

**MUTUAL ENLIGHTENMENT:
RECENT PHENOMENOLOGY IN COGNITIVE SCIENCE**

*Shaun Gallagher, Department of Philosophy, Canisius College,
Buffalo, NY 14208, USA. Email: gallaghr@canisius.edu*

Abstract: This article provides a critical review of recent work at the intersection of phenomenology and cognitive science. What is and what ought to be the relationship between these two approaches to the study of consciousness? This review explores problems involved with expressing subjective experience in an objective fashion, and issues involved in the use of principles of isomorphism to explain how brain and consciousness are interrelated. It suggests that strict lines cannot be drawn between third-person theory and phenomenological description, that the division of labour between phenomenology and cognitive science is not very strict, and that the best model for understanding the relation between these two approaches is one that emphasizes an externalist viewpoint.

The term *phenomenology* can be used in a generic sense to cover a variety of areas related to the problem of consciousness. In this sense it is a title that ranges over issues pertaining to first-person or subjective experience, qualia, and what has become known as ‘the hard problem’ (Chalmers, 1995). The term is sometimes used even more generally to signify a variety of approaches to studying such issues, including contemplative, meditative and mystical studies, and transpersonal psychology.¹ Within the disciplines of philosophy and psychology, however, *phenomenology* also has a more specialized meaning. In this case it refers to the methodology and philosophy initiated by the philosopher Edmund Husserl at the beginning of the Twentieth Century and developed in various ways by theorists such as Heidegger, Sartre, Merleau-Ponty, and Schutz. I restrict the scope of this review to phenomenology in this more specialized sense. In the light of several recent publications, the general questions I address are: What is and what ought to be the relationship between phenomenology and cognitive science? and what, if any, recent contributions has phenomenology made to the science of consciousness?²

Relations Between Phenomenology and Cognitive Science: Uneasy Détente

Eduard Marbach, in his recent book *Mental Representation and Consciousness* (1993), describes the current relationship, or more precisely in his view, the lack of relationship — something of a cold antagonism — between phenomenology and cognitive science. Focusing on investigations of ‘mental imagery’ Marbach suggests that the studies carried on in the respective fields of phenomenology and cognitive science, although, on the surface, seeming to investigate the same phenomena, are quite divorced from each other. Both enterprises are concerned with consciousness, yet they obviously work on different levels and with different conceptions of con-

¹ For example, the term has been used in this way in categorizing papers presented at the recent Tucson conferences on the theme: *Toward a Science of Consciousness*.

² Alternatively, we could take a bearing from Dreyfus (1982) and ask whether anyone has yet delivered on the promise of phenomenology to contribute positively to the projects that define cognitive science. Has phenomenology been able to move beyond its simple adversarial role and ‘contribute directly to current research in cognitive science, by providing concepts, analysis, and guidelines for further work as well as by raising questions concerning the possible limitations of all attempts to ground meaning and intelligibility in abstract mental structures’ (Dreyfus, 1982, p. 3)?

consciousness. The contrast between the two approaches is clearly delineated by the divergent interpretations given to the term 'representation'. Explanations of consciousness made by cognitive scientists and philosophers of mind for the most part rely on 'non-conscious physical symbol-manipulating machines or information processors' (Marbach, 1993, p. 4). Thus, for someone like Kosslyn (1980; 1984) the solution to the problem of mental imagery must be sought in representations that lie below the threshold of consciousness, that is, on the level of information-processing functions which are not accessible to introspection. In contrast, Marbach's training in Husserlian phenomenology leads him to seek solutions on the level of intentionality, and specifically in descriptions of conscious representation that are made precise by a methodologically controlled reflective introspection. The term 'representation' obviously means something different within these different frameworks.

For Marbach the main issue is not what the relationship *is* between phenomenology and cognitive science, but what it *ought to be*. Echoing in the background of his text are different versions of the same question: What is (or ought to be) the relations between first-person and third-person explanations? What is (or ought to be) the relationship between personal-level (intentional) explanation and subpersonal-level explanation? These are now standard distinctions. They are clearly made in Dennett's (1969) contrast between different levels of explanation, and Pylyshyn's (1973) delineation of experience and information. Husserl himself, in the early part of this century, had based his phenomenological method precisely on the distinction between what was available to reflective introspection (experience, intentional consciousness) and what was not (extra-intentional, subpersonal information). Arguably one can find similar distinctions in Descartes and Locke. Nor is the question about the relationship between these different levels a novel one. As Robert Schwartz (1994) makes clear in his recent work on vision, this issue haunts the analysis of perception from Helmholtz to Gibson.

