Rediscovery of the Mind*, Cambridge (Mass.) 1992: MIT Press, 117. Cf. T. Nagel, 'What is it like to be a bat?', in T.Nagel, *Mortal Questions*. Cambridge (Mass.) 1979: Cambridge University Press. I ignore here the differences between Searle and Nagel about what exactly is irreducible in conscious experience (first-person features or the phenomenal quality of consciousness).

<sup>15</sup> Searle, *Rediscovery*, 123. See also Churchland, 'Can neurobiology teach us', 132: "the reality and the appearance are inseparable — there is no reality to awareness except what is present in awareness. There is, therefore, no reduction to be had."



micro-physical processes, whereas these emergent properties themselves are unable to causally influence micro-physical processes. There is, accordingly, also an asymmetry with respect to mental-physical causation: the physical may cause mental phenomena, the reverse, however, does not hold. Searle even says that the contrast between the reducibility of heat, color, etc. and the irreducibility of conscious states does not reflect any distinction in the structure of reality, but a distinction in our definitional practices. When 'red' is reduced to light waves of a certain length, the subjectivity of red is not eliminated, we "simply stopped calling the subjective part 'red'". However, this 'carving out' of the subjective part does not bring us any further, when the phenomena that interest us most are the subjective experiences themselves.<sup>16</sup>

Churchland considers Searle's view as a needless doubling of concepts, which can only lead to conceptual confusion. She compares his ideas with those of Betty Crocker, writer of a microwave oven cookbook, who tries to explain how a microwave works, and then says that the microwaves excite the water molecules in the food, causing them to move faster and faster, bumping to each other, the bumping causing friction between the molecules and the friction heat. Betty Crocker, in other words, still thinks that heat is something other than molecular kinetic energy; that heat is caused by but actually independent of molecular motion. Searle, in fact, holds a similar ridiculous view, according to Churchland. Just as it is much more simple and coherent to assume that heat is molecular energy, accordingly contemporary neuroscience should adopt the far more coherent and economic assumption that conscious awareness *is* a pattern of activity in neurons.

Given his strong pragmatism, Searle is perhaps not the strongest defender of the qualitative distinctiveness of subjective states.<sup>17</sup> However, Churchland's response is not very convincing too. She simply avoids discussing what others have called the 'hard problem' of consciousness — that having to do with the phenomenal or 'what it is like' quality of consciousness.<sup>18</sup> Searle does not

<sup>16</sup> Searle, *Rediscovery*, 121.

<sup>17</sup> This reservation holds especially for his view on emergentism. Searle distinguishes two kinds of causation, one (causation 1; C1) associated with normal 'causal' processes between microphysical events, and the other associated with the emergence of new properties (causation 2; C2). Searle admits a re-description of C2 in terms of C1-processes; in other words, the emergence of a new property must be seen as a causal process that as such can also be deciphered in terms of microphysical interactions. This makes Searle's position ambiguous: a successful reduction of a C2-emergent property in C1 terms does bring him dangerously close to the causal reductionist camp; admitting that this re-description (or reduction) never will be complete, implies that emergentism ultimately cannot be explained in terms of microphysical causation and refutes emergentism considered as a result of causation.

<sup>18</sup> D.J. Chalmers, 'The puzzle of conscious experience', *Scientific American. Mysteries of the Mind* 7 (1997, nr. 1), 30-39: "... why should synchronized oscillations give rise to a visual experience, no matter how much integration is taking place? [against Crick and Koch] ... Daniel C. Dennett laid out a sophisticated theory of how numerous independent processes in the brain combine to produce a coherent response to a perceived event. The theory might do much to explain how we produce verbal reports on our internal states, but it tells us very little about why there should be a subjective experience behind these reports. Like other reductionist theories, Dennett's is a theory of the easy problems. [...] these easy problems all concern how a cognitive or behavioural function is performed. All are ultimately questions about how the brain carries out some task. [...] The hard problem of consciousness, in

assert, as we have seen, that conscious states are ‘things’ or ‘events’, that exist apart from neurophysiology — like Betty Crocker’s heat. This discussion can be summarized by saying that Searle claims that there are conscious states that interest us because they are subjective, whereas for Churchland subjective states are only interesting in so far the scientist can turn them into something objective.

In the meantime, this discussion again reveals an underlying issue we already pointed at, i.e. the almost inevitable tendency to argue for the qualitative distinctiveness of certain classes of phenomena by assigning independent existence to them. The Betty Crocker analogy at least suggests that, if there is any distinctiveness of subjective states, this distinctiveness must be argued for by providing evidence for the ontic independence of conscious states (or events). Because this would imply dualism, qualitative distinctiveness is rejected by Churchland; whereas Searle, because of fear of dualism, resorts to the rather unattractive and conceptually ambiguous pragmatism which holds that, on the one hand, consciousness is really distinct and, on the other hand, causally emergent — which means that consciousness as an emergent property ultimately can be explained in micro-physical terms. This leaves us with the question how this picture would change if not entities, but modes (of being/functioning; modalities) were taken as entry for the defense of qualitative distinctiveness.

