# Some aspects of phenomenal consciousness and their possible functional correlates

**Odmar Neumann**

**Department of Psychology**

**Bielefeld University**

Paper presented at the conference "The phenomenal mind – how is it possible and why is it necessary?" Center for Interdisciplinary Research (ZiF), Bielefeld, May 14-17, 1990.

## Introduction

When Gertrude Stein was dying, several of her friends and followers were around her. The mood was very spiritual, and someone, perhaps hoping to learn something about eternity from Gertrude's near-death experience, asked her "Gertrude, what's the answer?" Upon which Gertrude Stein opened her eyes for a last time and snapped back "What's the question?"

Indeed, it is sometimes not so easy to find out what the question is. The organizers of this conference have provided us with two questions as a guideline for our work: "The phenomenal mind – how is it possible, why is it necessary?" This is the kind of questions that philosophers like to ask, and it is their duty to ask them. However, as an empirical scientist, I would like to substitute them by two slightly different questions.

- What is phenomenal consciousness like? That is, what are its characteristic properties?
- What could phenomenal consciousness be for? In other words, what could have been the evolutionary advantage of inventing those functions that are accompanied by phenomenal consciousness?

Note that these questions refer to phenomenal consciousness, not to the phenomenal mind. I have two reasons for not using the term "phenomenal mind" in the present context:

First, the term "mind" is heavily loaded with philosophical connotations. It is difficult to avoid one or the other kind of dualism when using it. Today this is not so much the ontological dualism of the Cartesian brand, but what might be called a functional dualism: On the one hand the brain that is modular in its structure and parallel in its working; and on the other hand serial processing within a unitary consciousness system that controls, plans etc., and that resides somewhere within the brain. I do not think that this assumption is warranted; and I will have to say something about this towards the end of this talk. This is one reason for not speaking of the "phenomenal mind" when referring to phenomenal consciousness.

The second reason is that there exists a sense in which it does seem appropriate to use the term "phenomenal mind". But it is different from what this conference is about. Whenever I do not intend this particular meaning of the term "phenomenal mind" (which I will explain and discuss in the next section), I will speak of "phenomenal consciousness", and what I mean by this is the phenomenal aspect of consciousness, that is, awareness.

So what is awareness like, and what could awareness be good for? The first question refers to phenomenology, the second to function. What I will try to do is draw some connecting

lines from phenomenology to function. I believe that much of the argument could also be made on the basis of objective evidence (see Neumann, 1987, 1990, in press); but phenomenology has its own charm, and maybe we neglect it a bit in present-day research. Of course phenomenology can only offer hints, that need to be substantiated by other data.

**Some phenomenal aspects of consciousness**

In the following I discuss what I consider four characteristic properties of phenomenal consciousness. I will first present them with brief commentaries and then discuss each of them in more detail.

(1) "The content of phenomenal consciousness is *part of* a model of the world"

I have put this statement in quotation marks, because I have taken it from Yates (1985). However, I have inserted "part of" which, I think, is a decisive difference. Also, Yates says "awareness" instead of "phenomenal consciousness". As I have mentioned, I will use these terms interchangeably.

(2) Phenomenal consciousness consists of a sequence of episodes. The "stream of consciousness" may be an illusion.

This statement refers to a logical distinction that, I believe, is of utmost importance for an understanding of phenomenal consciousness: We do not have "direct access" to the properties of phenomenal consciousness. We are conscious of things, events, fears, toothakes etc.; but we are not – at least not normally – conscious of consciousness. Hence what we *believe* to happen in phenomenal consciousness can be at variance with what *actually happens*.

(3) New contents of phenomenal consciousness tend to replace previous contents instead of being added to them.

This is what we call in German "Enge des Bewußtseins", a translation of the Latin term "limitatio (attentionis, conscientiae)". I am not sure about the correct English translation; perhaps "narrowness of consciousness". This property of phenomenal consciousness has played a great role in 19$^{th}$ century theories of the mind, for example in Herbart's mathematical theorizing about the competition between ideas, or in Theodor Ziehen's theory of mechanisms of association.

(4) Any content of phenomenal consciousness can be related to any other content.

This is the "unity of consciousness" that has been the subject of philosophical theorizing since ancient Greek philosophy. I think the correct statement is "*can be* related", not "*is* related". Metaphorically speaking, there is free trade between contents of consciousness, not a centralistic administration that forces them together.

