

## Cognitive Phenomenology: Marriage of Phenomenology and Cognitive Science

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**Abstract:** Cognitive phenomenology is a particular variant of phenomenology originally articulated by philosophers and further developed to work in conjunction with cognitive science. Based on strict method it is suited to work with a science that takes person-in-situation as its unit of analysis and acknowledges that persons act in their subjective lifeworlds rather than in objectively given material environments. The phenomenological part of cognitive phenomenology constitutes an important instrument in the service of educational psychologists, particularly those interested in a modern theory of aptitude. The method distinguishes itself from introspection and naturalistic description that use "phenomeno" (-logy, -graphy) in their name.

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## 1. Toward an Integration of Methods

At present, there is a gap between experience and the description of associated mental or cognitive events: this gap constitutes one of the hard problems in cognitive science (CHALMERS, 1995). Cognitive phenomenology, the marriage of (HUSSERLIAN) phenomenology, a unique and privileged method of describing the first-person nature of consciousness, and cognitive science, is a methodological remedy for this problem (VARELA, 1996).<sup>1</sup> This brand of phenomenology differs from other first-person methodologies in that it is more rigorous and based on common scientific processes of validation and consensus formation (BAYNE, in press; VERMERSCH, 1996). It is a natural complement of experimental studies of knowing, learning and instruction. The cognitive sciences (including [educational] psychology) on their own are limited and benefit from an encompassing and comprehensive research program involving phenomenology (SNOW, 1992; VARELA, 2001; VERMERSCH, 1999). This paper therefore is centrally concerned with phenomenology as method that can contribute to cognitive science to create an integrated, better science of knowing, learning and instruction. [1]

### 1.1 First- and third-person methods

Cognitive phenomenology is a method of studying knowing, learning, and instruction through the employment of first- and third-person methods. By first-person method I mean a scientific process of studying experiential phenomena that are relevant and manifest for the researcher as self and subject; the phenomena have a subjective side. First-person methods study human activities not merely by taking the perspective of the actor as GRAUMANN (2002) describes it, an actor who always has this or that experience; rather, first-person methods in cognitive phenomenology strive for categories that explain why and how I have my particular experiences. By third-person method I mean a scientific process (or processes) that distinguishes between researchers and researched. In its present instantiation, both aspects of the cognitive phenomenological method draw on means to achieve publicly shared and agreed-upon observations and meanings. Third-person methods are not interested in how this or that individual actually perceives a problem or feels at a given moment, but in deriving general response patterns where the specifics of individual experience are noise and therefore have to be averaged out. The line of rigor and lack of it does not lie between first- and third-person accounts but rather on whether descriptions are based on clear methodological grounds leading to a communal validation and intersubjective knowledge. [2]

Experimental-quantitative (third-person) and interpretive-qualitative (first-person) methods of conducting research on knowing, learning and instruction have often been pitted against each other—most visibly and pronouncedly in the public debate referred to as the "science wars" (e.g., GOULD, 2000) and in early

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1 VERMERSCH (1999) uses the term *psycho-phénoménologie* (psycho-phenomenology) as a way of marrying phenomenology and psychology. I will use cognitive phenomenology because cognitive science includes psychology as a contributing discipline.

textbooks on qualitative inquiry (e.g., LINCOLN & GUBA, 1985). Having been trained as a statistician and developed expertise in a variety of qualitative methods common to sociology, social (discursive) psychology, and linguistics, I do not consider quantitative and qualitative methods as incompatible. I have always chosen the most appropriate from the panoply of methods. My research questions drive method rather than the other way around. The need to integrate a wide variety of research methods to construct more complete understandings of complex phenomena was articulated by the late Richard E. SNOW, an educational psychologist at Stanford, who was working towards a modern theory of aptitude. Although this position finds an increasing number of adherents in diverse fields including artificial intelligence (e.g., AGRE & HORSWILL, 1997), very few researchers and practitioners in education hold it tenable. [3]

SNOW (e.g., 1992) emphasized the transactional nature of aptitude according to which performance is the result of non-additive, "reciprocal, adaptive relationship between persons and situations" (p.7). SNOW's definition struck me again during a recent stay abroad. Being an avid and experienced hobby cook I offered my hosts to prepare several evening meals. Whereas visitors at home always praise my cooking, I felt that I failed in my hosts' kitchens (despite their assertions to the contrary). If a researcher with a bird's-eye perspective had used my cooking results as an indication of my ability (aptitude) and, perhaps, correlated it with some other variables, I would have scored poorly, or at least done less well than I would have in my own kitchen. How performance in a test situation relates to performance in everyday familiar situations is not normally evaluated, and will differ for different individuals. I could have easily blamed the unfamiliar kitchen. But this would not have changed matters much, practically or theoretically. What does matter, however, is the fact that my cooking rapidly changed over the one-week stay: the kitchen changed and became a better tool for converting my recipes into dinners. [4]

A good theory explains not only general aspects of cognition and learning but also particular instances (HOLZKAMP, 1983). What matters in adaptive teaching are the particulars of subject matter, time, place, and students (SNOW, 1997), which requires theories that not only provide general tendencies but also have something to say about the situational particulars. To understand my cooking away from home, we need to take into account the history of my cooking and what brought to the situation and also what the particular situation allowed me to do. More so, the way the kitchen appeared to me in the process of cooking better explain my cooking and its results than the objective properties of my hosts' kitchen. Much of the processes of knowing and learning in this case may have been lost had the researcher used abstracted my performance from the particulars of the setting. However, working in tandem with other meaning-oriented methods, the same researcher might be able to quantify aspects of the person-in-situation ecology, that is, Michael-in-the-foreign-kitchen. [5]

