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THE SELF AND ITS BIOLOGICAL FUNCTION: CONTRASTS BETWEEN POPPER AND SARTRE

Wilfried ALLAERTS

Abstract

In the present paper we aimed at a reflection about the cross-overs and contrasts between philosophical thoughts of a biological function of the Self (Popper, 1977) and theoretical reflections about the nature of biological self-reference idioms. Contrary to extreme materialistic or physicalist philosophies of consciousness, the interactionist view on the Self and its brain, places the Self, both conscious and dispositional, within a biological functionalist approach. As a consequence, the biological Self according to Popper (1977) is marked by an anchorage in time and also in space by so-called World 3 models. Hence, Popper's biological Self notion may be regarded as 'positional', similar to the positional consciousness of world and Self as expressed in Sartre (1943).

Recently, several efforts have been provided in neurophysiology, neuropsychology and neuropathology to dissect the anatomy of cognitive disorders as a heuristic tool to define the biological functioning of cognitive and other mental processes.

However, the biological function notion, and the functionalist approach to the Self, are renounced in the philosophical analysis and novel '*La Nausée*' by Sartre (1938). The renouncement of the functionalist approach is inspired by the so-called essential contingency of nature (Sartre, 1938). We feel this is an interesting position, for it illustrates the incompleteness of the biological function notion in self-reference idioms, for, these functional self-references are necessarily positional and marked by some relation of cognition. This is in strict contrast with the non-cognitive and non-positional consciousness of the Self-being-conscious of an object (Sartre, 1943). Sartre's monism of the phenomenon and the consequent annihilation of the inside-outside dualism, moreover, is interesting for it discloses an important philosophical and psychological theme, essentially related to the relationship between the awareness of time and the awareness of Self.

On the other hand, the perception-oriented phenomenological approach, unveals apparent inconveniences for the task of analysing biological self-reference idioms (Allaerts, 1997, in press). We here present some possible causes for these inconveniences: (1) the asymmetrical apprehension of the extendedness of space and time; (2) the inherent limitations imposed on the simultaneous awareness of time and Self (Popper, 1977); (3) the lack of perspective towards the aspect of functional significance or, according to Sartre, the resolute refutation of the functional significance perspective (Sartre, 1938, 1943).

Comparing the philosophical positions of Popper and Sartre, shows that both explicitly refer to the biological functionalist approach, but also that their positions are strictly opposed with respect to the merits of this biological self-reference idiom, allowing a dialectical confrontation of both philosophies.

1. *Introduction*

The territories claimed by the physical sciences, the biological sciences in particular, are these where systematic thinking leads to the comprehension of the object of its reflections by an unaffected and detached observer. In agreement with common sense, these scientific reflections mostly are fed by experience of an objective reality, that apparently occurs by necessity proven as such; the experimental facts running into the observers hands and positing the objectivity of their appearance do so by chance. These conditions would guarantee that realities correspond with truths, and that observers are not biased by the experimental set-up, which is chosen or adapted according to the ruling scientific paradigms, or in other words, the observer is detached from the reality observed.

In the case of a comprehension of the Self as an object of scientific knowledge, these conditions would implicate an irreconcilable contrast between objectivity and chance, for the observer is equally the object and the subject of his comprehensing activity. Also, it would implicate an irreconcilable contrast between determinateness and contingency, making the Self an unfit object for the scope of (physical) sciences and forcing them so to speak to navigate between Scylla and Charybdis. With Popper (1977), referring to Hume (1739), we may synthesize that "speaking of the Self as a substance is not illuminating" (Popper, 1977, p.103) and admit that "the habit of speaking about our selves is incorporated into our language, simply because of the fact that ownership is incorporated into our language" (Popper, ibid., p.103).

The fact that in philosophy and biology, each having their own characteristic discourses and idioms, the notion of (a) Self has different connotations, i.e. different meanings, may lead us into the thesis that philosophical and biological discourses or idioms about the / a Self have nothing in common but a similarity of terminology, and therefore should not be connected. However, there are two important arguments against a strict separation of both languages with regard to the topic of a Self:

1) *Self-recognition* and *self-reassessment* are well valorized processes in biology, in casu in *immunological self-determination* (Coutinho *et al.*, 1984), similar to the valorization in psychology for instance of the notion of *autopoiesis*, a notion conceived in psychology to indicate the self-determination through language and self-observation (Maturana & Varela, 1980; Rosseel & Van Engeland, 1991).
2) The biological function notion in itself, when related to the notion of self-consciousness, is subject to many philosophical questions, as made explicit in the writings of Popper (1977) and also in the literary work of Sartre, e.g. in the novel '*La Nausée*' (Sartre, 1938).

Moreover, in a recent book '*The Immune Self*' by Tauber (1994), the biological function of immunity of the Self is engaged in a philosophical inquiry into the foundation of the selfhood concept. According to Tauber (1994, p.9), the immune function is not restrictively interpreted as a biological feature of the individual organism, but on the contrary, it is regarded as a metaphor indicating the contours or the identity of the organism, thereby metaphorically defining the Self. Recently, we have analysed in more detail Tauber's philosophical position of the immunological self/non-self discrimination, which is regarded as an essentially cognitive function of the organism, and we have confronted this analysis with other viewpoints and models of the immune function of biological organisms (Allaerts, 1997, in press).

In the present paper the contrasts and cross-overs between biological and philosophical discourses about the Self and its biological function are highlighted starting from Popper's analysis in '*The Self and its Brain*' (Popper & Eccles, 1977) (Section 2). Moreover, we confront this analysis with the renouncement of a biological function concept accompanying a discourse about the perception of time and Self in '*La Nausée*' (Sartre, 1938) (Section 4).