Churchland also attacks Daniel Dennett’s well-known work on the nature of consciousness.<sup>19</sup> Dennett views the brain as a parallel machine (neural networks) simulating a serial machine. ‘Serial’ refers here to the fact that the operations of consciousness are performed one at a time, in a sequence, according to certain rules. Humans become conscious as they acquire language and learn to talk to themselves. This self-talk, of course, occurs serially. It can be compared with running software on a computer. Just as the installation of Flight Simulator creates a piloting virtual machine, so learning to speak silently to oneself creates a consciousness virtual machine. Consciousness bears the same relation to the brain as the flight simulation bears to the events inside the computer, summarizes Churchland. This implies that the study of consciousness has little to gain from the study of brain processes. Dennett’s functionalism rather promotes the analysis of the performance, the functional properties, of the brain. From these performances under all kinds of conditions, one may infer a variety of computational properties. The basis for Churchland criticism is mainly empirical: ‘virtual serial machines’ are not necessary to get a one-after-the-other temporal ordering. She refers in this context to neural nets with recurrent loops that can yield temporal sequencing. Sequencing tasks per

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contrast, goes beyond problems about how functions are performed. Even if every behavioural and cognitive function related to consciousness were explained, there would still remain a further mystery: Why is the performance of these functions accompanied by conscious experience?”. Cf. also D.J. Chalmers, ‘Facing up to the problems of consciousness’, *Journal of Consciousness Studies* 2 (1995), 200-219; and T. Polger & O. Flanagan, ‘Explaining the evolution of consciousness: the other hard problem’. At <http://www.duke.edu/~twp2/tucson2.html>.

<sup>19</sup> Cf. D.C. Dennett, *Consciousness Explained*, Boston 1991: Little, Brown & Comp.

se do not imply the existence of simulated serial machines, as has been shown by Beer and Beer & Gallagher.<sup>20</sup>

In her own account of consciousness, Churchland concentrates on visual awareness and visual perception. She combines the work of Crick, who sketched the outline of a theory on the temporal binding (or synchrony) of output responses of neurons relevant for visual perception; the hypothesis of Llinas and co-workers, who assume that there are two pairs of coupled oscillator families connecting the thalamus and the cortex, one providing the sensory and modality-specific content, the other providing the integrating context; and the ideas of Damasio, who says that body-representation provides the scaffolding for self-representation, which in its turn is the anchor point for awareness. Without such an anchor point there is no ‘point of view’, a representation of oneself into the known world. This ‘no awareness without self-awareness’ (in the sense of self-representation) echoes Kant in his comments on Hume. As will be clear, this self is not transcendental, but neural. It is not considered as an idea that necessarily has to be assumed in order to make knowledge of the empirical self and of the world possible. On the contrary, there is something behind this self and the knowledge of itself: the brain. Both the self-representation and the representation of the world are ‘produced by’ the brain. The brain is the condition that ‘necessarily’ must be presumed in order to make the self and its knowledge possible. The empirical becomes quasi-transcendental. If anything is clear from this account, it is that the brain is viewed as a self-sustaining entity; not as a part-structure within the body, not even as an organ; but, it seems, as a substance which finds the possibilities of its existence within itself (and its causal history).

#### 4. *Eric Kandel: Toward a new intellectual framework for psychiatry*

##### 4.1 Kandel about the contribution of molecular biology

As a second example of a text of a leading scholar in the field of neuroscience, I have chosen a recent article of Nobel-prize winner Eric Kandel, titled *A New Intellectual Framework for Psychiatry*.<sup>21</sup> Kandel and his group are well-known

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<sup>20</sup> R.D. Beer, ‘On the dynamics of small continuous-time recurrent neural networks’, *Adaptive Behavior* 3 (1995), 471-511. R.D. Beer & J.C. Gallagher, ‘Evolving dynamical neural networks for adaptive behavior’, *Adaptive Behavior* 1 (1992), 91-121. Interestingly, Churchland also criticizes Dennett for his insufficient response to critics who deny the pre-eminent status of linguistic activity: “The heart of the complaints is that Dennett wrongly assumes that performance is all that needs explaining — that explaining *reports of* conscious experience is tantamount to explaining conscious experience itself. Dennett’s core response here has been to wave off the complainers as having failed properly to understand him..” (this quotation is omitted in the 1997 book chapter, but can be found in the original version, which was a paper based on the Presidential Address to the American Philosophical Association, Pacific Division, March, 1993; at <http://www.phys.uni.torun.pl/~duck/umysl/churchland.html>, p.6). The explanation of performance, indeed, does not entail the explanation of the qualia of consciousness. One might wish, however, that Churchland had gone more deeply into the qualia-problem herself, for instance, in her discussion with Searle. It is ironical to hear from Churchland that Dennett has not done justice to ‘conscious experience itself’!

<sup>21</sup> E.R. Kandel, ‘A new intellectual framework for psychiatry’, *American Journal of Psychiatry*

because of their imaginative experiments with the marine snail *Aplysia*, in which they managed to unravel molecular biological correlates of behavioral states resembling anticipatory anxiety (in response to a classical aversive conditioning paradigm) and chronic anxiety (in response to a long-term sensitization paradigm). This background of experimental work in the seventies and eighties is important to understand Kandel's position in the nineties.

Kandel first sketches the diverging ways of general medicine and psychiatry. After World War II general medicine gradually evolved from a practicing art toward a scientific discipline based on molecular biology. Psychiatry, on the other hand, abandoned its roots in biology and capitulated for the anti-scientific and dogmatic climate of post-war psychoanalytic thought. However, from the late seventies and early eighties the brain sciences have become more and more important and today's psychiatry cannot even be thought of without acknowledging the enormous contribution of molecular biology and basic pharmacological research to the understanding and treatment of patients with psychiatric disorders. The divergence has, thus, altered into convergence.

Does this imply a reduction of psychopathology to biological dysfunction? No, says Kandel, the picture is more complicated. For, "(w)hen it comes to studying mental function, biologists are badly in need of guidance. Psychiatry, cognitive psychology, and psychoanalysis can define for biology the mental functions that need to be studied for a meaningful and sophisticated understanding of the biology of the human mind".<sup>22</sup> Psychiatry derives its scientific basis from molecular biology; however, molecular biology is in need of a careful and valid delineation of all kinds of behavioral dysfunction. Therefore, both disciplines are complementary.