## **1.2 Overcoming the subjective (first-person)/objective (third-person) divide**

The re-emergent interest by cognitive scientists in phenomenology as a method of scientific inquiry is associated with an increasing recognition that even knowing and learning cannot be understood and usefully modeled when the brain (mind) is taken as the unit of analysis studied by the outside observer (third-person). A phenomenological approach promises to lead to descriptions of the conditions that lead to specific individual and subjective experience (first-person). Continental phenomenology had proposed person-in-situation as irreducible unit of analysis for understanding, among others, cognition, emotion, interpretation, and common sense (HEIDEGGER, 1977). Focusing on person-in-situation means that scientists focus on how the world appears to the specific individual (first-person) rather than how the world appears as described by "objective" physical parameters (third-person). Scientists with very different theoretical commitments and methodologies, including cognitive science (VARELA, THOMPSON, & ROSCH, 1991), experimental psychology (O'REGAN & NOË, 2001), anthropology (LAVE, 1988), artificial intelligence (AGRE, 1997), visual science (PESSOA, THOMPSON, & NOË, 1998), robotics (BROOKS & STEIN, 1997), neuroscience (RIZZOLATTI, FADIGA, FOGASSI, & GALLESE, 1997), and science education (ROTH, MCROBBIE, LUCAS, & BOUTONNÉ, 1997a) now make person-in-situation its basic premise (unit of analysis) for studying knowing, learning and instruction. Many explicitly ground their work in, confirm results of, and model descriptions of experience derived by phenomenology, though for some, the main trust of phenomenology is on its value as method rather than as a body of research on cognition (VARELA, 1996). [6]

Educational psychologists such as SNOW (1992) have shown interest in phenomenology because statistical analyses and retrospective process analyses alone are insufficient to constitute and support a modern aptitude theory. Thus, "The ubiquitous complexity of ATI [aptitude-treatment interaction] makes conventional hypothesis-testing methodologies inadequate, not only for ATI research, but for educational psychology in general" (p.11). Insufficiency and inadequacy arise from the fact that aptitude-treatment interaction studies assessed performance from a distance by estimating the amount of variance that person (propensity) and situation variables jointly account for (CORNO et al., 2002). What a modern aptitude theory requires are methodologies that elicit first-person accounts of human experience and provide structural descriptions thereof. Good descriptions are necessary as data for scientific modeling of cognition, because people act in their perceived worlds not in the scientifically shared world of objective stimuli. [7]

## **1.3 Overcoming the subjective (first-person)/objective (third-person) divide**

There are two complementary parts to the cognitive phenomenological method. The first part consists in articulating the structures that characterize the person-in-situation unit; these structures are referred to as lifeworld (AGRE & HORSWILL, 1997). Thus, a lifeworld description of my earlier described cooking experience would include (a) objects and events as these were perceptually

salient to me, (b) patterns in my actions, and (c) changes in the items under (a) and (b). Simply asking cooks or other practitioners does not yield the necessary data unless these are specifically trained in the phenomenological method, for there is a general recognition that even accomplished masters of some trade—drawing on naïve psychological and sociological concepts and theories—provide very unreliable and inaccurate descriptions of their praxis (HOLZKAMP, 1983). This part of the phenomenological method therefore aims at articulating the lifeworlds from a shareable, scientifically sound third-person perspective. The second part is concerned with a scientific first-person account of both the contents and processes of experience. Everyday first-person descriptions are inherently subject to the person's pre-understandings. A scientific phenomenology confronts and overcomes the pre-understandings a researcher brings to a phenomenon. Philosophers, sociologists, and psychologists recommend a variety of methods and stances: *epoché*, that is, the suspension of habitual thought and judgment (HUSSERL, 1960), radical doubt (BOURDIEU & WACQUANT, 1992), and suspicion of ideology (MARKARD, 1990). [8]

Both parts of the method emphasize detailed observation and recording, a bracketing (suspension) of common, received ways of viewing and explaining, and subsequent validation processes all of which, ultimately, are accessible to and replicable by other researchers. The approach emphasizes the dynamic relationship between the two modes of investigation: "The lifeworld ontology guides the sciences, which in turn provide clues for the constitutive-phenomenological undertaking" (VARELA & DEPRAZ, 2000, p.155). The two parts, lifeworld analysis and first-person method, constrain and benefit from one another. Two types of data are required: (a) videotaped records of one or more persons acting in a particular setting over a period of time, sufficiently detailed to reconstruct the lifeworld and changes thereof; and (b) detailed observations and records regarding the researcher's personal experiences in a domain that has relevance to the data under (a). In the following two sections, I articulate both aspects of the approach before moving on to the description of a recent investigation concerning the perceptual experience during open-inquiry science investigations. I conclude by relating cognitive phenomenology to other research methods. [9]

## **2. Cognitive Phenomenology as Third-Person Method: Lifeworld Analysis**

### **2.1 Background**

Increasingly cognitive scientists agree that to understand knowing and learning, one needs to make person-in-situation the fundamental unit of analysis (e.g., BALLARD, HAYHOE, POOK, & RAO, 1997). Here, the "situation" is not given in an absolute sense, for example, by a scientific description of the physical setting (including the "task"), but by the situation as it appears to the person, that is, by a description of person-in-situation transactions. Analyses of person-in-situation transactions therefore include the conventions and invariants maintained by persons throughout their activity; this extended notion of situation has been

referred to as "lifeworld." The term, originally coined by phenomenological philosophers (LYOTARD, 1991) and phenomenological sociologists (SCHUTZ & LUCKMANN, 1979) to describe the familiar world of everyday life—is used in artificial intelligence and cognitive science to refer to the "environment described in terms of the customary ways of structuring the activities that take place within it—the conventional uses of tools and materials, the 'loop invariants' that are maintained within it by conventional activities, and so on" (AGRE & HORSWILL, 1997, p.114). Different people may inhabit the same physical environment and take this environment as shared but simultaneously inhabit different lifeworlds: "It is as wrong to assume that perspectives are completely unique as it is to assume that they are all the same" (CORNO et al., 2002, p.226). To me, an experienced hobby cook, my kitchen constitutes a different lifeworld than to my wife, an occasional cook, despite a similar amount of time that we have spent there. My kitchen lifeworld offers me opportunities for acting that are not offered to her. At the same time, a similarly experienced and competent cook new to my kitchen experiences a lifeworld quite different from my own. To researchers interested in knowing and learning, all three lifeworlds are of interest, requiring a close analysis of how the same physical environment (kitchen) offers different opportunities to different people and how these opportunities change over time. Because "Real lifeworlds and real activities incorporate a great deal of useful dynamic structure ... any effort we invest in studying that structure will be repaid in parsimonious theories about [cognitive] machinery" (AGRE & HORSWILL, 1997, p.119). [10]