We previously discussed the theme that the functioning of (biological) self-organizing systems is to be understood in relation to the positional information of the system (Allaerts & Roelants, 1993). In the work of Popper (1977, p.131), we also find the notion of a positional determinateness

of the Self expressed as an "anchorage" in space and time of the active Self (see section 2, b). On the other hand, in the introduction to '*L'Etre et le Néant*', Sartre (1943, p.19) refers to a '*positional consciousness*' of the objective world, for it is understood that consciousness of the world, and of any object in it, is also a 'positional consciousness' of the world/object. However, the consciousness of the Self being conscious of an object is *not* positional, but immediate and even non-cognitive (Sartre, 1943, p.19). Indeed, referring to the Cartesian revolution of ontology marked by the "*Cogito, ergo sum*", and although this founding is criticized by Sartre (see section 2a), the possibility of an objective *knowledge* of the Self is founded upon a cognitive relation between the consciousness of the Self and the consciousness of the world (Sartre, 1943, p.17–18). According to Sartre (1943, p.19), the reduction of consciousness into cognition (knowledge) implies a dualism between object and subject, which is a typical characteristic of cognition. To avoid, however, an infinite regression —for instance, if we consider the cognitive subject as the object of cognition— it is necessary to assume an immediate (non-cognitive) relation of the consciousness with itself, comparable to the notion of absolute consciousness in Husserl's phenomenology (see section 2a). This makes Sartre postulate that there is a '*non-reflective cogito*', which is the condition for the '*Cartesian cogito*' or the '*reflective consciousness of the Self*' (Sartre, 1943, p.20).

The relation of the consciousness of the Self and the consciousness of the world raises the problem of *extendedness*. We will treat the relation of the consciousness of the Self and the 'being in time' in the light of a critical analysis of a phenomenological approach of the Self (section 2. c) and the contrasting viewpoint of a biological function analysis, and will discuss a possible role of the problem of extendedness in this relation.

2. *The biological function paradigm in an interactionist view on the Self and its Brain (Popper, 1977), including Sartre's criticism of the* Cogito

In the first part of '*The Self and its Brain*' by Popper & Eccles (1977), a philosophical synthesis of the brain-mind controversy, Popper explains how materialism, as a modern philosophic inspiration of the physical sciences, has transcended itself by revealing in itself the limitations of the materialist research programme (Popper 1977, p.7). The popularity of materialism has recently been demonstrated by Daniel Dennett's '*Consciousness explained*' (1992), a philosophical analysis with an unmistakable affinity for poststructuralist literary criticism (Roskies & Wood, 1992). According to Dennett, the Cartesian tradition of dualism "*has been on the defensive since Gilbert Ryle's 'The Concept of Mind' (1949)*" (see

below), although "*a few brave souls, including Popper and Eccles (1977), have resisted the tide*" (Dennett, 1992, p.33). In the subsequent paragraph, we will recall the central themes of Popper's analysis, which, contrary to Dennett's phrase, doesn't incorporate into the Cartesian dualistic tradition, but reveals the importance of emergence and interactionism. We will further highlight some of the themes of Dennett's criticism at the end of this section (2.d).

To a considerable degree, Popper explicitly declares to agree with materialism and physicalism, not only with respect to "*the emphasis on material objects as the paradigms of reality, but also with respect to the evolutionary hypothesis*" (ibidem, p.11). But their ways "*seem to part when evolution produces mind and human language*" (ibidem, p.11). Several stages can be discerned in the creative evolution or emergent evolution, which according to Popper can be grossly arranged in the "*three cosmic evolutionary stages*", called world 1 (the world of physical objects), world 2 (the world of subjective experiences) and world 3 (the products of the human mind, including human language and theories of Self and of Death) (ibidem, p.16). This division is somehow related to the dualistic division into world 1-world 2 as proposed in e.g. Eccles (1987), although it contains some important contrasts.

With respect to the materialist explanation of the Self, Popper demonstrates "*that a consistent materialist view of the world (including ourselves) is only possible if it is combined with a denial of the existence of consciousness*" (ibidem, p.98). The denial of the existence of a Self has a long tradition, and as pointed out by Popper in the cited work (see also below), dates back to the empiricist theory by David Hume (1739). In an extensive elaboration of arguments commonly heard in the controversy between physicalism and interactionism, Popper is led to the interactionist position. The interactionism theory refers to the interaction between mental processes and physico-chemical processes taking place in an organical environment. This organical environment is regarded as a neuronally controlled self-comprehending system, of which the brains are the main seat. It is important to mention in this respect that Popper (ibidem, p.82) especially criticizes the identity theory by refuting "*a weaker consequence of it, namely the theory of parallelism*". According to Popper, there is a logical relation between the identity theory and the theories of interactionism and parallelism. This parallelist.theory is the (Spinozistic) theory that mental processes are physical processes experienced 'from the inside'. The parallelist theory is a weaker form of the identity theory, because the identity theory can be considered as a limiting case of parallelism. The position of Popper, which is to "*avoid criticizing the identity claim*", but at the same time to "*criticize the identity theory and (especially) the weaker forms of it*", is difficult for

non-philosophical readers, but it is an important cornerstone of Popper's defense of interactionism. (A variant of the interactionist theory is proposed as the dualist-interactionist hypothesis by Eccles [1987]).

Interactionism and an emergent evolution of the biological world, thus, are the cornerstones in Popper's analysis of the relation of the Self and its brain. Typical for the occidental way of thinking, which is marked by the historical progress of physical sciences, is that the model of a neuronal control of the body developed well before the model of immunological control of the body. In another paper (Allaerts, 1997, in press) we discuss in more detail the distinctions between neuronal self-accomplishment and immunological self-control, a distinction already made by Popper (ibidem, p.126). In contrast to the consciously achieved self-accomplishment of the neuronal system, the immune system acts in an unconscious way, which argument Popper adapted from Medawar's (1959) review of Schrödinger (1958) (Popper, ibidem, p.126).

The contrasts between the neuronal and the immune system stress the importance of the biological function paradigm in the discourse of self-accomplishment, and in the following paragraphs we will highlight this paradigm in Popper's discourse.

a. *Popper's argument against Hume, the escape from solipsism, and Sartre's criticism of the* Cogito

The position of a complete denial of the existence of the Self is currently believed to date from Hume in the '*Treatise of Human Nature*' (1739). In agreement with Hume's empiricist view on knowledge, it was argued that we cannot have anything like an idea of self, because ideas are derived from "*sense impressions*" (*negative assertion* about the Self). However, in several publications Popper (1972,1977) criticizes the illogical preponderance of visual sense perceptions as a standard for conscious experience, and especially in empiricism Popper criticizes the habit of taking (visual) sense perception as the main or only paradigm of an experience of knowing. According to Popper (1977, p.102–103) also contradictory assertions can be traced in Hume's Treatise with respect to the Self. Indeed, it was recognized by Hume that, "*the idea, or rather impression of ourselves is always intimately present with us (...), that it is not possible to imagine that anything can in this particular go beyond it*" (*positive assertion* about the Self). In fact, the latter positive assertion already indicates the credo of *solipsism*, the philosophical theory that the Self can know nothing but its own modifications and that the Self is the only existent thing. Popper summarizes Hume's theory of the Self in this way: "*the Self is no more than the sum total (the bundle) of its experiences*" (Popper, ibidem, p.103).