In terms of explaining the processes of imaging, Pylyshyn sets the general problem:

It is important to inquire whether the experience of imaging can reveal important properties of the information processing function or of the mental representation of information on which these processes operate (1973, p. 3).

Pylyshyn then outlines one side of what persists as an adversarial relation between phenomenology and cognitive science.

But we must not assume in advance that such observation [of experience] will reveal the content of the mental representation. Not only does such observation present serious methodological hazards, it is not *prima facie* an observation of the functional representation (i.e. one that figures in the human information-processing function) (1973, p. 3).

For Pylyshyn, as for Kosslyn, Dennett and many others, phenomenology can contribute little or nothing of importance to a genuine scientific explanation of consciousness.

In contrast, Marbach contends that cognitive science will remain blind insofar as it operates without a serious and methodologically controlled description of what it attempts to explain, that is, consciousness, or more generally, mental life. He suggests that if Kosslyn is right in his claim that 'a theory of imagery should be consistent with reliable introspective reports of imagery, and ideally should offer the basis of an account of these experiences' (1978, p. 223), then cognitive science needs to take its presuppositions from something more sophisticated than folk psychology. For Mar-

bach, phenomenology provides the reliable and systematic reflective analysis required for guiding cognitive science. More specifically, he states:

consciousness provides the experiential source for studying mental phenomena. By this I simply mean to say the following: even though I am inclined to share standard naturalistic views on which, I take it, the mental (including consciousness) will ultimately be *explained* in terms of ordinary physical properties, I do not believe that the *explicanda* themselves are all and only to be found at the naturalistic level of investigation (1993, p. 9).

On this view, cognitive science needs to relax its borders if, in any particular analysis, it is to target precisely what it is trying to explain. Phenomenology, in this respect, ought to constrain cognitive science. If, for example, we are to understand which brain activities produce or correlate to consciousness, Marbach claims, then we first must be provided with ‘*basic conceptual categories* for talking about the true nature of the mental’ (p. 9). Such categories are supplied by phenomenological reflection on conscious experience. Thus, ‘in order to convey a truly scientific content to the terms/concepts that cognitive psychology and related philosophy of mind use for determining their objects — i.e. mental phenomena — *a systematic descriptive analysis of consciousness in its own nature must be presupposed . . .*’ (p. 11).

Marbach is not alone in making such claims about the intersection between phenomenology and cognitive science. Tim van Gelder (1996–97) does a good job in mapping out what this intersection is, and what it ought to be. Phenomenology and cognitive science, he notes,

are patently different in almost every important respect: they have their own literature, practitioners, professional meetings, vocabulary, methods, etc. They have fundamentally different orientations: phenomenology proceeds from the assumption that the study of mind must be rooted in direct attention to the nature of (one’s own) experience, whereas cognitive science proceeds from the assumption that a genuine science of mind must be rooted in the observation of publicly available aspects of minds of others (1996, §4).

Van Gelder, however, like Marbach, takes the position that phenomenology and cognitive science should not be regarded as opposing disciplines, but should be understood as both compatible and mutually constraining. They ought to enrich and guide each other. In response to the issues raised by theorists like Pylyshyn, he argues that a complete theory needs to properly integrate causal mechanisms that figure in the human information-processing function with phenomenological observation. Although the latter does not provide direct insight into such mechanisms, ‘there must ultimately be an account of why those phenomena are the way they are given (at least partly) in terms of the nature of those mechanisms. For this reason, the nature of our experience should be regarded as having the potential to constrain our theories and models in cognitive science’ (1996, §27).