## 2.2 Reconstructing lifeworlds

Gestalt theorists noted that an individual does not perceive some situation at once and in all its detail, but that some entities become salient as figure that stands against a more or less diffuse ground (e.g., MERLEAU-PONTY, 1945; WERTHEIMER, 1985). Individual actors perceive and act toward this figure, which in turn shapes their activities and their learning. Therefore, understanding the nature of figure-ground relations from the perspective of the individual has to be the analyst's central concern. What is currently figure depends on an individual's past experiences, as well as her current goals and intentions. What entities are salient is contingent both in nature and extent; consequently, the figure constitutes a continuously changing field of attention. But if individual social actors are attuned to different attentional fields (i.e., when there are figure-ground shifts) their cognition changes so that the analyst will (have to) be attuned to these different fields in a similar way (SNOW, 1992). The analyst therefore has to find, from the documentary records, what is salient to the individuals she studies. Elsewhere, I articulated and exemplified in great detail how the analyst proceeds to identify the nature and content of the figure-ground relation of the social actor (student, teacher) and how the analyst chooses the level at which to analyze figure-ground relations that to understand the ongoing event (ROTH, 2001b). [11]

The phenomenological method does not require participants and researchers to perceive (stimuli, setting, tasks) in the same way. Having extensive longitudinal data allows researchers to reconstruct likely versions of the subject's lifeworld as

it unfolds and develops. Constraints on present lifeworlds can be made particularly when videotapes exhibit "aha" experiences or abrupt changes in actions—in these moments, the person-in-situation undergoes significant change corresponding to changes in the lifeworld. "Surprise is a wonderful dependent variable, and should be used more often in experiments; it is easy to measure and is a telling betrayal of the subject's having expected something else" (DENNETT, 2001, p.982). The ultimate goal of the method is to articulate historically unfolding lifeworlds in sufficiently detailed manner so that they lend themselves to formal models (neural networks, mathematical [catastrophe-theoretic] models), which requires a high degree of precision regarding (a) just what people perceive and know and (b) where this knowledge is represented across the person-in-situation unit (DEVLIN & ROSENBERG, 1996; ROTH, 2001a). [12]

### **3. Phenomenology as First-Person Method**

The second goal of cognitive phenomenology is to provide rigorous (repeatable and confirmable) first-person accounts of experience that—after being triangulated with the described lifeworld analyses—are sufficiently precise to lend themselves to mathematical modeling (e.g., PETITOT, 1994) or to figure as complements to experiments in neurophysiology (VARELA, 1996) and vision science (e.g., O'REGAN & NOË, 2001). [13]

#### **3.1 Recurrent, reflexive analysis of experience**

Phenomenology posits the irreducible nature of conscious experience. However, phenomenology is neither introspectionism nor impressionism: more than anything else, phenomenology is a style of thinking (VARELA, 1996). At the center of this aspect of the phenomenological method is the praxis of "epoché," which inscribes itself in a larger project designed to capture the different stages of a process by means of which the researcher becomes conscious of something that inhabited him/her in a confuse, opaque, affective, and immanent fashion, something that initially is pre-reflective and eventually becomes part of intersubjective understanding and shared knowledge (DEPRAZ, VARELA, & VERMERSCH, 2002). Through sustained critical analysis, these initial (raw) experiences yield invariants that hold across individuals. Thus, through the analysis of his experience of objects, MERLEAU-PONTY (1945) came to the conclusion that we perceive objects as three-dimension entities despite their two-dimensional projection onto the retina because we intuitively know how the projection would change if we began to move eyes, head, or body—object perception presupposes a network of virtual actions that bind mere stimuli. Modern cognitive sciences confirmed that perception is closely linked to implicit knowledge about movements that can be produced and that this implicit knowledge gives rise to spatial experience of objects even when the person does not move (O'REGAN, 2001; RIZZOLATTI et al., 1997). [14]

The phenomenological method requires two steps, bracketing of experience—also referred to as phenomenological reduction or epoché (LYOTARD, 1991)—

and subsequent expression and validation. In the following, I focus on *epoché*, the cornerstone of the phenomenological method, because expression and validation are little different from those in other sciences. *Epoché* is a systematic method for suspending judgment, a process of stepping outside our usual, preconceived notions about how the world works to gain greater insights and better understanding. It is an exploration of new degrees of freedom in experience—the Princeton physicist Piet HUT (1999) ascribes to *epoché* the same role as the laboratory takes in the natural sciences. There are three stages of *epoché*, which consist of an initial phase, during which experiences are systematically produced all the while suspending one's beliefs about them, a conversion phase during which attention is changed from the content of experience (*noema* [HUSSERL, 1982]) to the process of experience (*noesis* [HUSSERL, 1982]), and a phase of accepting experience (no-attention). The first stage requires an unprejudiced openness to the details of experience, whereas the second stage requires analysis of the processes that make experience possible in the first place. The third stage constitutes a systematic approach to a phenomenon many scientists have experienced but usually not systematically exploited: after wrestling long and hard with difficult problems, the solutions come to them while engaging in very different activities (sleeping, exercising). [15]

All three stages require extensive training and there is a general agreement that just understanding *epoché* already requires prior practical experience of *epoché* (DEPRAZ et al., 2002; HUSSERL, 1973; HUT, 1999). I therefore provide an illustrative example from perceptual experience to show how the recurrent and reflexive analysis of experience proceeds. The example is of continuing interest, for how visual input and experience is related continues to be unclear and currently constitutes a hotly debated issue in cognitive science and philosophy (O'REGAN & NOË, 2001b). [16]

### 3.2 Phenomenology as praxis

Figure 1 represents the type of images researched by the Gestalt psychologist Edgar RUBIN. Most people perceive the image as a cross oriented along the diagonals rather than a broad-leafed Maltese Cross that in fact constitutes the ground (SPILLMANN, 1999). Gestalt theorists explained the phenomenon in terms of the *law of proximity*, according to which items that are closer are grouped preferentially. In the present situation, the cross oriented along the diagonals is perceived preferentially rather than the upright, broad-leafed Maltese cross.<sup>2</sup> [17]

With some practice, viewers may notice that they can also see the upright Maltese cross as the figure with the diagonal cross as diffuse background. Further inquiry shows that the reversal between figure and ground is associated with our shift of the focal point. Moving the focal point back and forth between

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2 I take it for given that these figure-ground relations emerge at some point during ontogenesis rather than being there a priori. Babies and young children will likely have different perceptual experiences.

points inside the narrow diagonal cross to a point inside the broad-leafed standing Maltese cross switches figure and ground. [18]

Such perceptual experiences become the raw data for reflection, the second stage in the analysis. For example, we may realize that figure and ground are functions not only of the locus of the focal point but also of movement, in this particular case of the eye itself when head and body are fixed.<sup>3</sup> One can notice how the eye jumps (saccades) between figure and ground, staying longer on the figure, which becomes the distinct foreground against an indistinct background. (Notice, the boundary is always part of the foreground.) After intense reflection on the processes, the phenomenological researcher engages in times of non-attention to the phenomena. (Absorption in a sport, for example, can lead to moments of non-attention to any cognitive content.)