However, how does the study of mental function relate to the investigation of brain disturbances? To answer this question, Kandel formulates five principles, which could serve as, what he calls, a 'new intellectual framework for psychiatry'. These principles reflect current understanding of biologists of the relation of mind to brain. I mention the first, and most important, of these principles and give some comments<sup>23</sup>:

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155 (1998), 457-469. Cf. also Kandel's response to criticism from the psychoanalytic camp: E.R. Kandel, 'Biology and the future of psychoanalysis. A new intellectual framework for psychiatry revisited', *American Journal of Psychiatry* 156 (1999), 505-524. Compare also E.R. Kandel, 'From metapsychology to molecular biology: Explorations into the nature of anxiety', *American Journal of Psychiatry* 140 (1983), 1277-1293.

<sup>22</sup> Kandel, 'A new intellectual framework', 459.

<sup>23</sup> Other principles are: "Genes and their protein products are important determinants of the pattern of interconnections between neurons in the brain and details of their functioning" (2). Social and developmental factors also contribute to the variance of a given major mental illness: "Learning (...) produces alterations in gene expression. Thus all of 'nurture' is ultimately expressed as 'nature'" (3). Alternations in gene expression not only contribute to the biological basis of individuality, but are "presumably also responsible for initiating and maintaining abnormalities of behaviour that are induced by social contingencies" (4). Finally: "Insofar as psychotherapy or counselling is effective and produces long-term changes in behaviour, it presumably does so through learning, by producing changes in gene expression that alter the strength of synaptic connections and structural changes that alter the anatomical pattern of interconnections between nerve cells of the brain" (5) (Kandel, 'A new intellectual framework', 460).

“All mental processes”, Kandel writes, “even the most complex psychological processes, *derive from* operations of the brain. The central tenet of this view is that what we commonly call mind is a range of functions carried out by the brain. (...) As a corollary, behavioral disorders that characterize psychiatric illness *are* disturbances of brain function, even in those cases where the causes of the disturbances are clearly environmental in origin.” Kandel’s calls this principle the ‘basic assumption’ underlying neural science. “Specific lesions *produce* specific alterations in behavior, and specific alterations in behavior are *reflected* in characteristic functional changes in the brain.” (all italics added)

#### 4.2 Kandel’s ambiguity: between psychophysical identity theory and epiphenomenalism

These formulations sound familiar and — again — innocuous at first sight. However, are they really as innocuous as they seem to be? What does it mean to say that ‘mind’ *is* a range of functions of the brain; that psychiatric illnesses *are* disturbances of brain function; that brain lesions *produce* alterations in behavior and that specific alterations in behavior are *reflected* in functional changes in the brain?

First, by equating mind with ‘a range of (mental) functions’, Kandel evades the ‘hard problem’ of consciousness, the explanation of its phenomenal quality. I will not repeat this criticism again, because we discussed it already.

Secondly, Kandel seems to identify cognitive functioning with biological functioning. However, on closer look Kandel’s formulations are somewhat ambiguous, in this respect. For, they seem to reflect a position that can be reconciled both with a psycho-physical *identity theory* and with an *epiphenomenalist* position. On the one hand, Kandel uses terms like ‘is’ and ‘are’, — terms highly suggestive of an (ontic) identity between biological and mental functioning. On the other hand, he also uses terms like ‘produce’, ‘reflect’, ‘derive from’; terms, in other words that suggest a relation of dependence — i.e., a relation that considers mental functions to be a product of brain-functioning. This production-metaphor should not be understood in a dualist-interactionist sense, as if there were a temporal and/or causal relationship between brain and cognitive functioning. Kandel’s position is clearly epiphenomenalist in these passages. His formulations suggest the existence of an asymmetry between brain and cognitive functioning. Compare, for instance, his proposition that brain processes *produce* mental processes, whereas mental functioning is a *reflection* of brain processes.

Kandel does not go as far as Churchland in her plea for the elimination of folk-psychology. For instance, after having said that his biological point of view also can be applied to sociology and that social processes must, at some level, reflect biological functions, he admits that such a relationship “might not necessarily prove to be optimally insightful in elucidating social dynamics”. And, he adds, “For many aspects of group or individual behavior, a biological analysis might not prove to be the optimal level or even an informative level of analysis”. However, this does not detract from the fact that Kandel’s main focus is on biology and that the processes which are presumed to be critical for the production of behavioral dysfunction, are biological in nature.

I think, it is here, that many conceptual issues come together. Behind the easy formulations, one may suspect deep epistemic questions. Of course one might say, in a friendly reading of Kandel's text, that every human activity is in a certain sense a brain process. Walking, writing, thinking and believing, all these activities are in a certain sense brain activities. That is to say, there is brain activity implied in these behaviors; these behaviors cannot be imagined without presuming some very specific brain activity. However, this 'being implied' is hardly interesting for scientists and doctors. Scientists are used to put why-questions; they are looking for explanations. Why do people with a post-traumatic stress disorder have recurrent dreams; why are some of them in a state of 'numbing'?

This example, moreover, shows that the 'why' of scientists may be ambiguous, because it asks both for the 'how' (how it works) and for the 'aim' or 'goal' of a certain process (the implicit teleology). The answer to the why of 'numbing' could be that it serves as a defense against overwhelming feelings of fear and powerlessness. This is a teleological, or at least a normative, interpretation of the why-question — because the explanation in terms of defenses presupposes an optimum of alertness of the organism (which implies the existence of a norm or standard), and this optimum in its turn implicitly refers to, for instance, survival as the central task of the organism. The answer to the why of recurrent dreams, on the other hand, could refer to endocrine processes influencing the sensitivity of certain receptor subtypes in the brain, receptors that modulate the functioning of second messenger systems in the thalamus, hippocampus and amygdala, and so on. This is clearly an explanation in terms of how a particular process is going on.<sup>24</sup>

According to Kandel, it is science's task to determine which factors control the behavioral and brain processes to be studied. Causes of behavioral disturbances may have an environmental origin, but behavioral disorders that characterize psychiatric illness, are at the same time disturbances of brain function. This means that "Insofar as psychotherapy or counseling is effective and produces long-term changes in behavior, it presumably does so through learning, by producing changes in gene expression that alter the strength of synaptic connections and structural changes that alter the anatomical pattern of interconnections between nerve cells of the brain" (fifth principle).