However, in the work of Popper & Eccles (1977) the theory of solipsism as an antipode to Hume's denial of the Self is largely avoided. Moreover, in the first dialogue of this work (Popper & Eccles, 1977, p.426) it is called a position to "*escape from*". Implicitly, Popper refuted solipsism with the argumentation that "*the impression of 'primary' experiences carries with it the mistaken suggestion that the Ego is in time, or logically, the first thing*", which is, when referring to the newborn baby we all were, not true (Popper, ibidem, p.426).

Although it seems that Popper's argumentation is a refutation of solipsism in terms of epistemology, this refutation is problematic when taking Sartre's argumentation into account, formulated in '*L'Etre et le Néant*' (Sartre, 1943, pp.277–284). Sartre here explains that, when starting from the assertion that the fundamental *liaison* between the Self and the World and the Other(s) is a *liaison of knowledge*, it follows that the escape from solipsism as proposed in the writings of I. Kant and E. Husserl, for instance indicated by the certainty of the existence of the Other (Sartre, 1937), is not really an escape. For, according to Sartre (1943, p.280), it preserves the *liaison of knowledge*, whereas it does not add to the knowledge of the Self. The phenomenological attitude of Husserl as expressed in '*Ideeen zu einer reinen Phänomenologie und Phänomenologischen Philosophie*' (Husserl, 1913), revealing phenomena as subjective experiences by a process called 'bracketing' (or the epochè)[1], has also found followers in biology (e.g. Tauber, 1994, pp.215–224)(Allaerts, 1997, in press).

It is clear that Sartre in '*L'Etre et le Néant*' (1943; p.281) surpasses the position of Husserl on the *liaison* between Self and World. Indeed, Sartre indicates that the primary fact is not given by the knowledge of consciousness or experience, but is the *plurality of consciousness* (literally Sartre mentions '*consciences*' in plural!). The latter criticism of the *Cogito* as formulated by Sartre (1943), grounds on the criticism of the ontological foundation of Cartesian rationalism (Kail, 1996). According to Sartre, it is

[1] In the agenda of Husserl's phenomenology, an eidetic science is proposed to examine 'experience' directly, for "*reality, as lived, is the experiencing of the object, event or emotion*". With regard to consciousness, and applying the process of bracketing or epochè, Husserl is left with a so-called 'phenomenological residue', called "*the region of pure consciousness*":

> "... consciousness has, in itself, a being of its own which in its own absolute sense, is not touched by the phenomenological exclusion [bracketing]. It therefore remains as the "phenomenological residuum", as a region of being which is of essential necessity quite unique and which can indeed become the field of a science of a novel kind: phenomenology". (Husserl, 1913, 1982, pp.65–66; fide Tauber, 1994, p.221).

due to Descartes' "*imprisonment of consciousness into the primacy of cognition*" that the consciousness of the Self is locked up in a scheme of reflexion and is regarded as a "*cognition of consciousness*". As a result, consciousness has become uncoupled from its 'possessive being' and is projected into the *en soi*, giving rise to an inevitable substantialization of the conscious Self (Sartre, 1943; Kail, 1996).

Whereas Popper (1977, p.426) refers to expectations and inborn knowledge as the primary experiences enabling consciousness of the Self, Sartre (1943, p.281) refers to the *plurality* of consciousness, being realized in the "*form of a double and reciprocal relation of exclusion*". The *Cogito* thus is far from being a starting point for philosophy, for, on the contrary, it is the existence of the Other who enables the moment of the *Cogito*, which is "*the abstract moment where the Self grasps the Object of its Self*" (Sartre referring to Hegel's '*Phaenomenologie des Geistes*', 1806, ibidem, p.281).

b. *Popper's answer to Ryle, with respect to the awareness of Self and Time*

The position of Ryle in '*The Concept of Mind*' (1949) is, contrary to that of Hume, not the position of a denial of the Self, but rather a "refutation of the myth" ascribed to Descartes of the dualistic separation of body and mind. According to Popper, the central theme in Ryle's work is formulated in the phrase: "*man is not a ghost in a machine*" (see Popper, ibidem, p.105). This phrase now is tackled in the work of Popper. Ryle's assertion can be refuted, according to Popper, if we consider the failure of the Self to be self-aware in cases of complete loss of memory, e.g. in epilepsy. Popper explains Ryle's assertion as being related to his difficulties with the paradigm of self-observation (*the introspective method*), which was *not* correctly applied in Ryle's work. However, according to Popper (ibidem, p.106–107), this method has been excellently documented by members of the Würzburg School of Psychology. In fact, the problem of Ryle seemed to be that one cannot concentrate on a problem and observe his Self *at the same time* (Popper, ibidem, p.107). This is what a correct application of the introspective method learns, and it implicates that an important relation may exist between the possibility of self-observation and the awareness of time. We will further illustrate this relation by analysing this theme in Sartre's novel '*La Nausée*' (1938) (see below; section 4).

As a conclusion of the section devoted to Ryle's "man is *not* a ghost in a machine", Popper launches the notion that the Self and the consciousness of the Self may indeed deploy very intense activity (e.g. in the introspective method), and it is this activity, or performance, one should understand

in its biological function. In order to understand this biological function notion, however, it is indeed important to follow Popper (ibidem, p.108) when explaining the topic of the relation of the Self to World 3 (see section 2. c).

c. *Popper and the Continuity of the Self*

The relation between the notions of Self-awareness, consciousness and the continuity of the Self, according to Popper (1977), can be comprehended in terms of the psychology of learning. Popper stresses the important contribution of unconscious dispositional states within this respect, like e.g. the smiling of a baby as a disposition to communicate with its mother (Popper, ibidem, p.111). The continuity of the Self, moreover, is subject to a process of integration to unity, in which integration is the result of a person's disposition to consciousness, and, especially, to the disposition of perception of the body's localization.