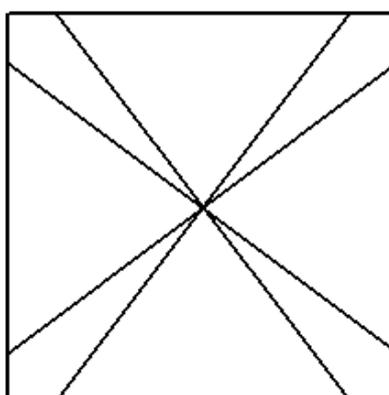


Figure 1: This Maltese-Cross configuration is used in gestalt psychological investigations and has contributed to the establishment of a law of proximity. [19]

So far, I presented the process in a linear fashion through the three different stages. In fact, phenomenology cycles recurrently through these stages. For example, we can further extend our research into perceptive experiences through systematic inquiry and variation. Taking another look at Figure 1, we might move our focal point from within the figure toward the intersection of the four lines, which provokes a constant flipping back and forth between the two figure-ground configurations. The analysis of the process reveals that this flipping is still due to the rapid movement of the eye, for when, after some training, we arrive at holding the focal point constant (not easy because the eye normally saccades three to five times a second [O'REGAN & NOË, 2001b]), first the individual lines themselves become figure and then begin to disappear. [20]

From this inquiry we come to understand that perception is not merely a passive process of recognition of features in the visual input, as suggested in the neuron doctrine (e.g., TABACHNECK-SCHIJK, LEONARDO, & SIMON, 1997), but that a continuously developing perception creates the perceived world in a constructive

3 *Experimental Phenomenology* (IHDE, 1986) gives a number of examples that newcomers can use to practice *doing* phenomenology. However, IHDE focuses more on the noema rather than on noesis, *that is*, he is more interested showing that different appearances can be created rather than *how* these different experiences are made possible.

or generative process. What we perceive is a function of what we do (locus focus, movement of focus). That is, what we experience perceptually is a matter of sensorimotor contingency. What is experienced as visual information from the environment is a function of the relative movement within the person-in-situation unit. More so, we infer that attention is needed to see anything specific, which arises from access to and control over one's perceptual activity. Any particular figure-ground configuration is therefore dependent not only on the specific focal point, but in fact on the relation of particulars of the local features in the global context, an assessment of which requires the movement of the entire body or relevant parts (eyes, head). The visual experience does not arise in the brain alone but from the active transactions involving the whole person and situation (O'REGAN & NOË, 2001b). The perceptual experience is related to our knowing of what will happen if we engage in some action such as shifting the focus of attention—the experience is contingent on our sensorimotor competencies. [21]

This example shows how the phenomenological method begins with the content of (perceptual) experience (noema) but then engages in systematic inquiries (variation of experience that leads to variation in sensations) and descriptions thereof to arrive at a description of the processes that make possible the contents; these processes (noesis) can be repeated and validated by other researchers. After creating experiences and after engaging in careful observation that goes beyond preconceived notions about cognition, the analyst focuses on the processes associated with the experiences, here the normally unnoticeable eye movement. These processes, normally transparent in everyday life, constitute the central object of the recursive, reflexive side of phenomenology. [22]

In the final step, after intensive analysis, the researcher deliberately abandons all reflection to permit new insights to arise (VARELA, 1996). This abandonment of conscious thought is actively and intensely practiced as part of meditation but also occurs when one becomes completely absorbed in some other activity that does not require any thought, such as doing sports. [23]

#### **4. Example: Perception in Unfamiliar Domains**

In this section, I provide an example how lifeworld analysis and first-person analysis are employed together to arrive at better descriptions and understanding of perceptual phenomena in school science classrooms. Such descriptions articulate experiences through a first-person, first-time-through, and genetic perspective. [24]

##### **4.1 Motivation**

Perception is fundamental to what and how we know and a central aspect of learning from hands-on experiences in science classrooms. My inquiry into the phenomenology of perception was motivated by the observation that students in science classes often do not perceive phenomena or aspects thereof relevant to the scientific theories that they are to learn (ROTH et al., 1997b). Importantly, teachers (and researchers for that matter) often do not understand that students

do not see what they are supposed to see; and researchers generally use the objective stimulus (third-person perspective) rather than learners' perceptions (first-person perspective) as input to models of cognitive processes. However, focusing on the objective stimulus rather than on students' perceptions does not appear to be a good scientific strategy. The objective of the research therefore became to both understand the phenomenon of "seeing something for the first time" and the process of amnesia, whereby human beings in general and teachers in particular forget that they, too, have lived in lifeworlds where some object or event has not existed prior to some first moment. [25]

#### 4.2 Emergence and articulation of lifeworlds

While analyzing the videotapes recorded during a ten-week unit on static electricity in a German high school (Gymnasium), I observed that students sometimes spent days and weeks working with simple objects and instruments (glow lamp, electroscope) without perceiving certain parts of equipment or objects crucial to the phenomena that they were to see and explain. They dealt with objects and instruments in holistic ways, for example, treating them as "working" or as "not working," rather than consciously focusing on the objective part-whole relations that someone familiar with these matters might perceive. I exemplify the details and unfolding nature of students' lifeworlds regarding one particular object, a glow lamp (Figure 2).