Now some more detailed remarks on these four properties of phenomenal consciousness:

(1) "The content of consciousness is part of a model of the world".

I have two comments. First, we do not need sensations in order to perceive objects; we do not have to be conscious of our inner world in order to become conscious of the outer world. This is a fact that has been stressed by many phenomenologists, for example Wolfgang Köhler, Wolfgang Metzger and James Gibson. Their reason for stressing it was that there has been a long philosophical tradition of asserting the contrary – from Descartes and Berkeley to Malebranche, Condillac, Reid, Brown, and finally to Helmholtz, Wundt and Titchener (see e.g. Neumann, 1972).

These philosophers and their psychological followers were convinced that the world as we experience it is not immediately given, but derived. Immediately given are the sensations or other elements that the mind finds *in itself*. They are the raw material from which the mind creates the experienced world – by means of mechanisms such as projection, association, judgment and unconscious inference. The assumption behind this doctrine was that the mind can be conscious only of what is within it, not of what is outside of it; hence the outer world must by necessity be something secondary – derived, constructed, assumed or, to use Fichte's formulation that is difficult to translate, "vom Ich gesetzt" – roughly, appointed by the ego.

As has been shown, among others, by the Gestalt psychologists, this doctrine rests on a logical fallacy, namely a confusion between the phenomenal and the physical world: There is a physical organism with a physical brain in the physical world. Corresponding to, and presumably depending on, certain processes in the physical brain, this organism possesses a phenomenal world. It consists of a phenomenal outer world and a phenomenal self.

From the standpoint of the outside observer, both – the phenomenal outer world as well as the phenomenal self – are inside the head of a person. From the standpoint of the person, the phenomenal self is part of the phenomenal world, equal in status to the phenomenal outer world. Conscious access to the phenomenal self is no more direct or indirect than access to

the phenomenal outer world, and we do not construct a phenomenal outer world on the basis of knowledge about the phenomenal self.

The logical confusion arises when one equates the phenomenal outer world with the physical world, i.e., when phenomenology and epistemology are confounded. The epistemological question is how the phenomenal outer world relates to the physical world. This is different from the question of how the phenomenal self – e.g., sensations – relates to the phenomenal outer world – e.g. objects. Berkeley, Malebranche and their followers treated an epistemological problem (How can we perceive objects and events, although our senses register but sensory impressions?). They believed (probably correctly) that we infer the physical world from the phenomenal outer world (the "Ding an sich" from its "Erscheinung", in Kant's terminology). They were, however, wrong in believing that we infer the phenomenal outer world from the phenomenal self.

The two components of the phenomenal world (self and outer world) can be further subdivided:

In the outer world there is, first, the observable physical environment – what I can see, hear and touch; for example, this room and the people in this room. There is further – as the next layer of the onion, so to speak -, the geographical environment – this conference building, Bielefeld, Germany, Europe, the globe, and so forth. Then there is what might be called "die Welt des objektiven Geistes" – Popper's "world 3", the world of objective ideas, principles, values, and so on. This is also part of my phenomenal outer world; notwithstanding the question of whether "World 3" has a "platonic" existence in addition. (Personally, I am not a platonist. I believe that what gives "World 3" the appearance of objectivity is the fact that it is shared by many people and is therefore not attributed to the self). Further components of the phenomenal world are ordered along the time dimension; for example, my episodic memory contains records of past events.

Similarly, the self can be subdivided. There is the phenomenal body, where most sensations are localized – touch, pain and so on. And there is the phenomenal mind, to which belong my moods, my plans, and my thoughts. The dividing line between the phenomenal body and the phenomenal mind is difficult to draw. For example, moods and emotions have bodily concomitants. (Indeed, it can and has been maintained that all contents of the phenomenal mind are bodily. This has, for example, been the position of sensualism. If we believe the sensualists, the phenomenal mind is nothing but a component of the phenomenal body).

This is why I hesitate to use the term "phenomenal mind" in the sense in which it has presumably been meant by the organizers of this conference. What they have had "in mind" is, I suppose, not the phenomenal mind as I use the term here but phenomenal consciousness – the whole onion that encompasses the phenomenal world, and not just the inner kernel.