It is interesting that the term 'structural' — again — has an ambiguous function in passages like these. On the one hand, the term structural is used in a descriptive sense and denotes something like 'long term', or, factual and 'long-lasting'. The changes that gene expression does produce, are changes in synaptic connections and anatomical patterns. These changes do persist through time. On the other hand, the term structural also seems to reiterate old distinctions, like those between substance and accident, genotype and phenotype, reality and appearance. For structural changes at the behavioral

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<sup>24</sup> There is a lot of discussion in philosophy of biology whether explanations in terms of biological function by definition presume and/or refer to an implicit teleology. I will not dwell on this question, because it will not play an important role in our further discussion with Kandel.

level to occur, structural changes at the molecular biological level are a necessary condition; the reverse, however, does not hold. Molecular biological changes are the changes that really do matter, they are the sort of changes that are critical for long lasting behavioral change. Without these molecular changes, there will be no real change. Molecular biological change is a necessary condition for persisting change in behavioral and mental functioning. It is not the other way around.<sup>25</sup> So, we are confronted here again with the same ambiguity as was mentioned earlier, i.e. Kandel's switching between an identity theorist and an epiphenomenalist position. The descriptive interpretation corresponds to identity theory; the interpretation in terms of substance and accidents corresponds to the epiphenomenalist position.

To my opinion, it is this ambiguity that obscures Kandel's position. His language can be translated into several directions, i.e. into the direction of a rather sterile parallelism of levels of discourse, and into the direction of a more or less reductionist biologism that sees biological processes as primary and as the basis of mental functions.

One may wonder, why Kandel does not notice this ambiguity. I think, the answer must be that he believes he has formulated an empirical answer to the conceptual problem behind it. This becomes clearer in Kandel's 1983 review-paper on anxiety. Modern science is able, he says, "to focus on individual protein molecules modulated by learning and to explore them in a behavioral as well as a biochemical context".<sup>26</sup> There are, in other words, 'unifying cellular and molecular principles' behind the phenomena of macro-biology and psychology. There is identity behind the phenomenal and epistemic diversity; a 'common ground' between learning theory and neurobiology; a 'molecular alphabet to learning'; a basic molecular grammar underlying the various form of anxiety, and so on. These metaphors, at first sight, seem to reflect an identity-theory-driven program. However, in the long run, the epiphenomenalism prevails. The conceptual presupposition of an identity of what manifests itself at different levels of appearance, is replaced by the empirical notion of basic molecular mechanisms. The identical is not a hidden and indefinable quasi-substance, it is a 'substance' with a definition; it has an entitary structure, albeit at the level of microstructure. This brings Kandel's position close to a kind of part-whole conception, in which the whole-like structures, such as macro-biological processes and mental functioning, are epiphenomena of the complexity of interactions at the micro-level.

#### 4.3 Kandel on interlevel dependence

Finally, we have to take one step beyond what has been said until now. Kandel belongs to those theorists who typically respond to conceptual questions with empirical answers. He, for instance, wonders whether the emphasis on genes

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<sup>25</sup> Kandel comes close to the well-known distinction between ultimate and proximate causes; ultimate causes referring to environmental and biographical events, proximate causes referring to the neurobiology of behavior and of mental functioning. This distinction blurs the distinction between the various modes of being/functioning.

<sup>26</sup> Kandel, 'From metapsychology to molecular biology', 1286.

and their protein products will lead to a deterministic view of man and of psychiatric patients. The answer is a clear and resolute no. Thinking so, is based on the common misunderstanding that the only function of genes is to transmit hereditary information to next generations and that biological processes are strictly determined by genes. Genes, however, also have transcriptional functions besides their so-called template function. They are, therefore, highly susceptible to environmental factors. So, there is no strict determination.

This empirical explanation, however, does not elucidate the conceptual issue whether inter-level relationships as such can or should be described in terms of determination (or dependence) without implying either reification of a particular part-structure (which means: reductionism) or dualism of part-structures. Is it possible, in other words, to describe the relation between levels of being (or functioning) in terms of dependence (of one level to another level) without implying reductionist monism or dualism? This is the conceptual side of the question under discussion. The affirmative answer to this question is very hard to defend, not to say impossible. Either, the dependence is too strong to admit a non-reductive relationship between the levels, or the dependence of the higher to the lower level is too weak to count as a relationship of dependence.<sup>27</sup>

How is it with the empirical side? How does Kandel's conceptual/ontological ambiguity relate to science's task of explaining a particular process? Kandel's use of terms like 'production' and 'determination' could be understood as denoting certain processes, of which the order of successive events is interpreted as a causal history, i.e., as a process in which the events have causal power and in the course of their development produce higher level phenomena. I think, this is not what Kandel means. I mention this solution, because it is a rather popular one in evolutionary accounts of interlevel relationships. Another interpretation could be that terms like production and determination refer to 'lawful regularities' or 'principles' that hold for the process under investigation. However, insofar as these process do entail interlevel relationships, this interpretation will not bring us any further; instead, it brings us back to old debates on so-called bridge-laws; a debate that was lost by the advocates of bridge laws, as will be known.