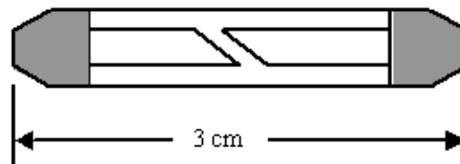


Figure 2. Representation of a glow lamp that was used during physics lessons. The diagram does not represent actual perceptions, for students (a) initially did not distinguish glass and metal ends, (b) note the gap in the filament, or (c) remark that lit on the different sides. [26]

While analyzing the videotapes of the first lesson, I noticed that a group of four female students attempted to reproduce an investigation whereby different objects, which had previously been rubbed with another material and presumably been charged in the process, would be tested with a glow lamp. However, the glow lamp hardly ever lit up. The students ventured hypotheses about the objects and materials they had used as causes for why their lamp "did not work." They called the teacher, who pulled a transparency through her clasped jeans-covered knees and touched it with the lamp: it glowed. The students replicated the event, but the lamp did not glow, which they, jokingly, attributed to the different brand of jeans worn by the teacher. At one point students exchanged the bulb for another one: it, too, failed to light up. Eventually, one of the students looked more closely at lamp, then attempted to make it light up with a transparency she had rubbed, then looked at the lamp closely again, and then excitedly asked her teacher whether the filament was not broken. This was the first time that any student had

provided evidence in her descriptions or actions that the bulb had two, disjointed filaments rather than one continuous filament. [27]

Over the next two lessons, the students continued to have only sporadic success whenever they used the glow lamp as a testing device for charges. In one instance, one of the young women tied a string around the center of the bulb in an attempt to make it light up during a test for charges. After repeated testing without an effect she tried again to get the lamp to light by holding it against the (presumably) charged materials. All of a sudden, after several attempts, she exclaimed, "I got it." She then called the teacher and showed her how the lamp had to be held: she moved her fingers demonstratively from the glass body to the metal end. That is, it took three lessons for the students to make emerge, and therefore perceive, the difference between holding the lamp at the glass body versus at its metal ends. According to BATESON (1972), information is a difference that makes a difference—even if the students had vaguely attended to difference between metal and glass parts, the difference made no behavioral difference and therefore did not constitute information. [28]

Viewing the tapes, colleagues and graduate students made disparaging remarks about these females in particular and about young women in physics more generally, about their lack of motivation to engage deeply in the subject of physics, and about their lack of observational competencies. This is not a good scientific strategy for understanding the phenomenon, for it turned out that I only perceived the differential glowing of the lamp after someone had pointed it out to me. That is, despite my training as a physicist and despite many years as a researcher, I had not tuned in to what today is a fact to me. Surprisingly, the phenomenon (inattentional blindness) is far from understood (DITTRICH, 2001). I began to pursue the hypothesis that the phenomenon of the students' increasing articulation of the glow lamp into parts was evidence for a more fundamental process. [29]

### **4.3 Recurrent, reflexive analysis of perceptual experience**

I pursued the question of perception in a domain or terrain and kept extensive notes of careful description of experiences, predictions of what I would see, and recollections of what I had seen while repeatedly cycling the "same" route. It turned out that the route never was quite the same. For example, on my fifth trip along one of the routes, I noticed for the first time white posts and then that these posts, with some exceptions, were spaced in regular intervals. During the seventh trip, I noticed for the first time the tops of two enormous towers rising above the treetops. I also noticed that as soon as I perceived the posts and towers for the first time, I began to forget that they had not existed for me before that moment. All of a sudden, my world contained objects, which I remembered, waited for while approaching their placement, and used as part of my distance and speed calculations. Analyzing the processes closely, I realized that not only were these objects suddenly integral part of my world, but also that there had been an equally sudden switch between the first appearance of the objects and the immediately subsequent feeling that they had been (immanently) present all

along. It was difficult to understand that there had been times when I had been unaware of these features that now so prevalently figured against everything else. [30]

One time I had a flat. Because it turned out to be a five-centimeter tear in my inner tube, I walked back to town to replace it. I vaguely saw a piece of metal wire and thought about buying a new tire in the near future. When my tire blew out again a few kilometers later, "it dawned on me" and I "put the pieces together." The wire held the tire against the rim and thereby held the inner tube in place. The inner tube had exploded because the wire had become detached from the remainder of the tire, which had allowed the inner tube to protrude under the pressure. What had only been a vague noticing, the tear in the tire, was insufficient to affect my behavior. It was a difference that did not make a difference in my behavior, and therefore cannot be considered to constitute information (BATESON, 1972). With the second blow out, what ever it has been before had become an undeniable, factual "tear." [31]

#### 4.4 Analysis

This investigation of my perceptual experiences while riding a bicycle through initially unfamiliar surroundings shows that the world is not given to me the instant that I first lay eye on it. Rather, following extended experience, different figure-ground relations (e.g., twin towers, white posts, equal spaces) manifested themselves as they emerged from an indeterminate perception. In the light of previous studies, we expect these manifestations to be due to the relative motion between my surrounds and me. This result was further underscored by the tear-in-the-tire episode, which showed that I might be vaguely aware of something without it becoming a *behaviorally relevant* entity. My noticing became a fact that I addressed in my behavior only afterward. Once I saw the parallels between these episodes and the ones involving students, a better understanding of learning in school science laboratories emerged. The phenomena that they are to explain do not exist a priori but, if at all, contingently arise from their experience of engaging with the curricular objects. [32]

Of equal importance was my forgetting of the fact that my lifeworld had changed, that it had not existed in its articulated form at some prior date. In this process of *amnesia*, we forget that much of the material world surrounding us is present only in an immanent way and that it has to be brought forth through actions. As teachers, we act as if certain aspects of the world (feature of demonstration, graph) should be self-evident and do not comprehend when students do not perceive and understand. To comprehend students' "failure," one needs to understand that they live in different lifeworlds. [33]

This, of course, has implications for teaching. Rather than taking students' perceptions for granted, a teacher has to find out students' current perceptions and help them see what they need to see in order to understand the explanation of the phenomenon. An example of how this might be done may be found in ROTH (1995). [34]

## 5. Discussion

In this article, I propose and exemplify a combined first- and third-person cognitive phenomenological method to collect data that are suited to build more appropriate theories of knowing, learning, and instruction. The two methods converge and therefore provide researchers with better understanding of the objects and contents of their research participants' experiences. Together, the two parts of the phenomenological method provide data that experimental methods can use. Neither phenomenological nor experimental approach ought to be privileged: they provide different, mutually constraining and constitutive approaches to a single phenomenon. To be useful, experimental approaches need to be able to explain individual experience and phenomenological approaches need to provide the kind and level of descriptions that experimental methods can account for (VARELA, 1996). It is true that existing first-person methods often yield accounts that are flat and poor, which is one of the recurrent complaints made by those critical of first-person methods (VARELA & SHEAR, 1999). Though these complaints are justified in many cases (by inexperienced [want-to-be] practitioners), they do not invalidate phenomenological method that can, enacted rigorously and consistently, lead to important data and insights. [35]