"The whole onion" is, however, not entirely correct. The phenomenal world consists of components that we *can* be conscious of; but we certainly *are* not conscious of all these components simultaneously. So this is my second remark about the first statement: The phenomenal world is largely "preconscious", in Sigmund Freud's terminology. For this reason I have added "part of" to the title of Yates' above-mentioned paper. Phenomenal consciousness has the character of the successive coming into focus, and fading out of focus, of different components of the phenomenal world, to use a time-honored metaphor.

This process of contents entering and leaving phenomenal consciousness has been described by many writers, and by some psychologists. Among the latter has been Wolfgang Köhler. On the first page of "Gestalt Psychology", Köhler describes the moment when he starts drafting the book. There is

> "... a blue lake with dark forests around it, a big, gray rock, hard and cool, which I have chosen as a seat, a paper on which I write, a faint noise of wind which hardly moves the trees, and a strong odor characteristic of boats and fishing. But there is more in this world..."; namely, remembrances of another lake in Illinois, a feeling of health and vigor, and finally, says Köhler "... something like a dark pressure somewhere in my interior which tends to develop into a feeling of being hunted – I have promised to have this manuscript ready within a few months" (Köhler, 1947, page 7).

Interestingly, Köhler does not stress the sequential character of his becoming aware of these components and aspects of phenomenal consciousness. Indeed, they are *phenomenally simultaneous* in the sense that Köhler knows and feels all of them to coexist in the phenomenal world and his phenomenal self. Nevertheless, common experience tells us that it takes considerable time, and some shifting of attention, before a person can possibly have become aware of all the subtle aspects that Köhler mentions. This is no contradiction at all. We must not confuse the sequence of phenomenal experiences with the phenomenal experience of a sequence (see Neumann, 1982). The parts and aspects of the phenomenal world that come into focus and go out of focus are not perceived as appearing and disappearing. Why should they? That which is represented (the phenomenal world) need not

mirror the properties of the process by which it is represented. (To briefly depart from phenomenology and look forward to function: It is indeed the nature of a scanning-like process that the sequence of scanning operations is *not* represented in the result of scanning; see Neumann, 1990).

This gets me to the second statement: "Phenomenal consciousness consists of a sequence of episodes. The 'stream of consciousness' may be an illusion".

What are the characteristics of this sequence of coming into focus and going out of focus of different components of the phenomenal world? The probably most often used metaphor is the "stream of consciousness". The implication is that there is continuity – the contents are changing, but consciousness as such is continuously there, as long as we are awake.

It seems that relatively few phenomenological analyses have doubted this. However, it may be wrong. Among the authors who have voiced a different opinion was the German poet Arno Schmidt. He writes:

> "... does one have the feeling of an "epic flow" of events? Of a continuum at all? This epic flow ... does not exist at all. May everyone compare his own, damaged mosaic of a day! The events of our life rather leap. (...) From this porous structure ... of our feeling of the present results an existence full of holes" (Schmidt, 1959, page 290; translation mine).

Suppose that Arno Schmidt is correct. What could then be the reason for the usual – illusory – assumption that there is a continuous flow of consciousness? The reason is fairly obvious. To illustrate, consider the following two analogies:

First, the well-known example of the blind spot in the retina. There are no receptors in the retina in the region where the nervous opticus leaves. Hence we are functionally blind in this area. Nevertheless, we don't see a hole in the world at the corresponding position. As Gibson has pointed out, this is because to see a hole we need information that specifies a hole, and receptors that respond to this information. If there is no such information, and if there are no such receptors, then no hole can be seen. Hence we perceive the visual world as continuous.

Similarly, suppose that there are holes in the sequence of conscious events. We could not be conscious of them, because we obviously cannot be conscious of a period when we are not conscious. Holes *in the stream of consciousness* cannot logically be represented as holes *that we are conscious of*. (As Wittgenstein has remarked, death is not an event of life. This was a logical statement, not a metaphysical one).

How should be test whether such a period is happening? In order to do the test at a given moment, we need to be conscious in the first place. This means that the result of the test has already been determined when the conditions for carrying it out are fulfilled. This can be illustrated by a second analogy, the lamp in the refrigerator. Suppose I doubt that the lamp is off when the door is closed. How to test this suspicion? Whenever I look into the refrigerator in an attempt decide the question, the lamp will be on!