## 5. *Toward an alternative conception of brain functioning based on the work of Herman Dooyeweerd*

### 5.1 Summary

We started our investigation by reviewing the tensions between reduction (or abstraction) as a primarily epistemic endeavor and reductionism as a program with, ultimately, ontological pretensions and claims. We noticed the importance of metaphors and images in opening-up a field of science. Think, for

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<sup>27</sup> J. Kim, 'The myth of nonreductive materialism', in J. Kim, *Supervenience and Mind. Selected Philosophical Essays*, Cambridge/New York 1993: Cambridge University Press, 265-284.



instance, of the developments in biology after the discovery of DNA as a ‘carrier of information’. Extending the meaning of concepts beyond their original domain almost automatically leads to a metaphorical use of these concepts (DNA molecules do not really communicate). It is in the metaphorical use of scientific language that one may find the worldview, hidden or not. In addition to this extension of conceptual meaning worldviews also enter into scientific language by the unjustified substantialization and reification of abstract concepts.

We saw how entities are often confused with modes (or levels) of existence and how this may result in unclarity and reification. Psychophysical dualism and dualist interactionism may be seen as a result of the unjustified belief in the independent existence of mind and of body as (quasi-)substances. The modal aspect — mental functioning as a mode of functioning that qualitatively differs from biological functioning — is substantialized and changed into a mental substance or a mental entity called ‘The Mind’. Psychophysical identity theories, on the other hand, run the risk of being transformed into one or another form of monism. This occurs when the nature of the ‘common ground’ of different forms of functioning, is defined in terms of one particular scientific discipline, such as biology.

In the remainder of this paper, I will attempt to give a more systematic account of the notions and the ideas we came across until now. What will be said, relies on the seminal work of the Dutch philosopher Herman Dooyeweerd (1894-1977), especially on his theory of entities (or individuality structures).<sup>28</sup> Dooyeweerd, however, has never published extensively on philosophical anthropology and/or on neuroscience; so, we have to rely on the other works and extrapolate from these studies to the field of neuroscience and philosophical anthropology. In what follows, I will present my own elaboration of ideas of which the basis can be found in the work of Dooyeweerd. The aim of this sketch is to provide a systematic framework, which can be used as a frame of reference in the evaluation of empirical models and theories. It should not be considered as a blueprint or a dogmatic doctrine, but as a fallible attempt to provide some conceptual clarity in the interpretation of neuroscientific findings.

## 5.2 The fundamental distinction between entities and modes

Let us begin with the distinction between entities and modes. Entities are, roughly speaking, things, events, and states of affairs. Things, events and states of affairs can be recognized as individual entities; they can also be identified as entities belonging to a certain class or family. They have, in other words, both

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<sup>28</sup> For an introduction to Dooyeweerd's thought, see R.A. Clouser, ‘A sketch of Dooyeweerd's philosophy of science’, in J.M. van der Meer (Ed.), *Facets of Faith and Science*, Vol. II, Lanham 1996: University Press of America, 81-97. R.A. Clouser, *The Myth of Religious Neutrality: An Essay on the Hidden Role of Religious Beliefs in Theories*, Notre Dame 1991: Notre Dame University. H. Dooyeweerd, *A New Critique of Theoretical Thought, Vol. I-IV* (especially Vol. III), Philadelphia/Amsterdam 1951-1955: Presbyterian and Reformed Publ. Comp. Cf. also H. Hart, *Understanding Our World. An Integral Ontology*, Lanham 1984: University Press of America.

an individual and a structural side. The tree at the corner of the street can be identified both as this particular tree of which I have some dear, personal recollections, and as the tree I recognize as belonging to the class of oaks.

The distinction between modes and entities is important, as we saw, to correct the popular view that the universe is build up as a hierarchical ordering of part/whole-structures with an increasing degree of complexity. Complexity is simply not enough to do justice to the qualitative diversity of the structures within the universe. Part-whole 'holism' easily leads to reductionism, because either whole and parts are both conceived as the product or result of underlying and more basic processes (microphysical processes, for instance); or whole and parts are seen as determined by the laws and regularities of the largest whole, i.e. the universe and/or the principles of cosmology.

Modes, or modalities, or aspects, are conceived by Dooyeweerd as fundamental and universal modes of being, or modes of functioning. This concept of mode (modality, aspect) is very abstract. It refers to the "most basic kinds of properties and laws exhibited by the things, events, relations, states of affairs...".<sup>29</sup> These kinds of properties must be distinguished from the notion of type (of events, things, or states of affairs). Types are types of things (events; states of affairs) and, therefore, associated with the domain of entities.

Modalities are universal modes of being of entities. Therefore, statements about the functioning of a particular entity are typically statements with a universal intent: these statements refer to a particular lawful pattern of properties in the modal functioning of that entity.

Examples of these modalities are (in order of succession): the numerical, the spatial, the kinematic, the physical, the biotic, the psychic, the logical, the historical, the lingual, the social, the economic, the aesthetic, the jural, the ethical and the pistic modality. The discovery of this succession is based on the painstaking examination of the way in which the modal functioning of different types of entities is organized. Every entity functions, basically, in all modalities. That is to say, every thing, event, and state of affair — and, we may add, person — has properties in all known aspects of reality. This means that the tree, just mentioned, functions in a more-than-biotic sense, for instance also in a psychical, or in a juridical, or in an aesthetic sense.

This may sound odd. However, it is much less peculiar when another distinction is taken into account, i.e., the distinction between functioning in a passive and in an active sense.<sup>30</sup> One could say, then, that the tree actively functions in the numerical, the spatial, the kinematic, the physical and the biotic modality; which means that its functioning in those aspects is necessary for being a tree and that this functioning is not dependent on the activity of another entity or agent, but depends on the tree itself; and that it functions passively in the other 'higher' aspects; which means that, its functioning in

<sup>29</sup> Clouser, 'A sketch', 82.

<sup>30</sup> Dooyeweerd calls the passive functioning of an entity within a particular aspect a functioning according to (the laws or norms of) that particular 'object function' of the entity, whereas the active functioning of an entity within a particular aspect is equaled with functioning according to the laws or norms of that 'subject function'. See also Hart, *Understanding our world*, 232ff.

those aspect belongs to its possibilities, but that, on the other hand, the actualization of these possibilities is not a prerequisite for being a tree. Therefore, we may say of the tree that its odor can be smelled (psychical), that its existence can become the subject of a legal procedure (jural); and that its beauty may inspire the artist's imagination (aesthetic). All these properties are, however, potential qualities; qualities, in other words, that can be opened-up; their opening-up is not a necessary condition for the tree being recognized as a tree (although the odor of a tree may help to identify which kind of tree it is we smell).