The virtue of both Marbach and Van Gelder is that they abandon polemics and set out to show, in some precise details, how phenomenology, specifically the kind of phenomenology developed by Husserl, can contribute to and constrain cognitive scientific approaches to consciousness. Readers of this journal will be familiar with Varela’s (1996) recent treatment of these themes under the title of ‘neurophenomenology’. Several other works that I will consider here pursue these issues in different ways. McClamrock (1995), working primarily within the framework of cognitive science, attempts to integrate important insights developed in more exis-

tential versions of phenomenology. Dreyfus (1996) advances the work of Merleau-Ponty to make it relevant to neural network theory. Okrent (1996) focuses on the existential phenomenology of Heidegger and claims that 'Heidegger is relevant to cognitive science insofar as he puts forward a set of constraints which any cognitive system must satisfy if it is to count as similar to our own' (§3). In reviewing these works my intent is to explore the putative relation between phenomenology and cognitive science, and to see in the details whether these different traditions are ready to open clear lines of communication, or whether there are still barriers that will prevent the easing of what at best is an uneasy *détente*, and at worst, a cold antagonism.

A Problem With Words

In examining some of the detailed arguments put forward by these authors, I want to keep in mind the larger issue of phenomenology's relation to cognitive science. What problems are entailed if cognitive science does relax its borders enough to admit phenomenological reports? Can it still remain scientific? Daniel Dennett (1991) thinks not. He raises several important concerns about phenomenological methods that can help, in a rhetorical fashion, to structure the following discussion.

According to Dennett, one cannot have a serious science of the mind if one relies upon subjective accounts of experience. Rather, one needs 'agreed-upon methods of description and analysis', so that scientists can be sure about what other scientists are saying. One old complaint about phenomenology is that people use words in different ways to construct their descriptions.³ Phenomenologists have always relied on what Dennett calls 'the first-person plural presumption', that is, the idea that intersubjective communication will always resolve differences of word meaning. This, however, presumes that we are all alike in a very high degree and it leads to unjustified generalizations about 'how it is with everyone' (Dennett, 1991, pp. 66–7). Furthermore, phenomenology assumes immunity to error in the process of introspection, and there are good reasons to doubt that we are always absolutely right about what we discover through reflection (see, e.g. Lyons, 1986). Finally, in contrast to what phenomenologists explicitly set out to avoid, Dennett notes the propensity to substitute theory for pure description and not realize it.

Given such problems with phenomenological methods, Dennett proposes his own method which he calls 'heterophenomenology'. In contrast to first-person methods of phenomenology which entail an identity between scientist and subject, real science requires the separation of scientist and subject, that is, a third-person approach. Heterophenomenology involves taking the intentional stance toward the speech-acts of subjects who are put in controlled experimental situations. In other words, the scientist gains access to the phenomenological realm only by interpreting what others say about their subjective states. In such cases the scientist does not have to take the subject's report as veracious; rather, subjective reports are treated neutrally as data to be interwoven with other experimental data and to be interpreted as one might interpret a text.

³ Auguste Comte, for example, noted this in the 19th century: '*Internal observation*' gives almost as many divergent results as there are individuals who think they practice it' (cited in James, 1890, vol. I, p. 188).

It's difficult, however, to see how heterophenomenology offers any improvement over phenomenology with respect to the problem of word meaning. The problem of how one phenomenologist knows what the other phenomenologist means is simply transposed into the problem of how the scientist knows what the subject means. One might even suggest that since in heterophenomenology everything depends on detached interpretation rather than communication, the means for clarification of meaning are somewhat diminished. Furthermore, Dennett would not want the scientist to rely on her own subjective experience as a way of interpreting the subject's experience, since this would just lead back into the problems of phenomenology — in this case, the scientist's own phenomenology. It seems that one could only resort to objectively, formalized meanings established within the framework of behavioural science in order to interpret the subject's speech acts. In that case, however, might one not be using generalizations that, from the perspective of the individual case, are just as unjustified as the ones Dennett sought to avoid? More importantly, one need only ask where such formalized meanings could come from to see that at some point phenomenological experience is required to justify the scientific interpretation that heterophenomenology calls for. Heterophenomenological interpretation is not only, by design, quite removed from the original experience to be interpreted, but may in fact impose the results of a previous and now anonymous phenomenological exercise.⁴