According to Popper (ibidem, p.128–129), the latter perceptional disposition has been experimentally demonstrated by Penfield (1955). Penfield repeatedly stimulated, with the help of an electrode, the exposed brain of patients who were being operated on while fully conscious. When certain areas of the brain cortex were thus stimulated, the patients reported reliving very vivid visual and auditive experiences while being, at the same time, fully aware of their actual surroundings (Popper, ibidem, p.66). More recently, using positron emission tomographic (PET) measurements, Frackowiak and co-workers (Bottini et al., 1995) obtained similar results, documenting the physiological substrates of "*phenomenological consciousness*" (awareness).

The temporal continuity of the Self, according to Popper, is not only achieved by the conscious Self, but also by 'unconscious dispositions' (Popper, ibidem, p.129–131). What has been demonstrated by Bergson (1968) to result from a disposition to gain intuitive knowledge, to comprehend the continuity of time, designated as "our intuition" by Bergson,was defined as an "*unconscious disposition providing the Self its continuity from moment to moment*" by Popper (ibidem, p.131). The different explanations of Bergson and Popper are not solely a matter of terminology. However, instead of looking for an explanation of these different positions, it is more important to stress that both explanations share the outcome of a disposition of the Self to temporal continuity. This conclusion according to Popper (ibidem, p.131), can also be interpreted in terms of *memory*. So we have to consider two types of memory —and none of these, obviously, are restricted to humans only— namely (a) the *continuity-producing memory*

and (b) memory in the sense of what one has *acquired by some method of learning*. Also this continuity-producing memory "*has to be interpreted theoretically, in the light of a theory of our position in the environment, represented by a 'feeling', of our body and its place in a kind of model or map*" (Popper, ibidem, p.131). This theory is regarded too as unconsciously and dispositionally held, and here, Popper's position corresponds well with Sartre's definition of a '*positional consciousness*' (see Introduction).

The continuity-producing memory has to be understood in its "*biological function*" (Popper, ibidem, p.131). Here Popper conjectures a kind of reverberating nervous circuit, thereby implicitly referring to the neurological theories of Eccles (1981). Indeed, Eccles (1981, p.1849) claims that "*on the basis of the generalization that cognitive memory and self-consciousness are intimately related phenomena, the conjectured modular patterns (of the neocortex) subserving memory on the conjunction hypothesis should also be the modular patterns correlated with self-consciousness in all of its manifestations*". A later variant of this hypothesis was presented as the '*microsite hypothesis*' (Eccles, 1987, p.56), adopting a more probabilistic approach of the structure-function relationships at the level of presynaptic vesicular grids.

On the other hand, referring to Bergson (1968) the conjecture of an observable biological nervous circuit subserving temporal continuity is (philosophically) problematic in a phenomenological approach of time (cfr.4.c and Allaerts, 1992). However, we agree with Popper on the so-called theoretical interpretation of the biological function of these nervous circuits, thereby avoiding the continuity-discontinuity paradox by introducing the theoretical function notion (Allaerts 1997, in press).

To conclude, according to Popper, the problem of the continuity (and integration) of the Self is solved when we consider the active Self to be orientated and *anchored in space* (by means of so-called World 3 theories or models) and *in time* by our dispositions to recall the past and our expectations for the future (Popper, ibidem, p.131). Not only the moment of the present, the detection of coincidence here and now (Human Frontier Science Program, 1996), but also the retention (to a certain, variable moment in the past) of this past experience, experienced as being passed, make part of the active or conscious Self.

d. *Dennett's defense of Ryle*

The idea of the absence of a central meaner, or witness providing our consciousness with an inherent unifier —an idea already proposed by Ryle (see section 2.b)— has found a strong defense in Dennett's work '*Consciousness explained*' (1992). Dennett strongly endorses the credo of Ryle

that "*man is not a ghost in a machine*". Dennett's central theme, according to Roskies & Wood (1992), is to overturn the idea that consciousness is to be understood as a *homunculus*, a little "person" inside one's head having all the powers of a human being.

Dennett's view of the absence of a central meaner not only follows Ryle's central theme, but also strongly criticizes the so-called witness intuition, as for instance worked out in J.R. Searle's "*Chinese room thought experiment*" (Searle, 1980, 1990; Dennett, 1992, p.322). Searle explains in his famous thought experiment that merely manipulating symbols is not enough to guarantee cognition, just like manipulating the Chinese symbols by a non-Chinese speaking person in a room being guided by an English rule book and reacting to orders given from outside the room, does not make this person understand Chinese. The analogy in this argument of Searle with the brain-mind controversy is obvious, but not unquestionable, as indicated by Searle himself (1990). The argument was elaborated by Searle to defeat the strong claim of a number of researchers in artificial intelligence (AI). These strong AI claims state that the computer programs are (or may become in the future) constitutive for, or sufficient to create (human) minds, in such a way that they may pass A.M. Turing's test (1950) to be indistinguishable from each other (Searle, 1980, 1990; for a discussion of A.M. Turing's test see also Hofstadter, 1979). Searle's conclusion, however, is negative to this point, although many objections have been raised since its first publication (Searle, 1980), one of the strongest objections being that "*semantics does not exist, since there is only syntax (that counts)*", and similar objections (Searle, 1990).