There are two reasons why this distinction between functioning in an active and in a passive sense is so important. The first reason is that it counteracts the common idea that the 'passive' modes (or object-functions) in which trees function and the properties belonging to these passive modes, are only subjectively ascribed to, or projected into, the tree by the observer — as were these modes or functions not properties of the tree itself, the 'real' tree, but 'merely' properties in the imagination of the observer or epiphenomena of the tree as a physical/chemical reality. Dooyeweerd, in other words, adheres to a realist interpretation of what the empiricists called secondary qualities. The fact that one can smell a tree, is a property of the tree itself — of its 'smellability', so to say.

The second reason for distinguishing between the two types of functioning is that the difference between functioning in a passive and in an active sense — when applied to a large number of entities — is indispensable to make ontological distinctions within the various realms of entities. To mention only one obvious example: the distinction between lifeless entities, plants, and animals can be defended, now, by saying that lifeless things (such as chairs) function actively in aspects up to the physical (and passively in all the higher aspects); plants (such as trees) in all aspects up to the biotic; and animals (dogs) in all aspects up to the psychical (dogs have instincts and emotions).<sup>31</sup>

### 5.3 Part-whole relations and the notion of enkaptic interlacements

So far, we have distinguished between modes and entities; and between active and passive functioning in the various modal aspects. Modes point to universal modes of being or functioning; modal formulations are often law-like propositions. Entities have both an individual side (they are exemplars) and a universal side (as types, or classes). Entities function in all modes, partly in an active, partly in a passive sense, depending on the nature of the entity. One of

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<sup>31</sup> Is this not Aristotelianism in new clothes? No, certainly not. Aristotle's form-principles were substances with an existence in themselves. The distinction between modes and entities is meant as an alternative to the Greek form-matter scheme; in the sense that, according to Dooyeweerd, the essence of things never can be grasped by theoretical thought (for instance, as form-principle), but can only be approximated by a modal analysis of the different aspects of the thing-structure. The (individual and structural) essence of a thing consists of its referring to the creational order or divine law, of which it is itself the expression. This law-order is transcendent and can, therefore, never be the object of scientific investigation. The sciences are directed at the orderliness of creation, which corresponds to this law-order.

the refinements of this theory entails the notion of qualifying and foundational functions (aspects, modalities). A thing may be qualified by a function, higher than the highest active function (mode); chairs around the table, for instance, may be qualified by their social object-function. Their being used (passive) in social interaction qualifies them as chairs. However, the chairs are not themselves functioning as social agents. Object-functions, in general, require another thing or agent to interact with; it is in this interaction that the object-function (or passive function) is disclosed.

Now, we must enter the subject of (a) part-whole relations, (b) the enkaptic interlacements between structural wholes, and (c) the enkaptic structural whole as a structure binding together a number of part-structures. Enkapsis literally means incapsulation.<sup>32</sup> The term points, roughly, to the ‘interwovenness of part-structures into a larger whole without loss of relative independence of part-structures’. The crucial issue is that ‘independence’ should not primarily be understood, here, as independent existence as an entity, but as independence in a modal or functional sense, i.e. as the independence of the internal destination, or the internal qualifying function, of the part-structures. The marble in the famous statue called the ‘Hermes of Praxiteles’ remains, as a part-structure, physically qualified. The marble is enkaptically bound within the structure of the whole — the ‘Hermes of Praxiteles’ as a sculpture, i.e. as an aesthetically qualified entitary structure. The same holds for the molecules in a cell, and for living organisms and their Umwelt.

We can now understand the difference between part-whole relations and enkaptic interlacements. In the part-whole relation, parts do not retain their internal qualifying function; the qualifying function (or qualifying mode) of the part is identical to the qualifying function of the whole, from which it is derived. An example of a part-whole relation is the relation between organs and the organism as a whole. Organs differ with respect to their function within the body, but from a more general (modal) point of view, all these functions are meant to support the fundamental biological properties and goals of the organism: homeostasis and reproduction, for instance.<sup>33</sup>

One further step is the distinction between enkapsis as such (enkaptic interlacements as such, without a superordinate or encompassing entitary structure) and enkaptic structural wholes. The latter differ from ordinary forms of enkapsis, because the parts are bound together in a larger whole which has itself also an internal destination and conforms to certain structural principles,

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<sup>32</sup> Dooyeweerd borrowed the term enkapsis from the biologist Haering, who in his turn had borrowed it from the 19th century anatomist Heidenhain. The latter used the term enkapsis to denote the relation between the separate organs of the body and the total organism. He considered this relation as one between an individual whole and relatively independent part-structures; not as a simple part-whole relation in which the parts are dependent components within the larger whole. Haering meant the term to denote the now common idea of the whole as more than the sum of its parts, i.e. the whole as a new qualitative unity. Dooyeweerd gives it a different meaning, whereas he retains the idea of the relative independence of part-structures.

<sup>33</sup> At the other end of this spectrum one finds so-called aggregates. Aggregates do not have the enkaptic interlacements between part-structures; they are characterized by a much looser organization between more or less independent (part-)structures.

whereas the part-structures obey to their own internal structural principles. The Hermes of Praxiteles is an example of such a structural whole, in the sense that the physical material (marble), as a part structure, keeps functioning according to the (physical) laws for pieces of marble in general, and, at the same time is bound and determined by its functioning within the larger whole, i.e. the statue as a product of the artistic imagination, a product that is qualified by its aesthetic (object-, passive) function.