SNOW's desire was for educational psychology to develop a theoretical language that would integrate aptitude research and be an appropriate candidate for productively guiding tomorrow's research. This theoretical language ought to use the best from information processing, connectionism, situated learning and distributed intelligence, personality theory, ability factor theory, and, important in the present context, phenomenology (SNOW, 1992). In my experience, the phenomenological approach described here is a good candidate for providing aspects of the language that Snow wanted educational psychologists to develop. [36]

### 5.1 Phenomenology and experimental (educational) psychology

Psychologists using formal models of cognition require good and particularly the right kind of data. Phenomenology as presented here aims at generating experience-related data that are not subject to the weaknesses of ordinary self-reports. It also addresses a problem that arises when general laws of learning are derived from averaged group data—the general law may not be representative of the learning trajectory of any individual. Thus, it can be shown that if learning takes place in one trial and different individuals make associations in different trials, and if individual differences are normally distributed, the learning law will take on the familiar S-shaped learning curve (PETRINOVICH, 1989). Although individual learning occurs by a zero-one step function (such as observing an object or parts thereof for the first time), the group data would lead one to think of continuous learning at each level of problem complexity. The data derived from rigorous cognitive phenomenological method, on the other hand, would reveal the processes that led to the step function or, for example, to the sudden changes in situation when a problem solver moves from verbal to visual encoding of the problem (SNOW, 1992). The phenomenological method is particularly suited to

identify what a person perceives *in situ* and how these perceptions change over time, both in immediate and long-range terms. [37]

My inquiry into perceptual processes highlighted the emergence of new features in the students' and my lifeworlds. It turns out that Gestalt psychologists (e.g., KOFFKA, 1935) already knew about the phenomenon of emergence (e.g., the various representations of Dalmatian dogs that emerge from what initially appears to be a random assembly of ink plots or highly degraded perceptual input [P.M. CHURCHLAND, 1995; P.S. CHURCHLAND & SEJNOWSKI, 1992]). However, it has virtually not been addressed as a phenomenon in education, research or practice: research participants and students are not only presented with stimuli (e.g., perceptual) and curricular materials but the resulting learning data are analyzed as if students had perceived what researchers and teachers assumed to be the perceptually salient entities. Such phenomenological inquiries may therefore lead to renewed work on forgotten problems and phenomena that continue to puzzle and be of theoretical interest. Thus, the most prominent journals such as *Science* continue to publish research on perception, some of which explicitly make reference to earlier results of phenomenological studies (e.g., RIZZOLATTI et al., 1997) and a new journal, *Phenomenology and the Cognitive Sciences*, has recently been founded to pursue the connections that exist between the two. [38]

## 5.2 Phenomenology versus introspection and accounts of feelings

Phenomenological research is sometimes equated with naturalistic research or any other research that pays attention to feelings (BENTZ & SHAPIRO, 1998); researchers access such feeling experiences in extended conversations with the participants. Other researchers engage in introspection taking their own feelings and thoughts as objects of analysis. All these forms of inquiry are directed towards the private and therefore non-observable objects in the scientific sense. This is not the kind of research that phenomenological philosophers and cognitive scientists are interested in (VERMERSCH, 1999). It may be the method of choice, however, if the researcher's interest is in counseling and personal transformation—though critical psychologists warn that such transformation cannot be achieved without a person's critical analysis of his/her own preconceived ways of describing experience (HOLZKAMP, 1984). [39]

Phenomenological philosophers such as HEIDEGGER (1977) or MERLEAU-PONTY (1945) were concerned with the structures of experience in everyday understanding and common sense and how these arise from experience. Some graduate students and professors, however, appear to think of phenomenology as a way of describing and understanding feelings. I recently co-edited a special issue of *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* on the topic of subjectivity and reflexivity (MRUCK, ROTH, & BREUER, 2002; ROTH, MRUCK, & BREUER, 2003): more than 60% of the submissions were of the woe-me type, describing one experience/feeling or another (related to doing qualitative research). In the hands of these individuals, phenomenology as method has a lot of similarities with life-history and other first-person narratives

that only deal with participants' own accounts rather than with unprejudiced descriptions of experience and the underlying structures that make such experiences possible. Such first-person approaches that deal with surface meanings without attempting to get at structures are doomed to failure because they are trapped in ideology (HOLZKAMP, 1983). A rigorous reflexive hermeneutic phenomenology employs explanation-seeking, structural analyses to undercut the dangers arising from existing understandings and to develop these to new levels (RICŒUR, 1991). Understanding, to develop, requires structural analysis and sustained engagement with experiences; it is misleading to assume that cursory considerations of individual experiences can lead to deep, structural understanding of human knowing and learning (VARELA & DEPRAZ, 2000). [40]

A confusion between the two approaches may arise because phenomenological reduction and introspection share an interest in reflexive doubling, whereby cognizing analysts turn their attention to aspects of their own experiences; this requires some referential "I" that can take a part of itself and make it the object of reflection. After these similarities, the two approaches part company because phenomenological reduction aims at the opposite of introspection: "Phenomenological reduction is not a 'seeing inside,' but a tolerance concerning the suspension of conclusions that allows a new aspect or insight into the phenomenon to unfold" (VARELA, 1996, p.339). At the heart of the phenomenological method is the assumption that human experience follows fundamental structural principles that express themselves differently and contingently. Experience is necessarily personal but not necessarily private. [41]

### 5.3 Cognitive phenomenology versus phenomenography

The phenomenological method described here also differs from phenomenography (e.g., MARTON, 1994). Describing a characteristic and exemplary study, MARTON articulates the principles of the phenomenographic method with an example from his own research that was designed to understand, "What does it *mean*, that some people are better at learning than others?" and "Why are some people better at learning than others?" After reading a text from which students were to learn about some topic, they were interviewed about their understanding of the text and were asked to give an account of it. Students were also asked about their experience of the situation and how they had gone about learning the text. The researchers then analyzed these accounts to find commonalities and differences. [42]

It is evident that what MARTON and his colleagues found were patterns in students' *accounts* of experience. That is, the phenomenographic method—as exemplified in MARTON's (1994) encyclopedia entry—is the method of choice when researchers attempt to reconstruct after-the-fact accounts of experience. MARTON and his colleagues did not get either at *lived* experience of reading and learning from reading or at the fundamental conditions that allowed differences and similarities between the experiences of different individuals. Consider again Figure 1. Gestalt psychological research shows that persons generally observe a cross on the diagonals rather than an upright (broad-leafed) Maltese cross