The correlating idea of Dennett of a Self that is indistinguishable from what is in some way externally defined or programmed, is the following: Dennett explains Self-achievement as a so-called auto-stimulatory strategy, deeply embedded in our culture and training, or, in other words, as a process of postnatal (brain) design-fixing (Dennett, 1992, p.199). Via the vehicles of language, our brains would become parasitized literally (and so: involuntary!) by units of cultural tradition, called '*memes*' according to R. Dawkins (1976), and essentially analoguous to '*genes*' (Dennett, 1992, p.200–202). Examples of these '*memes*' are an alphabet, a calendar, chess, or impressionism, or the theme from the slow movement of Beethoven's Seventh Symphony ... (examples are drawn from Dennett, including the capitals of some examples). It would lead us far beyond the scope of this paper to treat this notion of Dawkins (and also Dennett), except for its value to situate Dennett's position. In other words, according to Dennett, Self-achievement is but an illusory process of building around a (virtual) '*Centre of Narrative Gravity*' (Dennett, 1992, p.410). This idea of the Self

as a '*Centre of Narrative Gravity*', in our opinion, being virtual in se, has some affinity with the extensionless Self of e.g. Schopenhauer (see also footnote 4), and moreover, is not far away from the position of Popper, when referring to Popper's so-called anchorage of the active Self in World 3 (the World of products of human mind and language; see section 2.c).

3. *The challenge from neuropsychology and psychopathology*

In a recent issue of *Science* devoted to 'Cognitive Neuroscience', Andreasen (1997) suggests the study of neural mechanisms of mental illnesses as heuristic tools to comprehend the cognitive processes of the mind. 'Mind' and 'brain activity' being unseparable entities in actuality (Andreasen, 1997), may be separable for the purpose of analysis, thus providing a heuristic solution to the problem of the interaction between the mind and its brain (see section 2).

At the end of section 2.c, we recalled Popper's viewpoint (1977) that the biological function notion may prove genuine value to comprehend the problem of the continuity and integration to unity of the (conscious) Self. This position is the more taunting, since we may also encounter it in past and in contemporary neuropsychology and also in philosophy. Also Dennett recognizes the fact that his book "*Consciousness explained*" (1992) (see above) defends a version of 'functionalism'. Creutzfeldt (1987) refers to functional mappings of the various parts or fields of the cerebral cortex, dating back to neurological studies of the 19th and the early 20th centuries. Following these 'classical' neurological studies (e.g. the functional cortex map of Kleist, *fide* Creutzfeldt, 1987), primary sensory functions and higher cognitive (mental) functions are associated with distinct areas of the cortex (Fig. 1). However, we must admit that it is not very well known how to conceive this biological function concept at the level of single neuronal units (neurons), and, *a fortiori*, at the level of integrated neuronal circuits within the brain (see also Allaerts & Roelants, 1993). With no doubt, much information has been gathered about the mechanisms involved in the auditive, visual, sensory functions of localized brain areas, whereas much of our understanding of the capacity of the brain to integrate these functions remains fragmentary (Allaerts et al., 1997). Moreover, the following absurd exemplum drawn from Jaynes (1976), demonstrates that although neurophysiological mechanisms explain a lot of the 'mechanics' of the nervous system, these mechanics do not exhaustively explain their function.

The exemplum of Jaynes is illustrative: when speaking about hallucinatory experiences in schizophrenia, he announces that "*a vestigial god-like function*" can be allocated to "*the right hemisphere*" (Jaynes, 1976 p.107).

When critically examining this assertion in Jaynes' work, we conclude that it neither learns about the nature of the "*vestigial god-like function*", neither about the right hemisphere. Frith and co-workers have studied schizophrenia in great detail from the background of cognitive psychology (see review by Andreasen, 1997), and concluded that the disorders of consciousness and of self-awareness, like in schizophrenia, could be explained within a conceptual framework of an abnormal functional connectivity between different brain regions (Fig. 1A)[2]. Recent experimental findings indeed strongly support the notion of normal functional connectivity of the brain as a condition required for normal cognitive functioning, including consciousness and self-awareness (McGuire et al., 1995; Andreasen, 1997). However, we may indeed wonder whether this functional integrity of neuronal circuits in the brain is sufficient to explain consciousness in all of its manifestations.

Another group of disorders affecting mental processes are the depressive syndromes. Also here, Andreasen (1997) forwards the idea that these very common mood disorders concur on the general cognitive process of depression, and that an anatomical dissection can be made of depression in its various forms (melancholy, unipolar- and bipolar depressive disorders,...) similar to the study of Price et al. (1996)(Fig. 1B)[3]. However, according to Sacks (1982) there is a greater need for an anatomy of miserableness or for an epistemology of disease starting from the individual life-stories of patients coping with these disabling threats (Sacks, 1982, p.253 of 1987 Ed.). We may conclude that in a certain way Sack's suggestions follow the footsteps of Schopenhauer, Burton, Nietzsche and Freud (Sacks, ibidem).

[2]Recently, Frith and co-workers have demonstrated activation in the so-called area of Broca, an area in the brain normally associated with the production of inner speach, when schizophrenic patients are hearing voices. It is conceivable that schizophrenic patients misinterpret their own inner speech as coming from an external source, e.g. another person, thus reflecting a defect in Self-monitoring (McGuire et al., 1995).

[3]Disecting the anatomy of melancholy, several studies suggested that hereby a key-role is played by the amygdala (reviewed in Andreasen, 1997)(see also the legend to Fig. 1B). Indeed, memories of past pain are retained in regions such as the amygdala (and also the parietal cortex), and may lie dormant, predisposing an individual to developing a clinical depression if additional (environmental) factors arise, but that can eventually be modified by experiences of both psychological and chemical/molecular events (Andreasen, 1997).