I think, we should be aware of the radicalism of this position. Dooyeweerd's approach entails, among others, the idea that the difference between the physical part-structure and the sculpture as an enkaptic structural whole, cannot be found in the physical material itself; for instance in its micro-structure.<sup>34</sup> There is no single aspect of the structural whole of the statue as an aesthetic object that is not at the same time also physical. On the other hand, there is no single aspect of the marble, which does not also possess an aesthetic meaning. This position, nevertheless, does not amount to either a psycho-physical identity theory (because of the qualitative diversity of modal aspects and the relative independence of the internal structural principles of the part-structures) or to a kind of epiphenomenalism in which the mental qualities appear as the result of a particular ordering of the physical material; nor to a dualism of substances or properties, or to a view in which the relation between two co-varying levels is conceptualized as a relation of supervenience.

#### 5.4 Brain functioning

What is the relevance of these distinctions, and of this position, for the study of the brain? One of the thrusts of this paper is to warn for an almost ineradicable thought-habit, i.e., to identify the brain as a concrete, morphologically discernable entity with the results of scientific research into the biotic (and other) functions of the brain. This identification, in fact, implies reification. For, from the modal (or functional) point of view the brain is studied as an 'organ' of which the functions obey to certain biotic regularities and laws. However, the identification of this modal point of view with the brain as tangible and visible entity means that two conceptual gaps are neglected: the gap between the modal and the entitary point of view; and the gap between entity in a structural and entity in an individual sense.

Modern neuro-imaging techniques are especially interesting in this respect, because they are highly suggestive for the tangibility of what in fact belongs to the structural features of brain functioning. Looking at the different colorings

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<sup>34</sup> Cf. for an example of this (latter) position with respect to the relation between neurobiology and psychology, see for instance M.F. Reiser, *Mind, Brain, Body. Toward a Convergence of Psychoanalysis and Neurobiology*, New York 1984: Basic Books, 10 (cf. 17-19). Reiser calls for 'intermediate conceptual templates' or 'bridging concepts', between the languages of neurobiology and psychoanalysis. He speculates even on the role small-particle physics might play in this respect: "... this third realm would be basic to the higher order (mental and biological) emergent phenomena encountered in each of the other two realms. For example, the third realm could perhaps turn out to be small particle physics" (10, note 1). Reiser admits this is a credo — a credo turning his psycho-physical ('two-track') identity theory into physicalist reductionism (same note).

of the MRI-pictures of schizophrenic patients and normal controls, one is tempted to say: "We now see what schizophrenia is". However, there are many levels, structures and distinctions that are passed over in this sentence. Clinicians, for instance, easily forget the determining role of mathematics in the geometric representation of the brain. We also should not forget that the term 'brain' is an unqualified and undifferentiated word that belongs to ordinary language. When transposed to scientific discourse, this term may become a carrier of many different meanings, some of which with clearly substantialist connotations.

In response to these all-too-easy identifications, I would like to plea for a view in which the brain as a concrete, visible part of the human body is seen as responding to, and operating within, a number of part-structures; and in which these part-structures are seen as functioning within the structural whole of the human body.<sup>35</sup> To give an idea of the kind of part-structures one might think of, one could begin by discerning a physical-chemical part-structure, a biotic part-structure, a psychical part-structure and an actstructure; part-structures of which each 'lower' part-structure is encompassed by the next, 'higher' part-structure; the actstructure encompassing them all. Each encompassed or underlying part-structure functions in a foundational sense within the higher part-structure, the physical-chemical within the biotic, the biotic within the psychic, .. et cetera. The part-structures are qualified by the function or mode, which is used to denote them. The actstructure is an open structure in the sense that it has no fixed qualifying function or mode, but may conform to a wide variety of functions and/or modes. It defines the mode to which a particular act of a person conforms. Which mode prevails depends on the activity of the person and the context in which this takes place.

Briefly stated, there are three ways to resist the all-too-easy identification of the brain as concrete 'organ' with what neuroscientific investigations say about the brain.

(1) The modal point of view should be sharply distinguished from the entitary point of view. In other words, the functioning of the brain according to the laws and regularities of a particular modal aspect should be distinguished from the functioning of the brain as an entity. The modal term denotes a particular aspect of the functioning of the brain; whereas the entitary term refers to the thing-like structure(s) of the brain. Of course, both the expression 'modal function' and the expression 'entity' are used in an abstract sense here. What one actually investigates are always — except in certain post-mortem cases — brain processes, i.e., molecular, neurochemical, and neuro-endocrine processes. In the laboratory one never encounters brains as such, but brains involved in all kinds of processes. This brings us to the second distinction.

(2) What just has been said, seems trivial. However, the term process may obscure the important difference between what is lawlike about a particular

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<sup>35</sup> The term body is taken, here, in the widest possible sense, which includes functioning as a social, moral and believing agent. These ways of functioning are all corporeal; or, also corporeal.

brain process and the process itself, as a sequence of concrete events. Propositions about the lawfulness of the brain process are of a different order, compared to propositions describing this sequence. I emphasize this, because there is a rather strong tendency in philosophy of science to blur this distinction. The explanation of a particular state of affairs is, then, limited to the description of the causal history of that state of affairs or to descriptive generalizations applicable to the sequence of events leading to that particular state of affairs. Confusingly enough, these descriptive generalizations are sometimes called 'causal laws'. In other accounts, laws are viewed as laws of the models providing the conceptual framework for these descriptions, and not as laws governing real processes. According to this approach, laws are merely instrumental.<sup>36</sup> In all these approaches laws are denied to have existence in reality; they are either something in the mind of the scientist or do not exist at all (at least not as something which 'holds for' a particular piece of reality). Because the lawfulness of reality, ultimately, cannot be denied, elements of lawfulness return, but now as qualities inherent to reality itself (as hidden powers, encompassing principles, basic building blocks with evolutionary potential et cetera). Determinism is less far from us than some of us would be inclined to expect.