(SPILLMANN, 1999). In a phenomenographic project, researchers collect data on what respondents *report* to have seen, and, perhaps, provide frequencies of persons reporting having seen one or the other figure. Introspection and naturalistic research might describe what the person feels while looking at the figure, perhaps reminiscing about experiences related to such a cross, etc. In contrast, researchers interested in the structures that allow people to perceive in the way they actually do *in situ* employ (neuro-, psycho-) phenomenology. The mentioned law of proximity might be one of the results that could be arrived at. [43]

The phenomenographic method does not lend itself to describing the lifeworld as experienced at the moment of interest—for example, during problem solving or other aspects of everyday praxis. If phenomenography is based on interviews, the best it can hope for is the identification of structures in accounts of experience rather than in experience itself. What the relation between accounts of experience and structures of actual experience has to be an empirical matter. The problematic nature of the relation between post hoc interviews with subjects about what they have done and what they have actually done has been pointed out repeatedly in the literature (BOURDIEU, 1990). In fact, one of the results of phenomenological studies is that accounts of experience tend to change over time beginning immediately after the experience (e.g., MERLEAU-PONTY, 1945). This change is related to the different ways members of a culture can describe experience, on the one hand, and the changing nature of interpretation, on the other. Regarding the first issue, any culture has discursive repertoires for talking about experience; the individual qua member of the culture has access to and uses these repertoires as resources in accounting for their own experience (EDWARDS & POTTER, 1992). It should be immediately evident that the phenomenographic method is equivalent to sampling the culturally shared and legitimate ways for talking about the types of experiences that the interviews are about. [44]

## 6. Coda

First-hand experience is a proper field of phenomena that cannot be reduced to other approaches. This field requires a rigorous method and pragmatics of inquiry (exploration and analysis); cognitive phenomenology constitutes such method and pragmatics. Cognitive phenomenology seeks mutual constraints between the phenomenal field, as revealed by the researcher's experience and careful lifeworld analysis, and the associated field of phenomena, as studied by cognitive science. Phenomenology is not a reiteration of solipsism, for it assumes that the study of particular experience leads to the recognition of generative structures that are common to human beings more generally. It is above all an attempt to establish a scientific method that explicitly deals with experience and structures that give rise to it and thereby deal with the hard problem of cognitive science to relate personal experience and cognitive or mental events. [45]

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## References

- Agre, Phil (1997). *Computation and human experience*. Cambridge: Cambridge University Press.
- Agre, Phil, & Horswill, Ian (1997). Lifeworld analysis. *Journal of Artificial Intelligence Research*, 6, 111-145.
- Ballard, Dana H; Hayhoe, Mary M.; Pook, Polly K. & Rao, Rajesh P.N. (1997). Deictic codes for the embodiment of cognition. *Behavioral and Brain Sciences*, 20, 723-767.
- Bateson, Gregory (1972). *Steps to an ecology of mind: A revolutionary approach to man's understanding of himself*. New York: Ballantine Books.
- Bayne, Tim (in press). Closing the gap? Some questions for neurophenomenology. *Phenomenology and the Cognitive Sciences*.
- Bentz, Valerie M. & Shapiro, Jeremy J. (1998). *Mindful inquiry in social research*. Thousand Oaks, CA: Sage.
- Bourdieu, Pierre & Wacquant, Loic J.D. (1992). *An invitation to reflexive sociology*. Chicago: University of Chicago Press.
- Brooks, Rodney A. & Stein, Lynn A. (1994). Building brains for bodies. *Autonomous Robots*, 1, 7-25.
- Brown, Steven R. (2000). Tip-of-the-tongue phenomena: An introductory phenomenological analysis. *Consciousness and Cognition*, 9, 516-537.
- Chalmers, David (1995). Facing up to the problem of consciousness. *Journal of Consciousness Studies*, 2, 200-220.
- Churchland, Paul M. (1995). *The engine of reason, the seat of the soul*. Cambridge, MA: MIT Press.
- Churchland, Patricia S. & Sejnowski, Terence J. (1992). *The computational brain*. Cambridge, MA: MIT Press.
- Corno, Lyn; Cronbach, Lee J.; Kupermintz, Haggai; Lohman, David F.; Mandinach, Ellen B.; Porteus, Ann W.; Talbert, Joan E. for the Stanford Aptitude Seminar (2002). *Remaking the concept of aptitude: Extending the legacy of Richard E. Snow*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Dennett, Daniel (2001). "Surprise, surprise," commentary on O'Regan and Noë. *Behavioral and Brain Sciences*, 24, 982.
- Depraz, Natalie; Varela, Francisco & Vermersch, Pierre (2002). *On becoming aware: Steps to a phenomenological pragmatics*. Amsterdam: Benjamins.
- Devlin, Keith & Rosenberg, Duska (1996). *Language at work: Analyzing communication breakdown in the workplace to inform systems design*. Stanford, CA: CSLI Publications.
- Dittrich, Winand (2001). How could you miss it ...? *Trends in Cognitive Sciences*, 5, 284-285.
- Gould, Steven J. (2000). Deconstructing the "science wars" by reconstructing an old mold. *Science*, 287, 253-261.
- Graumann, Carl F. (2002). Explicit and implicit perspectivity. In Carl F. Graumann and [Werner Kallmeyer](#) (Eds.), *Perspective and perspectivation in discourse* (pp. 25-40). Amsterdam: John Benjamins.
- Heidegger, Martin (1977). *Sein und Zeit*. Tübingen: Niemeyer.
- Holzkamp, Klaus (1983). *Grundlegung der Psychologie*. Frankfurt/M.: Campus.
- Holzkamp, Klaus (1984, November). Die Menschen sitzen nicht im Kapitalismus wie in einem Käfig. *Psychologie Heute*, pp. 29-37.