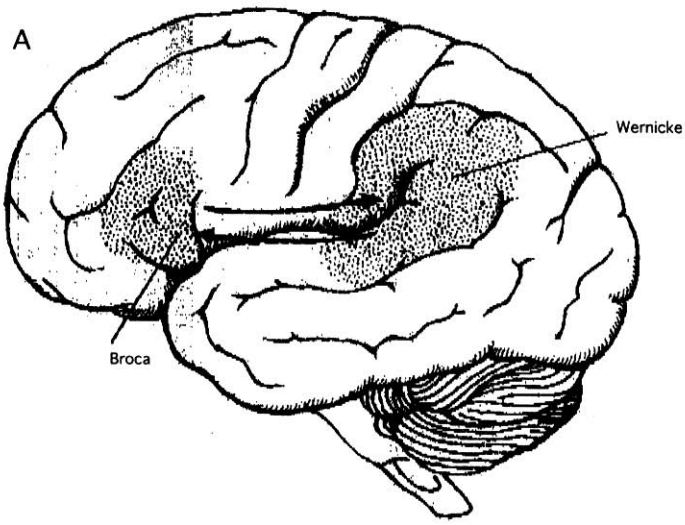
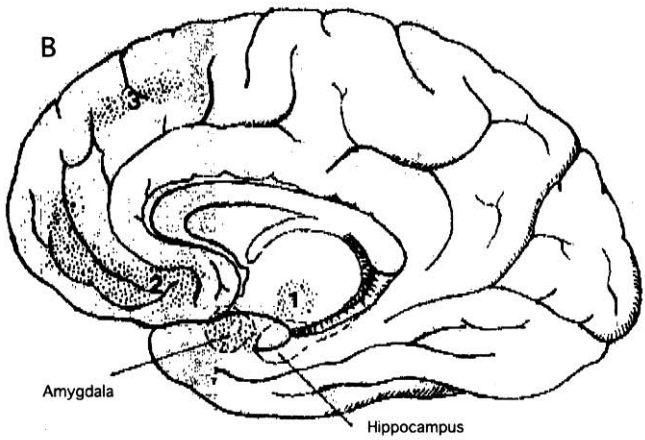


Fig. 1 — Left (A) and right (B) hemisphere of the human brain shown from the lateral, resp. medial aspect.

1.A. 'Classical' functional mappings of the cortical regions of the brain seem to differ from recent physiological evidence obtained from positron emission tomography (PET) studies of regional blood flow at this point: whereas the former studies revealed a discrete mapping of areas related to specific sensory, cognitive or motor functions, the new technology especially emphasizes functional connectivity of various regions at work during certain performances or cognitive activities (e.g. silent thinking). However, in many cases, e.g. the speach areas designated as the anterior (area of Broca) and posterior speach area (area of Wernicke), the functional connectedness of both areas is known for considerable time, for it was shown that lesions in between the two areas caused so-called conductance aphasia (Brodal, 1992). Moreover, Brodal remarks that these areas more correctly should be termed "areas of aphasia", since it is known that their destruction produces various disturbances of language (aphasia), whereas little is known of how these areas contribute to the normal production of language and speach (ibidem, p.420).



1.B. An example of the recent functional PET studies is represented, showing the areas of increased blood flow (shaded areas) on an anatomical map of the brain at the medial plane. Some limbic structures with a more lateral location are also shown by broken lines (amygdala and hippocampus). Data on the distribution of computed *t*-statistic of difference between depressive and non-depressive subjects are drawn from Price et al. (1996). The subjects studied suffered from familiar unipolar (pure) depressive disorder. When scanned with PET, these subjects were found to have increased blood flow in specific regions of the orbital and medial prefrontal cortex (2–3), when compared with non-depressed subjects. Also in the amygdala, an increased activity was observed in these subjects, which moreover was correlated with the severity of depression, suggesting that the amygdala may provide a depressive 'drive' to the cortex (Price et al., 1996; see also footnote *3). (In bipolar depressive subjects, scanned in the depressed phase, a somewhat different picture was obtained, showing e.g. decreased in stead of increased blood flow in the cortex area roughly corresponding to area 3). 1: Medial thalamus; 2: medial orbital cortex; 3: medial prefrontal cortex. Anatomical details of the drawings are inferred from Gray (1977), Feneis (1974) and Brodal (1992).

To conclude, the anatomy of mental illnesses is considered as an heuristic tool in contemporary studies for the analysis of dysfunctioning cognitive and mental processes. Hereby, a biological explanation of the functioning of cognitive/mental processes is adopted, which like other biological function paradigms has the connotation of a positional, non-transcendental relation to the subject of these processes.

4. *The renouncement of the concept of function, and the awareness of Time and Self in* 'La Nausée' *(Sartre, 1938)*

Although Popper's position of interactionism may be called exceptional within the Mind-Brain debate, the position of a biological functionalism is not uncommon. Both Popper's 'interactionism' and Dennett's 'extreme materialism' (1992) explicitly defend a kind of (biological) functionalism (see section 2). Also the contemporary approach of cognitive psychology and psychopathology (see section 3) are not in contrast with this basic assumption of a biological Self. However, the adoption of biological functional explanatory schemes to comprehend our Selves, may perhaps be too easy! With the advent of existentialism (e.g. Sartre 1938, 1943; Camus, 1942), the human rationalistic endeavours to explain an essentially irrational World, and to explain our consciousness of this World, using universal, deterministic categories, were called exponents of the absurdity of the human condition (Camus, 1942, p.39). Camus refers to Kierkegaard, Jaspers, Heidegger and Chestov (ibidem, p.41–45) when summarizing their philosophies (although quite different) by stating they all opposed rationalism and have linked consciousness to absurdity. Within this philosophical context, the position of Sartre is interesting, since he in fact tackled the position of a biological functionalism, or, at least, has radicalized this position of functional explanations by an explicit refutation in his novel '*La Nausée*' (1938). Especially interesting in this novel is the intermingling of ideas on the essential absurdity of nature with ideas on the problem of awareness of time and Self. With the latter theme, the work of Sartre not only shows contrasts with, but also similarities with the work of Popper (1977), Jaynes (1976) and recent studies in psychology (see below). We feel that each of the basic insights, as formulated by Sartre (1938, 1943), related to a (biological) functionalist approach of the Self, abbreviated as (*a*) the essential contingency (or absurdity) of nature, (*b*) the interrelatedness of the awareness of time and Self, and (*c*) the related problem of extendedness, represent important sidemarks, although each of them may need some nuance.

a. *The contingency of nature in* 'La Nausée'

Reading the philosophical treatise '*L'Etre et le Néant*' (Sartre, 1943), we have no reason to doubt the philosophical importance ascribed to the discovery of the irreducible contingency of nature by Sartre's novel protagonist Roquentin (R.). The position of Sartre in '*La Nausée*' (1938) is strictly in opposition with the credo of modern developmental biology. We retain two important assertions within this respect, formulated in Sartre's novel:

(1) "*La fonction n'expliquait rien: elle permettait de comprendre en gros ce qui c'était qu'une racine, mais pas du tout celle-ci (...) Chacune de ses qualités (de cette souche) lui échappait un peu (...) chacune était de trop dans la racine, et la souche tout entière me donnait à présent l'impression de rouler un peu hors d'elle-même, de se perdre dans un étrange excès.*" (Sartre, 1938, p.185).
(2) "*L'essentiel c'est la contingence. Je veux dire que, par définition, l'existence n'est pas la nécessité.*" (Sartre, 1938, p.187).