Probably there are other, indirect means of testing whether the lamp goes off when the door is closed. Similarly, we can try to reconstruct the sequence of conscious events by testing, for example, what we remember and what we don't. It seems that very few systematic investigations have explored this. There is some evidence that we can perform relatively complicated actions such as writing down dictated words without being conscious of their meaning (e.g., Hirst, Spelke, Reaves, Caharack, & Neisser, 1980). But this is not yet conclusive evidence. A more intriguing finding is a result from Wulf-Uwe Meyer and his collaborators, who asked subjects to report the position of a dot to which they had immediately before reacted by pressing a button (Niepel, Rudolph, Schützwohl, & Meyer, 1990). When this question came without warning, subjects could in the majority of cases not give a correct answer. However, performance improved dramatically when an unexpected change in the display had occurred together with the presentation of the dot.

One possible interpretation of this is that conscious episodes occur whenever something new or unexpected happens. I will shortly return to this possibility. For the moment, the conclusion is that the continuous flow of consciousness is far from certain and may well be illusory. At least we have no positive evidence for it.

The remaining two statements can be treated more briefly. They refer to those characteristics of phenomenal consciousness that have been considered and discussed since the beginnings of philosophy:

"New contents of phenomenal consciousness tend to replace previous contents instead of being added to them". This is the narrowness of consciousness. Today it is often referred to as "limited capacity". "Any content of phenomenal consciousness can be related to any other content". This, I believe, is what we mean by "unity of consciousness".

Historically, the metaphysical interpretation of this has been that the soul is "simple", "invisible", and the like. Today we know that this is not strictly true, even if we disregard the metaphysical connotations. The mind can be surgically dissected by severing the corpus callosum. Initially it was believed that this restricts phenomenal consciousness to the left

hemisphere; but meanwhile we have excellent evidence that both hemispheres of split-brain patients enjoy phenomenal consciousness. But they cannot communicate. In my view, this does not mean that split-brain patients have something like two minds. It simply means that they are aware of things that they cannot put together. A similar dissociation can be observed in hypnotic trance.

It has long been suggested that the narrowness and the unity of consciousness are not independent, that they are perhaps even two sides of the same coin. There is, for example, an extremely sophisticated discussion in Aristoteles' "Peri Psyches" and in one of his minor works "Peri Aistheseos Kai Aisteton". Aristoteles shows that one sensory impression tends to inhibit another impression and then suggests the possibility that this mutual inhibition can be overcome by integrating them into a common sensory object. Thus, there is already the idea that the narrowness and the unity of phenomenal consciousness may be functionally interrelated.

From a modern point of view, the narrowness and unity of consciousness present a particular challenge in view of the functional organization of the brain. It seems clear that the brain is a highly modular system with a highly parallel mode of operation. If the properties of phenomenal consciousness reflect the structure and the working of the brain, then we would expect consciousness to also exhibit a considerable degree of parallel processing. Similarly, the unity of consciousness is difficult to reconcile with the modular organization of the brain. It is, to use a formulation of Daniel Dennett, as if consciousness were the emulation of a serial computer on a parallel machine.

In computation, we are forced to emulate parallel processing models – for example, connectionist models – on serial machines because we do not yet have the appropriate parallel computers. But what should have provoked evolution to develop the opposite kind of emulation? Why should consciousness be limited in capacity and serial when the brain is not? Why should consciousness exhibit unity when the brain has, for excellent functional reasons, this modular organization? This gets us from phenomenology to function.

## Some possible functional correlates

It seems that there are two ways of trying to understand the discrepancy between the presumable structure and functioning of the brain and the properties of phenomenal consciousness. First, there is the option that consciousness reflects not the general properties of the brain, but the properties of a particular subsystem that is not modular and parallel, but

unitary and serial. There are several candidates for such a subsystem. It has often been related to speech, especially inner speech, and/or to some kind of central executive whose task it is to control the rest of the system.

This is a presently very popular assumption. It is, however, not the only possible one. Alternatively, it could be that consciousness corresponds not to a particular *subsystem* of the processing system, but to a particular *state*, or mode of operation. I believe that this alternative view is worth considering. This is, first, because the other view – let me call it the "system" view of consciousness – cannot easily account for some empirical findings. Second, there are also positive arguments that favor the "state" view. Among them are, I believe, the phenomenal aspects that I have discussed in the first part of this talk.