Marbach proposes a different strategy to deal with the problem of word meaning and scientific communication. In contrast to Dennett, who moves outside of phenomenology and simply transforms the communication problem into an interpretation problem in the realm of scientific discourse, Marbach proposes to import into phenomenology what is usually taken to be a scientific solution to such problems. It is a solution similar to the one that Dennett would be forced to fall back on in order to carry out a heterophenomenological interpretation — namely, an appeal to formalized and intersubjectively verifiable meanings. In the case of heterophenomenology, however, such an appeal seems to lack justification since it does not make the ultimate source of such meanings apparent (the source, one suspects, is either folk psychology or some implicit and unsaid phenomenology). In one sense, Marbach's solution is to make the origination of such formalized meaning explicit. Marbach agrees with Dennett that within phenomenology there is a problem with respect to word meaning. In scientific contexts such problems are addressed through the use of formalized language systems such as one finds in mathematics. Marbach thus attempts to develop a formalized language, a phenomenological notation, to express phenomenological findings.

Phenomenological notation expresses, not the content of experience, but the formal structure of experience. It reflects how various mental activities can be different from one another and yet also related to one another. Marbach shows, for example, how memory depends upon perception. The precise phenomenological description of memory requires the notion of 're-presentation' (*Vergegenwärtigung*). In contrast to perception, which establishes intentional reference to something present and is therefore an activity of 'presentation', memory refers to something that is absent. To establish conscious reference, however, an activity that involves presentation is

⁴ In the background of objective, third-person explanation there are always first-person, phenomenological presuppositions. Köhler, for example, recognized that the original meanings of words used in third-person accounts are unavoidably established in direct experience (1947, pp. 36–9).

required. For something like memory or imagination, Marbach suggests, consciousness establishes reference to that which is not present in such a way that it is 'as if' it were given to me in perception (1993, p. 61). The 'as if' indicates a modification of the perceptual element which Marbach, following Husserl, calls a representation. To explicate and clarify the structure of such a representational act Marbach develops his notation. An act of perceiving some object, x , is signified as

(PER) x

The representation of x in an act of memory involves (PER) x , not as an actual and occurrent act of perception, but as a reenactment of the perception which he designates as

[PER] x

The fact that, with memory, it is a *reenactment* rather than just an imaginary enactment means, according to Marbach, that there is an element of belief (signified by \square) involved. That is, in some cases, memory involves a belief that at some point in the past I actually did perceive x . The fact that the perception of x is in the past rather than in the future, that is, the fact that it is an act of memory rather than expectation, can be indicated by the letter p . So Marbach signifies an act of memory, that is, a re-presentation of x by means of 'a perceiving of x bestowed with the belief of having actually occurred in the past', as follows:

(REP $p \square$ [PER]) x

Things get more complicated of course, but one can see the virtue of formulating a notation like this. The notation helps to clarify both the complexity of consciousness and the explication of that complexity provided by phenomenological reflection. It also helps to suggest alternative structures that might be implicated, for example, in various memory systems (this is something that Marbach could have pursued further, and perhaps would have if the book had been devoted exclusively to the topic of memory). It helps to provide a clear phenomenological contribution to questions that cognitive scientists are interested in, questions about the role of perceptual information in memory systems, the role of linguistic elements in perception (see e.g. Marbach's disagreement with Tugendhat, pp. 111 ff.), or about elements of interpretation, distortion, and construction in memory (issues that Marbach does not consider).⁵

⁵ An interesting example of how phenomenology and cognitive neuroscience might enlighten each other is provided by Antonio Damasio's recent book, *Descartes' Error* (1994). The book, which is excellent in many ways, is neurologically rich but phenomenologically impoverished. It relies on an entirely undeveloped and quite traditional (Humean) notion of 'image' to account for mental experience (e.g. p. 108). The concept of image amounts to a place holder for the missing phenomenological analysis. A communication between Damasio and Marbach concerning memory could result in mutual benefits. If, as Marbach contends, memory involves, in some fashion, a re-enactment of perception, one would expect precisely the kind of neural activity associated with memory that Damasio describes as occurring in 'the same early sensory cortices where the firing patterns corresponding to perceptual representations once occurred' (p. 101). Marbach provides the phenomenological analysis that fits Damasio's observations about how the brain works in cases of memory; Damasio provides the neurological evidence that supports Marbach's claim. Further support for the Husserlian view that memory involves the reenactment of a previous perceptual experience is to be found in neurological differences involved in illusory versus veridical memory. See Schacter *et al.* (in press).