It is clear that assertion (1), abridged as "*the function explains nothing*", is too strong: if we make abstraction of the personal conflict of the personage, we may read in the following line that "*a function might help to comprehend grossly the meaning of it*", which already mitigates the first assertion. However, contemporary developmental biologists would argue against the conjectured contingency, as formulated in assertion (2). Considering the notion of individuation, which notion according to Popper (1977) was already expressed by John Locke (1690) (Popper, 1977, p.112), it is nowadays assumed that the morphogenesis of an individual biological form (the ontogenesis) reflects the preformed genetic template and the actual physico-chemical environment at the place and time of its genesis. The contingency of the biological form is translated into a spatio-temporal contingency (see also Allaerts, 1992), with allowed stochastic variation and an individuated occupancy of space and time. In the example of the tree root, the different qualities (see assertion 1) of the individual root with its actual shape at that place and time, can be defined in terms of physical characteristics of the root in that place and at that moment. Moreover, certain characteristics of shape, proportions and chemical composition will reveal remnants, traces or injuries of the individuated history and of the preformed genetic template of its bearer.

b. *The awareness of Time and Self in* 'La Nausée'

Two 'leitmotivs' can be traced throughout '*La Nausée*', i.e. *the loathing of the Self* (the Nausea) and the *awareness of Time*. Moreover, it is an essential structural characteristic of the novel that these two leitmotivs are systematically connected with each other. We find a possible meaning of this loathing of the Self explained in the introduction to '*L'Etre et le Néant*' (Sartre, 1943). The Nausea is called a "*way of immediate access to the phenomenon of being*" (Sartre, 1943, p.14)(see also Sartre's criticism of the Cogito, in section 2a), and this immediate manifestation of the phenomenon of being is used as a foundation of the ontology expressed in '*L'Etre et le Néant*'. The peculiar relationship between the Nausea as an immediate access to the appearances or phenomena, and the expression of awareness

of time and Self, is meticulously described in '*La Nausée*'. Herein, Sartre describes the slipping away of R's loathing when he listens to a tune of jazz-music proclaiming that "*another Time exists*" (Sartre, 1938, p.41). The striking reference to Bergson's idea of a time presenting itself as a duration (Bergson, 1968) becomes shrouded further on in Sartre's novel, as now 'time' is unveiled as what is 'in the present' only:

> "*La vraie nature du présent se dévoilait: il était ce qui existe, et tout de qui n'était pas présent n'existait pas. Le passé n'existait pas.*" (Sartre, 1938, p.139).

However, it is the fascination towards 'time', and the fascination towards the moment of the present, which finally causes the state of "*blinding evidence*" to R's mind. Here, we find the emergence of an attractor of the mind, characterized as the inability of the novel protagonist to either accept or refuse his Self (Jaynes, 1976; Rosseel & Van Engeland, 1991). Jaynes (1976) explains the symptoms of this personality dysfunctioning or situation of mental distress in terms of anxiety about one's capacity of Self-monitoring. Thus, R. became stuck of the present, the moment of 'now', making impossible to accept his Self, refuse his Self, or see his Self as being separated from an 'outside' world (Sartre, 1938, p.175–187).

The description given by Sartre is the more interesting, because it illustrates the interaction of the awareness of Self with the awareness of time. Or, referring to Popper (1977) (see above), it illustrates the impossibility to be aware of an object and the Self at the same instant (see Husserl's 'Jetzt-punkt' notion in Kokoszka, 1996, p.319). This illustrates the philosophical problems that are inherent to the perception of Self and the outer, objective world (see below).

c. *The inside-outside dualism and the problem of extendedness*

The lesson to be drawn from '*La Nausée*' (Sartre, 1938) about a Self and a biological functionalist approach of it —or rather the renouncement of this approach— is not easily traced in the phenomenological ontology which was elaborated in '*L'Etre et le Néant*' (Sartre, 1943). A philosophical refutation of the functionalist approach indeed can be traced in the latter work, but we will not comment on the body of this work. As we explain below, the refutation of this functionalism results in part from the annihilation of the inside-outside dualism in a phenomenological approach of the objective world (Sartre, 1943, Introduction pp.11 and following).

Sartre's concern about the inside-outside dualism is inspired by the ambition to clear modern philosophy from certain embarrassing dualisms and to install the "monism of the phenomenon" (Sartre, ibidem, p.11). This

endeavour of Sartre's phenomenology leads to the annihilation of the outer demarcation of the existant object, seen as a kind of superficial skin hiding the true nature of the object, as well as of the inner hidden reality. Apparitions therefore are neither interior nor exterior (Sartre, ibidem, p.11). We will not in this paper treat the contrasts between this philosophical viewpoint and e.g. the topological definition of geometrical objects in terms of notions like open and closed environments (Armstrong, 1979; Thom, 1969, 1974; Bruter, 1974). We also will not treat problems like how to conceive holes in *n*-dimensional objects because, obviously, this was not conceived in Sartre's analysis of the outer world phenomena. The relation between the biological function of natural or biological objects and the so-called connectivity notion is discussed elsewhere (Allaerts 1997, in press).