So, first, some critical comments on the "system" view (for a more detailed discussion see Neumann, 1987). Is phenomenal consciousness serial because language is serial? This seems rather unlikely. Phenomenal consciousness does not seem to be closely tied to the language faculty. True, our ability to *communicate* contents of consciousness depends critically on language; and it may well be true that the outer layers of the phenomenal world – e.g., knowledge that transcends the physical environment, especially Popper's "World 3" – could not exist without language. But phenomenal consciousness as such – awareness – does not disappear when the language function is destroyed or severely impaired; and as already mentioned, the right hemisphere, which has only rudimentary linguistic capabilities in right-handers, does not seem to be devoid of phenomenal consciousness.

Does phenomenal consciousness correspond to the activity of some central control system in the brain? It does not seem so. First, there is no known neuroanatomical structure in the brain that would qualify for such a system. The forebrain has sometimes been suspected to be a candidate. It is true that lesions in the frontal lobes affect the ability to plan and execute actions; but they do not seem to impair phenomenal consciousness in general.

Second, there is what may be called a double dissociation between phenomenal consciousness and the planning and control functions that such a central executive would have to perform. In neuropsychology, "double dissociation" refers to the case that function A is preserved although function B is impaired, and vice versa, function B is preserved although function A is impaired. In our case, the double dissociation consists in the fact that, on the one hand, many planning and control functions can be performed without phenomenal consciousness, and on the other hand phenomenal consciousness is not restricted to planning and control. The latter is fairly obvious. Recall the statement that the contents of

consciousness are part of a model of the world. In other words, phenomenologically, consciousness is much closer related to perception than to action. There is little planning and control when we experience a toothake. On the other hand, action planning and problem solving can occur 'in the background', with no conscious involvement. For example, the solution to a problem often 'comes to mind' as a result of a problem-solving process that we were not conscious of.

Third, there are functional properties associated with phenomenal consciousness that do not fit into the idea of a central executive. For example, its surprising latency. There is converging evidence from experimental psychology and electrophysiology that it takes about 200 to 500 msec for a sensory stimulus to appear in phenomenal consciousness – much too late for a central executive to take the appropriate action. For simple timing reasons, we must assume that much of the translation of sensory information into action control is not mediated by a conscious representation (see Neumann, 1989).

There are a lot more arguments against a "system view" of phenomenal consciousness. I will not mention them (see Neumann, 1987) but instead turn to the alternative, i.e. the possibility that phenomenal consciousness corresponds to a state or mode of operation rather than to a subsystem within the system.

This idea can probably be concretized in many ways. Let me sketch one possibility. It is admittedly speculative, but I think that it accounts well for the phenomenological aspects of consciousness. I mention it mainly to demonstrate that there is an alternative to the "system" view. What follows is something like an evolutionary just-so story, similar to mythologies about how the world was created. So, how was consciousness created?

The main suggestion is that consciousness has evolved from simple roots in a type of evolutionary process that is called exaptation by biologists. It refers to the commonly observed case that, during evolution, already existing mechanisms come to be used to serve new functions. The more detailed assumptions are these:

First, phenomenal consciousness occurs if, and only if, a person – and possibly any higher animal – is engaged in a particular activity. This activity is the updating of an internal representation of the world. The phenomenal equivalent of this internal representation is what I have called the phenomenal world.

Second, one phylogenetic root of this updating activity is the orienting response. It is elicited by a sufficiently sudden and/or intense and/or important change in the environment. The orienting response has several components: Ongoing activity is interrupted; there is an

increase in general arousal; and the animal turns towards the source of stimulation. This situation is – I am speculating! – associated with some primitive form of consciousness. Thus, initially, consciousness occurred in the form of scattered, isolated episodes.

Third, during the evolution of higher vertebrates, this relatively primitive reaction has developed into exploratory activity. Unlike the original orienting response, this is internally controlled behavior that serves to update the internal representation even in the absence of specific eliciting stimuli. As a result, the scattered episodes of consciousness cold turn into l longer periods of consciousness. At the same time, the power to internally represent the world increased tremendously, due to the faculty to systematically explore the environment. There is a mutual dependence between exploration and representation: While exploration serves to create and update the internal representation, the latter is needed to guide and control exploration (see Neumann, 1990).