A Question of Isomorphism

There is often a tendency in cognitive science to anthropomorphize or intentionalize the subintentional level. Naïve homuncularisms (e.g. the observer in the Cartesian Theatre, or the attribution of intentional behaviour to neurons) provide the most apparent examples of such anthropomorphism. It takes other forms too, all of which involve treating subpersonal, subintentional processes as if they operated by intentional rules. The employment of what Dennett calls the ‘intentional stance’ involves the formalization of this tendency as a preferred strategy in some contexts. According to this strategy, for purposes of discussion, we may speak ‘as if’ subpersonal processes were intentional, although this is clearly not the case. According to the ‘current rules’ of cognitive science,⁶ however, when this strategy not acknowledged as such, it leads to what might be called the fallacy of misplaced intentionality.

The intentionalizing of subpersonal processes can be considered the opposite of reductionism, that is, rather than reducing the intentional to the subintentional, this fallacy inflates the subintentional with intentional descriptors. This is most curious, and most clearly fallacious, when, in the context of a reductionist project, mechanisms that are said to be subpersonal are described in intentional terms, and no ‘as if’ clause is apparent.⁷ In another, no less egregious form of this fallacy, what seem most likely to be subpersonal processes are elevated to the level of intentional consciousness. An example of this can be found in what Dreyfus refers to as Husserl’s cognitivist position. Dreyfus suggests that Husserl was often guilty of packing too many operations, an excess of ‘mental machinery’, into the intentional performance of consciousness. In his description of perceiving an object visible from one side, for example, Husserl requires too much on the intentional level.

The similar reminds me of the similar, and by analogy with what was given with the similar on the one side, I expect something similar on the other side. It is associated with it and ‘reminds’ me of it, though as analogon (sic) of something remembered in the usual narrow sense. . . . All thingly apperception and all apperception of unities of the nexus of several things and thingly processes would have their source in associative motivations (Husserl, 1983; cited in Dreyfus, 1996, §45).

This is a description of pre-reflective mental processes, all of which allegedly take place on an intentional level which is accessible through reflection. In this respect it is just one step short of the type of explanations given by the 18th-century ‘optic writers’ who made the visual perception of space the result of conscious calculations (see Schwartz, 1994). The question is whether the ‘reminding’ or ‘associative motivation’ in Husserl’s account is to be thought of (or best described) as an intentional

⁶ By ‘current rules’ I mean, for example, the idea that clean distinctions ought to be maintained between physics, syntax and semantics, and that a main part of the task of cognitive science is to explain or explain away semantics by appealing to the other two levels. Things may be much more complex than the current rules will allow, and in fact some version of phenomenology may present a serious challenge to the distinctions under consideration here. In this part of the discussion, however, I will stay within the current paradigm; I turn to more radical considerations in the final section.

⁷ Dennett is careful about this when others are not. For example, in his description of what purports to be the subpersonal syntax of introspection, an executive brain process “directs a question” to a memory buffer and then “interprets” the answer (1978, p. 156). The context and numerous double quotation marks make it clear that he is pursuing the intentional stance strategy in this case.

state (e.g. involving access to an unconscious belief or background schema) or as a subintentional performance of various neuronal structures. Husserl, of course, limited himself to an intentional explanation and suspended his judgment concerning extra-intentional factors.

Both in principle and by design phenomenological description, even if perfected with formalized language, as Marbach suggests, can only go so far within the bounds imposed by the procedure called 'phenomenological reduction' (Varela, 1996, provides a good description of this phenomenological method). It is limited to the intentional (personal or phenomenological) level. If one then wants to develop a causal explanation of conscious or intentional experience by appealing to extra-intentional or subpersonal levels, the question is precisely how phenomenological description will perform its constraining function and whether one can give phenomenology this function without committing the fallacy of misplaced intentionality. Marbach doesn't offer much guidance here. As a good phenomenologist, his aim is to perfect phenomenological description and to let others worry about causal explanation. Dreyfus (1996), Van Gelder (1996–97), and Varela (1997) offer more substantial suggestions about the nature of underlying causal mechanisms.