The being of the phenomena, according to Sartre (1943, p.16), although being a "*coexistif au phénomène*", i.e. being a coexistant of the phenomena, goes beyond and hypostases the consciousness attained from the phenomena. But the being of the phenomena in the first place is a 'being extended', in order to be an appearance at all. The argument that the perception of a temporal object contains temporality in itself, or the perception of duration requires by its very essence a duration of the perception, is due to Husserl (1966) (*fide* Kokoszka, 1996, p.317). The representation of the being of the phenomena as an infinite series of apparitions in time, relates the phenomenological world to the Self, namely via the Self-conscious-of-the-world (see also introduction). But this relation in turn raises the problem of extendedness: the extendedness of space is not equal to the extendedness of time. Phenomena are described by Sartre (1943) with an apparent extendedness in space, but without any extendedness or duration in time. However, the lack of extendedness attributed to the apparitions in time, is an inappropriate projection of the lack of extendedness —either spatial or temporal— of the conscious Self here and now, which is an anthropocentrism![4] We indeed may think or model the discontinuous character of space, but not withstanding this, accept the illusory continuous appearance of space. On the contrary, the continuity of time or the so-called flux of absolute consciousness (Husserl, 1966; *fide* Kokoszka, 1996), can only be comprehended by our intuition (Bergson, 1968), or it is modelled as a largely unconscious, dispositionally held achievement of the Self (Popper, 1977) (see also section 2.c and Allaerts, 1992).

[4]The philosophical viewpoint here expressed reflects the Schopenhauerian Self as referred to by e.g. Janaway (1989) (*fide* Tauber, 1994, pp.244–245). "*The Self is neither a spatiotemporal individual nor an immaterial substance; rather it is analogous to an 'extensionless point', to become a viewpoint to know the world, yet distinct from the content of what is known.*"

The problem of an inside-outside dualism, and the refutation of this dualism as proposed by Sartre (1943), is related to the problem of extendedness of the outside world (or objective world). In contrast to the visually achieved illusion of a continuously extended (material) world, our eyes cannot offer the illusion of continuity of time, because we cannot 'see time', but we 'see *in* time'. The passing over, or the transition in time, apparently lacks 'the essential coexistant' (cfr. above) of the apparitions-in-time themselves. To refute this position we may recall the exemplum of a generalized biological function, namely the function of insulation, previously documented by Allaerts and Roelants (1993). We may reformulate the question whether or not to accept a functional explanatory scheme in this case as follows: can we see the insulative function of an object, animate or not, i.e. can we visually observe insulation? What do we really see?

A simple way to answer this question is illustrated by the following line of thought: given a finite domain A with boundary B, both regarded as physical entities, and consider A and B as functions of time (t). Counting the number (n) of particles inside and outside the domain, whenever this is physically possible, at $t=x$ and $t=x+i$ —i.e. at two successive time points— will most directly reveal the insulation property provided by the boundary on the sole condition that the distribution of particles at both sides of the boundary is known for $t=x$. As a result, the insulative property is not really observable, because it is the resultant of a 'transition in time', which however, due to the perseveration of its conditions, has become a measurable property. To formulate it boldly, although a most natural physical phenomenon, we just can not "see" insulation[5].

[5]Alternatively, one might infer the magnitude of insulation (with respect to a certain kind of particles or energy) when the physico-chemical characteristics of the boundary are known depending on the conditions of a steady-state or a non-steady state. Therefore the immediate environment at both sides of the boundary, as well as the boundary itself, have to be sufficiently characterized in physico-chemical terms. When particle distributions can be defined as parameters with differentiable functions (not necessarily continuous!) we may describe the spatial and temporal characteristics of these parameters with so-called gradient-functions. The sum of physical process taking place 'within' the boundary B and at both sides of the boundary (facing the interior or domain A and facing the exterior) in turn is also a complex gradient function. Depending on the nature of the physical processes taking place within and in the immediate environment of the boundary, it is imagined that complex interaction phenomena may occur that eventually obscure the contribution of each of the individual physical processes (Allaerts, 1984). In the terminology of Sartre (1943, p.11), the physical forces are regarded as the sum of their 'effects'. In the exemplum described above, i.e. the insulative property of the boundary, the insulation of the whole boundary would consist of the insulative characteristics of its composing elements. Physics indeed will tell that the insulation of composing elements can be summed up, but not be the physical processes (radiation, conduction, convection,...) themselves, because the latter (also) depend on gradient functions within and between boundary and environment (Allaerts, 1984). On the con-

The above exemplum demonstrates that the inside-outside dualism does not primarily reflect the problem of a hidden reality, i.e. a non-observable parameter, but rather reflects the reality of the 'transition in time', because all the above named parameters are 'measurable in time', without 'time' being properly seen. In this perspective, we may conclude that the problem of an inside-outside dualism (related to the biological functionalist approach) bears upon the problem of extendedness, which notion has divergent connotations when regarding either its spatial or temporal aspect.

4. *Concluding remarks*

We started our philosophical analysis with a brief review of the biological function notion in the interactionist view on the Self and its brain (Popper and Eccles, 1977), and especially we emphasized Popper's argumentation (ibidem) against some extreme materialistic philosophies. Moreover, the Self cannot be reduced to a so-called coincidence detection circuit in our brains, although allowing the unification of perceptual skills, but, the anchorage of the Self in time is theoretically formulated by the capacities of retention of past experiences (as being passed) and by the capacity of expectation for the future (Popper, ibidem).

The biological function metaphor, on the other hand, is open to many criticisms, which are especially crystallized in the phenomenological approach of Sartre (1938, 1943). The renouncement of the functionalist approach as found in '*La Nausée*' (Sartre, 1938) is interesting in our opinion, for this position illustrates the incompleteness of the biological function notion in self-reference idioms. The non-cognitive, non-positional consciousness of the Self-being-conscious (of an object) (Sartre, 1943) is *not* matched by any of the known biologically functional self-reference idioms, for these functional self-references are necessarily positional and marked by some relation of cognition. The criticism of the essential contingency of the (biological) objective world (Sartre, 1938) may be avoided by regarding (biological) functions as spatio-temporal contingent relations of these objects to their physico-chemical environments (see also Allaerts, 1992).

The phenomenological monism of Sartre (1943), on the other hand, is problematic when regarding the phenomena as apparitions in time without duration. This reduction of the extendedness of time seems inappropriate, for it reduces the dimensionality of the objective world to its purely spatial extendedness. Because of this reduction, also the perspective of functional significance of the (biological) object becomes sublimed, and this sublima-

trary, a definition of the subject of a boundary in terms of both its content and global environment, when these are assumed to be non-constant functions of time, is a meaningless construction.

tion, *mutatis mutandis*, also holds for the biological function of Self-consciousness in all of its manifestations.

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Dept. Animal Physiology,
University of Nijmegen, The Netherlands

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