- Hurlburt, Russell T. & Heavey, Christopher L. (2001). Telling what we know: Describing inner experience. *Trends in Cognitive Sciences*, 5, 400-403.
- Husserl, Edmund (1960). *Cartesian meditations*. The Hague: Nijhoff.
- Husserl, Edmund (1973). *Zur Phänomenologie der Intersubjektivität, Dritter Teil: 1929-1935* (Edited by Iso Kern, Husserliana XV). The Hague: Nijhoff.
- Husserl, Edmund (1982). *Ideas pertaining to a pure phenomenology and to a phenomenological philosophy*. The Hague: Nijhoff.
- Hut, Piet (1999). Theory and experiment in philosophy. *Journal of Consciousness Studies*, 6, 241-244.
- Ihde, Don (1986). *Experimental phenomenology: An introduction*. Albany: State University of New York Press.
- Koffka, Kurt (1935). *Principles of Gestalt psychology*. New York: Harcourt Brace.
- Kuhn, Thomas S. (1970). *The structure of scientific revolutions* (2nd ed.). Chicago: The University of Chicago Press.
- Lave, Jean (1988). *Cognition in practice: Mind, mathematics and culture in everyday life*. Cambridge: Cambridge University Press.
- Lincoln, Yvonne S. & Guba, Egon G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage.
- Lyotard, Jean-François (1991). *Phenomenology*. Albany: State University of New York Press.
- Markard, Morus (1984). SUFKI—theoretische Grundlage und methodische Entwicklung. *Forum Kritische Psychologie*, 14, 56-81.
- Marton, Ference M. (1994). Phenomenography. In Torsten Husén & T. Neville Postlethwaite (Eds.), *The international encyclopedia of education* Second edition Volume 8 (pp. 4424-4429). Oxford: Pergamon.
- Merleau-Ponty, Maurice (1945). *Phénoménologie de la perception*. Paris: Gallimard.
- [Mruck, Katja](#); [Roth, Wolff-Michael](#) & [Breuer, Franz](#) (Eds.) (2002). Subjectivity and Reflexivity in Qualitative Research I. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research [On-line Journal], 3(3). Available at: <http://www.qualitative-research.net/fqs/fqs-e/inhalt3-02-e.htm>.
- Noë, Alva (2002). Is the visual world a grand illusion? *Journal of Consciousness Studies*, 9, 1-12.
- O'Regan, J. Kevin (2001). The feel of seeing. *Trends in Cognitive Sciences*, 5, 278-279.
- O'Regan, J. Kevin & Noë, Alva (2001a). A sensorimotor account of vision and visual consciousness. *Behavioral and Brain Sciences*, 24, 883-917.
- O'Regan, J. Kevin & Noë, Alva (2001b). What it is like to see: A sensorimotor theory of perceptual experience. *Synthese*, 129, 79-103.
- Pessoa, Luiz; Thompson, Evan & Noë, Alva (1998). Finding out about filling in: A guide to perceptual completion for visual science and the philosophy of perception. *Behavioral and Brain Sciences*, 21, 723-802.
- Petitot, Jean (1994). Phenomenology of perception, qualitative physics and sheaf mereology. In R. Casati, B. Smith, & G. White (Eds.), *Philosophy and the cognitive sciences* (pp.307-408). Vienna: Hölder-Pichler-Tempsky.
- Petrinovich, Lewis (1989). Representative design and the quality of generalization. In Leonard W. Poon, David C. Rubin, & Barbara A. Wilson (Eds.), *Everyday cognition in adulthood and late life* (pp.11-24). Cambridge: Cambridge University Press.
- Ricœur, Paul (1991). *From text to action: Essays in hermeneutics, II*. Evanston, IL: Northwestern University Press.
- Rizzolatti, Giacomo; Fadiga, Luciano; Fogassi, Leonardo & Gallese, Vittorio (1997). The space around us. *Science*, 277, 190-191.
- Roth, Wolff-Michael (1995). Affordances of computers in teacher-student interactions: The case of Interactive Physics™. *Journal of Research in Science Teaching*, 32, 329-347.
- Roth, Wolff-Michael (2001a). Designing as distributed process. *Learning and Instruction*, 11, 211-239.
- Roth, Wolff-Michael (2001b). Situating cognition. *The Journal of the Learning Sciences*, 10, 27-61.

- Roth, Wolff-Michael; McRobbie, Cam; Lucas, Keith B. & Boutonné, Sylvie (1997a). The local production of order in traditional science laboratories: A phenomenological analysis. *Learning and Instruction*, 7, 107-136.
- Roth, Wolff-Michael; McRobbie, Cam; Lucas, Keith B. & Boutonné, Sylvie (1997). Why do students fail to learn from demonstrations? A social practice perspective on learning in physics. *Journal of Research in Science Teaching*, 34, 509-533.
- Roth, Wolff-Michael; Mruck, Katja & Breuer, Franz (Eds.) (2002). Subjectivity and Reflexivity in Qualitative Research II. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research [On-line Journal], 4(2). Available at: <http://www.qualitative-research.net/fqs/fqs-e/inhalt2-03-e.htm>.
- Schutz, Alfred, & Luckman, Thomas (1973). *The structures of the life-world*. Evanston, IL: Northwestern University Press.
- Snow, Richard E. (1992). Aptitude theory: Yesterday, today, and tomorrow. *Educational Psychologist*, 27, 5-32.
- Snow, Richard E. (1997). Aptitudes and symbol systems in adaptive classroom teaching. *Phi Delta Kappan*, 78, 354-360.
- Spillmann, Lothar (1999). Gehirn und Gestalt: I. Metzgers Gesetze des Sehens. *Psychologische Beiträge*, 41, 458-493.
- Tabachneck-Schijf, Herminia J. M.; Leonardo, Anthony M. & Simon, Herbert A. (1997). CaMeRa: A computational model for multiple representations. *Cognitive Science*, 21, 305-350.
- Varela, Francisco J. (1996). Neurophenomenology: A methodological remedy for the hard problem. *Journal of Consciousness Studies*, 3, 330-350.
- Varela, Francisco J. (2001). Consciousness: The inside view. *Trends in Cognitive Sciences*, 5, 318-319.
- Varela, Francisco J. & Depraz, Natalie (2000). At the source of time: valence and the constitutional dynamics of affect. *Arobace: Journal des Lettres et Sciences Humaines*, 4, 143-166.
- Varela, Francisco J. & Shear, Jonathan (1999). First-person methodologies: What, why, how? *Journal of Consciousness Studies*, 6 (2-3), 1-14.
- Varela, Francisco J.; Thompson, Evan & Rosch, Elenor (1993). *The embodied mind: Cognitive science and human experience*. Cambridge, MA: MIT Press.
- Vermersch, Pierre (1996). Problèmes de validation des analyses psycho-phénoménologiques. *Expliciter*, 14, 1-12.
- Vermersch, Pierre (1999). Pour une psychologie phénoménologique. *Psychologie Française*, 44, 7-19
- Wertheimer, Max (1985). A Gestalt perspective on computer simulations of cognitive processes. *Computers in Human Behavior*, 1, 19-33.

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