Van Gelder thinks that phenomenological evidence points to a dynamical model rather than a computational model. He focuses on the specific problem of time-consciousness, starting from Husserl's analysis of the flow structure of consciousness. If Husserl's description of the retentional–protentional structure of consciousness — a structure that unifies consciousness over time, in an intentional fashion — is correct, then it should help the cognitive scientist develop a good causal explanation of the underlying neural mechanisms. The constraint can be stated in this way: the cognitive scientist needs to know the phenomenology if she is to properly identify the right explanatory mechanism on the subpersonal level.

The reasonableness of this strategy will depend, I think, on whether one takes phenomenology as a strong constraint or a weak one. To take phenomenology as a weak constraint would be to hold that causal explanation ought to make good sense of the way we actually experience our phenomenal life. Van Gelder and Dreyfus, however, appear to take phenomenology as a strong constraint, in the following manner: for van Gelder and Dreyfus the causal mechanism to be identified on the subpersonal level needs to be isomorphic with details explicated in the phenomenological account.

Both Dreyfus and Van Gelder try to avoid intentionalizing descriptions of subpersonal levels, yet they may be guilty of a more subtle anthropomorphism in their appeal to neural net models as a possible way to discover a neural basis for intentional operations. The appeal to neural nets seems feasible. In some limited regards, taking the intentional stance, artificial neural nets (ANNs) can be regarded as intentional systems that operate in a similar way to the intentional system of human cognition. The logic is clear: to the extent that, on an intentional description, ANNs function in a fashion similar to human cognitive processes, then we might expect the underlying subintentional mechanisms of cognitive processes to be similar to neural net mechanisms. Here, for example, is Dreyfus' (1996) description of the subpersonal process involved in a neural net.

The hidden nodes of the most sophisticated networks are always already in a particular state of activation when input stimuli are received, and the output that the network produces depends on this initial activation. Thus input plus initial activation determines output. If the input corresponds to the experience of the current situation, the particular prior activation of the hidden nodes which is determined by inputs leading up to the current situation might be said to correspond to the expectations and perspective that the expert brings to the situation, in terms of which the situation solicits a specific response. This would distance this view from passive associationism and make it a perfect candidate for the neural basis of the phenomenon Merleau-Ponty calls the intentional arc (§49).

There are no homunculi in this description, and Dreyfus doesn't inflate intentionality with processes that are genuinely subpersonal — indeed, this is the 'passive associationism' that he is trying to avoid. Nor does he inflate subpersonal processes of input and output with intentionality. Yet it is possible to discern a more subtle anthropomorphism here, specifically in the positing of an isomorphic correspondence between the personal and the subpersonal levels.

Similarities are claimed, not simply and in a general fashion between intentional processes and neural nets, but on a more precise scale between intentional processes and their underlying subpersonal processes. Must subpersonal processes be isomorphic with intentional processes in order to meet the qualification of a good explanation? In Dreyfus' account the subpersonal processes seem to mirror precisely the kind of thing that the expert does when he or she acts in the world. Dreyfus uses the term 'correspondence', but there are two versions of correspondence that need to be sorted out. Isomorphic correspondence would entail, not simply a close tie between different-level events, but a resemblance or similarity. If the process on the intentional level looks like <ABC>, then the process on the subpersonal level must look something like <abc>. A weaker form of correspondence entails no isomorphism. In this case the subpersonal processes that underlie or correspond to <ABC> on the intentional level may look quite different, for example, <x . . . 3/4>.

The stronger, isomorphic correspondence is even clearer in van Gelder's proposal. Van Gelder rehearses Husserl's criticism of Meinong's account of time-consciousness. According to Meinong our consciousness of a temporally extended object, such as a melody, is made coherent by an additional mental act that synthesizes, *post factum*, the various momentary perceptions that develop as the temporal object (the melody) unfolds across time. This explanation runs counter to the way that we seem to experience temporal objects like melodies. Husserl's retentive–protentive model of time-consciousness provides an account that matches our experience — that is, it describes an ongoing and dynamic self-organizing perception of melody as the melody unfolds. Van Gelder asks about the subpersonal processes that might explain such perception. Like Dreyfus, he suggests that neural net models are to be preferred to computational models. The latter

have the same temporal structure as the Meinongian account of time consciousness. In computational models, the auditory pattern is first encoded symbolically and stored in a buffer. Only when the entire pattern has been stored in the buffer do the recognition algorithms go to work; and it is only when those algorithms have done their work that the system could be said to have any kind of awareness of the pattern as such (van Gelder, 1996, §29).