(3) Finally, reification is also precluded if the notion of enkaptically interlaced part-structures is taken into account. These part-structures obey to their own internal structural principles, each of them having their own qualifying function; whereas all are encompassed within the structural whole of the human body. 'Body' should be taken here to denote the human person in a full sense, including the functioning of the person in social, economic, legal, aesthetic, moral and religious relations. These ways of functioning are all corporeal, according to Dooyeweerd, in the sense that they are nothing apart from human corporeality.

When these views are taken seriously, they imply that each part of the human body, the brain included, at the same time functions in all four part-structures. This means that the brain not only functions within the physical and biotic part-structure, but also in the psychical part-structure and in the act-structure.

### 5.5 Is the brain an agent?

Does this mean that the brain 'feels', 'thinks', or 'loves'? No, it does not, because being a subject (or agent) differs from 'functioning-within-a-particular-modal-aspect' and from 'functioning within a particular part-structure'. There is not a homunculus hidden between the convolutions of the brain, nor

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<sup>36</sup> Cf. N. Cartwright, 'The Reality of Causes in a World of Instrumental Laws', in R. Boyd, Ph. Gasper & J.D. Trout (Eds.), *The Philosophy of Science*, Cambridge 1991: MIT Press, 379-386; B. van Fraassen, *Law and Symmetry*, Oxford 1989: Clarendon Press. One's position with respect to this issue depends of course from one's worldview. Theist worldviews are compatible with a view in which laws are distinct from reality and in which the orderliness of creation is distinguished from the (transcendent) order which holds for creation. A-theist and a-gnostic worldviews tend to blur the latter distinction (between law/order and lawfulness/orderliness).

a ghost in the machine. However, this does not coerce us to the alternative of considering the brain as ‘merely’ a computer, a biochip, or a virtual machine.

Does it mean that the brain itself, as part of the human body, functions in an active sense within modalities higher than the biotic modality? Or, are these higher-than-biotic functions only opened in a passive sense? Here, I think the notion of enkapsis in a foundational sense may be of help.<sup>37</sup> I am not an advocate of stretching the meaning of scientific language to the extent that it is maintained that brains as such, as entitary structures functioning within the biotic part-structure, actively function within the psychical (or social, moral ... et cetera) aspect. As soon as this would be maintained, we would transform the ordinary meaning of the term brain and change it into a metaphor denoting a mixed psycho-physical entity without clear conceptual boundaries.

However, the brain is more than passive substrate. What minimally can be said from the perspective developed here, is that the biotic part-structure is encapsulated within the psychical part-structure in a foundational sense. The psychical part-structure is, in its turn, in a foundational sense bound within the act-structure (and the physical within the biotic). This means that the functions of the brain, as a biotic part-structure, are opened-up into the direction of the psychical and higher functions, and, at the same time, do not lose their internal biotic destination. This opening-up of object-functions implies that there is an increasing tendency toward functional specialization and a growing potential for variation.

Therefore, it is in an indirect sense that one might say that the brain functions within the psychical part-structure and the act-structure. It is the brain viewed from the perspective of the body as a psychical structure that is engaged in all kinds of psychical processes. In other words, at the level of the psychical part-structure, the brain cannot be studied in isolation. This is reflected by the fact that psychological processes almost always entail the functioning of the entire body (and its bio-psychosocial environment). We enter here into the domain of temperament, emotion, and sensory perception. Traits and functions within this domain are related with both the central and the peripheral nervous system, with the regulation of the sympathetic and parasympathic tonus; and with changes in endocrine and immune functioning, i.e. with virtually all parts of the body. Brain-functioning in a psychical sense is integrated in the functioning of the body as a whole. Therefore, saying that the brain sees, smells, or feels is an abstraction (because the brain is only part of the body). Saying that seeing, hearing and feeling are brain-functions is also an abstraction. It is conceptually more adequate to say that seeing, hearing and feeling are activities of the human person, which — as processes — can be studied from the perspective of the psychical part-structure that, in its turn, is founded in a biotic part-structure. One could add, here, that there is an irreversible order in this foundational relationship between the biotic and psychical part-structure. The irreversibility, or asymmetry, consists of the fact

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<sup>37</sup> Dooyeweerd distinguished between enkapsis in a foundational sense, enkaptic symbiosis, correlative enkapsis and enkaptic subject-object relations. Cf. H. Dooyeweerd, *A New Critique III*, 640-652.



that without the biotic (and physical) part-structure the psychical part-structure does not have existence, whereas the biotic part-structure can exist, and be conceptualized, without presuming the higher part-structure(s).

From this account it might be predicted that the 'higher' the part-structures that are involved in a particular human activity, the wider the context neuroscientists should take into account in order to study the brain correlates of that particular activity. Even at a biological level the context widens when more complex and typically human activities are studied.

#### 6. *Concluding remarks*

Our conceptual analysis revealed some of the weaknesses of Churchland's eliminative materialist attempt to reduce consciousness to neurobiological events and of Kandel's 'new intellectual framework' for psychiatry. In both Churchland's and Kandel's approach there appeared to exist a tendency to view interlevel relations as reductive relations, i.e. as reducible to one another by splitting wholes at 'higher' levels into constituting parts at 'lower' levels. In doing so, the distinction between modes and entities, which is fundamental in the work of Dooyeweerd, was almost completely ignored.

Dooyeweerd's philosophy not only appeared to be fruitful in a critical sense. His distinction between law and subject, between subject functions and object functions, as well as his notion of the human person as an enkaptic structural whole, proved to be illuminating in our further analysis of brain functioning. Dooyeweerd's philosophy will not immediately lead to other types of neuroscientific research. But his work may certainly change the way we think and speak about this research. And this, in the end, might lead to other, richer and more refined research paradigms.