Fourth, some mammals have developed an eminently efficient instrument for the updating of the internal representation of the world. They posses highly mobile eyes that, by means of saccades, perpetually scan the visual environment. This incessant exploration is a peculiarity of vision, and within vision of a few highly developed mammals, in particular primates. The functional organization of their retina (high-resolution fovea and low-resolution periphery) is ideally suited to elicit and subserve this kind of continuous exploration (Wolff, 1984). Based on this enhanced capacity for exploration, the periods of consciousness could turn into longer, perhaps sometimes almost continuous, states of consciousness. (Incidentally, this speculation may offer a clue to why dream consciousness is usually accompanied by rapid eye movements (REMs)).

This extended exploratory activity should produce something like a stable awareness of the outer world, at least of the physical and the geographical environment. This does not yet explain other components of the phenomenal world , such as the phenomenal self, the phenomenal mind and our phenomenal representation of Popper's "World 3". These, I believe, do not belong to the evolutionary story. They are acquired during the ontogenetic development of the human in a cultural environment.

Likewise, the speculation as sketched here does not account for the fact that we can be conscious of what seem to be purely 'inner' phenomena such as images and thoughts. Analyzing how these develop and which functions they serve is beyond the scope of this talk. (For some speculations see Neumann, 1983). Let me only point out that these phenomena and the corresponding mental functions are most likely phylogenetically as well as

ontogenetically late acquisitions. The fundamental mistake of many theories of consciousness – most notably of Descartes' concept of 'res cogitans' – has been to take them as a *starting point* for an analysis of consciousness, or to even regard them as its defining properties.

I will not further pursue this. Instead, let me return to the four more fundamental properties of phenomenal consciousness that we started with. One thing that I like about the evolutionary speculation that I have sketched is the fact that it fits nicely with these properties:

(1) "The content of consciousness is part of a model of the world": According to the speculation, to be conscious of something means to integrate it into the appropriate portion of the phenomenal world. This implies that, if this integration is prevented or cannot take place, then the information may still be analyzed, and be used for action control, but it will not be represented in consciousness. This is in full agreement with the results from dissociation studies. In blindsight, hemineglect, and amnesia, information can be used to guide action and/or to develop a skill. What these patients lack, however, is the ability to integrate this information into a representation of the world (e.g. Weiskrantz, this conference). According to the present interpretation, this is the functional equivalent of the phenomenal fact that they are not aware of it.

(2) "The stream of consciousness may be an illusion": According to the speculation, consciousness evolved as an alternative to immediate action: When an unexpected event triggers an orienting response, then ongoing activity has to be stopped. Thus, consciousness episodes should have been relatively rare at the beginning of this evolutionary process. Primates may be conscious of their environment most of the time, because exploration by means of saccades is compatible with other ongoing actions; but still it remains true (according to the speculation) that continuity is no characteristic property of phenomenal consciousness.

(3) "New contents of phenomenal consciousness tend to replace previous contents instead of being added to them" (narrowness of consciousness"): According to the speculation, this characteristic of phenomenal consciousness has nothing to do with limited capacity or serial processing. It results from the fact that orienting as well as exploration are actions that can be controlled by only a small portion of the whole stimulation at a time, as is the case for all actions (see Neumann, 1990). Hence, the narrowness of consciousness is simply a special case of our general physical inability to do many things at once.

(4) “Any content of phenomenal consciousness can be related to any other content” (unity of consciousness). This is perhaps the biggest puzzle, as has already been recognized by Aristotle in his discussion of “koine aisthesis”, the common perceptual faculty. According to the speculation, the clue to this riddle may reside in the biological function of the orienting response. When something unexpected happens, then an animal must not only interrupt its ongoing activity, but also decide about an adequate reaction to the new situation. In other words, this is a situation where routine behavior is insufficient. Ideally, the whole internal representation of the world should be available as a potential source of knowledge for deciding about an adequate response. (Indeed, the whole point of an internal representation is that it is not tied to any particular type of action but available for controlling all kinds of actions, similar to a data bank or public domain software).

Or, to use a different metaphor: When a ship is on course and everything is fine, then the crew can go about its business in a modular, distributed manner: Each team of sailors works on their particular task. But suppose that an emergency arises. Then the system has to shift from modularity to cooperation. All teams have to communicate and develop a common strategy to cope with the new situation. Something similar, I believe, happens when we are conscious. *How* it happens is, of course, another matter.

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