In contrast, neural net models are isomorphic with the details of Husserl's account. The dynamics of neural nets are much the same as the dynamics of experience. If Husserl's critique of Meinong is correct, then neural nets offer a better model than computational models for explaining consciousness.

According to van Gelder, not only does phenomenology guide our intuitions about the right subpersonal explanations, but the preferred neural net model of subpersonal processes identifies the 'actual mechanisms which underlie time consciousness and instantiate retention and protention' (1996, §36). In a neural net designed for auditory pattern recognition, for example, the current status of the system instantiates the culmination of a temporal trajectory; it retains its past in the same way that Husserlian retention retains past phases of experience; it 'stores' in the system the exact way in which the auditory pattern unfolded in the past. It is how the system "remembers" where it came from' (1996, §38). Van Gelder makes similar claims about protention and then sets out a strong case for isomorphism in the structural details of both time-consciousness and neural nets. For van Gelder, the isomorphism between these two models clearly stands as explanation.

Certain questions remain unanswered however. Why do subpersonal processes need to be isomorphic with intentional ones, and do we have any guarantee that they are, even in their structural features?⁸ Dennett (1991), for example, citing the neurophysiological work by Libet on backwards referral in time, provides good reason to question whether the temporal structure of subpersonal representation can be isomorphic with the serial structure of that which is represented on the intentional level. The phenomenological experience of temporal relations may be quite different from the temporal relations of neural processes.⁹ We also know that what we consciously perceive as a spatially coherent gestalt of integrated qualities — e.g. the red balloon floating off to the right across our perceptual field — is actually processed in a distributed and diversified manner in different parts of the brain. In this fact there is no necessary isomorphism between the distributed functioning of the brain and the ordered routine of intentionality. It is also well known that the brain processes a larger quantity of information about environmental features than we become conscious of in perception (see e.g. Marcel, 1983). Here, we might say that there is no quantitative isomorphism. It is likely that if we subtracted the subpersonal information that seems in excess of that which strictly corresponds to the intentional experience, the intentional experience would not remain identical. Our conscious perception depends a good deal on what we are not consciously aware of.¹⁰

⁸ Dreyfus and van Gelder are not alone in purchasing explanation with the currency of isomorphism. Many theorists slide too easily from what may be significant correspondences to accounts that make isomorphisms work as explanations. There is a tradition of this in psychology. Köhler (1947) cites principles of psychophysical isomorphism developed by Hering and Müller as forerunners of his 'principle of isomorphism'. More recently Chalmers' principle of structural coherence, which quickly turns into an explanatory principle (1995, p. 213), is little criticized in the follow up discussions (see Chalmers, 1997). McClamrock (1995, p. 180), however, criticizes such claims for isomorphism, and argues that context dependency on the phenomenological level, and multiple realizability on the subpersonal level upset such claims. See further discussion below.

⁹ This challenges directly a proposition formulated by Köhler based on his principle of isomorphism: 'experienced order in time is always structurally identical with a functional order in the sequence of correlated brain processes' (1947, p. 62).

¹⁰ Damasio (1994) provides some indications of this.

Millikan (1993) has pointed out the danger of assuming the stronger form of correspondence. Millikan distinguishes between content and vehicle on the intentional or phenomenological level. For example, it would be a mistake to claim that the content of perception has to have the same properties as the act of perception, or vice versa. The perception of a red tomato does not have to be red; the perception of succession is not equal to the succession of perception, etc. Finding or positing isomorphic correspondences, according to Millikan, draws forth the illusion that one has found the explanation. Perception of a tomato as red is possible because of a corresponding redness of sense datum; we perceive succession because our perception is successive. If these are obvious mistakes that we now avoid, there are more subtle forms of isomorphic correspondences between intentional and subpersonal levels that may mistakenly take the place of good explanation.¹¹ Both Dreyfus and van Gelder come to rely on the criterion of isomorphism to support the idea that subpersonal dynamical processes explain intentional experience. Simply put, because neural net processes are isomorphic with intentional processes, the former explain the latter. Varela (1996) nicely summarizes this kind of isomorphic correspondence as follows:

Φ looks like $\Psi \Rightarrow \Phi$ explains Ψ

Does good explanation require an isomorphic correspondence? Does isomorphism constitute a good explanation? One easily sees the problem in a different sort of example. An automobile ‘behaves’ in the following way: it moves smoothly along a straight path on a relatively horizontal plane. If we start to look under the hood to explain how this ‘behaviour’ is possible, the assumption that the explanation must be isomorphic with the explicandum would require us to find mechanical processes that move smoothly on a horizontal plane. We would be puzzled at finding small explosions that drive pistons along vertical planes, causing a variety of circular motions. The apparent behaviour of the automobile is not a very good clue to the dynamic properties of the underlying mechanical processes that drive it, although once we know how combustion engines and drive trains work it becomes obvious how they can explain the automobile’s ‘behaviour’.¹²

Varela (1997), in an application of his concept of neurophenomenology, independently explores the very same relation that van Gelder examines between a cognitive–dynamical account and Husserl’s analysis of time consciousness. One important difference is that Varela avoids taking isomorphic correspondences as explanations. The reason for this difference is that he provides experimental data from the neurosciences that closely ties the phenomenology to dynamical processes, so much so that the neuronal processes he refers to can stand as part of a causal explanation. The fact that Varela can find evidence in the neurobiology and in

¹¹ Schwartz (1994, p. 38) indicates a good example of such false explanation: on the projective field model of vision, spatial organization of the neurological array is isomorphic to environmental or perceived space; the isomorphism is then taken to be the explanation of how we perceive spatial dimension.

¹² Van Gelder himself suggests the limitations of looking for isomorphic correspondences. ‘There is no reason to assume that the phenomenology of a mental process should somehow give direct insight into the nature of the causal processes that subserve that phenomenology. By analogy, the picture on television gives no insight into the causal mechanisms that give rise to that picture . . .’ (van Gelder, 1996, §26).

experimental data that suggests connections between dynamical organization and the structure of time-consciousness moves his analysis beyond the simple claim of isomorphism (or more precisely, the assumption that isomorphism is equivalent to explanation). Although Varela does find in the non-linear dynamical and distributed neuronal processes of the brain ‘strict correlates’ to structures that Husserl describes on the phenomenological level, these correlates are not strictly isomorphic. The task, as Varela sees it, is not to settle on isomorphic correspondences, but to sort out correlations and contradictions between phenomenological and neuroscientific accounts in such a way that these accounts mutually constrain, enlighten, and enrich each other. A neurodynamical account, for example, may suggest that more attention should be paid to emotion or affect in the phenomenological analysis of temporal experience, and conversely, phenomenological descriptions may suggest connections among dynamical process levels different than one might suspect solely from the results of empirical experiment.

On the basis of the distinction between strong (isomorphic) and weak correspondence we can distinguish between a strong and a weak version of the claim that phenomenology constrains cognitive science. The strong version states that phenomenological descriptions of consciousness and cognition provide something like a template that defines what we need to find on the subpersonal (syntactic, physical) level of explanation. On this view, if the intentional process looks like <ABC> then the subpersonal process that we need to find should look like <abc>, and if it doesn’t, it can’t be right. The weaker version simply states that if we are to seek explanations of consciousness and cognition on subpersonal levels, we need to start with a precise description of what it is that we are trying to explain so that we can recognize a good explanation when we see it. This claim would not place strong limiting constraints on the shape of the subpersonal mechanism — it would not require that the sub-intentional level mirror the intentional one, and if it happens that the subpersonal process is isomorphic with the structure of intentional experience, it does not mistake this fact for an explanation.

Proclivities to Theory

If we formalize our descriptive vocabulary, and we avoid the fallacy of misplaced intentionality, including the inclination to substitute isomorphisms for explanations, we are still not out of Dennett’s woods. We still need to deal with reflection’s susceptibility to error and the proclivity to slide from description to theory, for these issues threaten even the weak constraint that phenomenology might have over cognitive science.

It is not easy, in the mode of reflective phenomenology, to keep from reading too much into conscious processes, or from sliding into theoretical construction. Husserl himself, in the context of working out his analysis of time-consciousness, cautions the phenomenologist against letting reflection distort living experience (1991, p. 132; 1983, §77). Yet his own phenomenological analysis of time-consciousness may count as a good example of what he cautions against.

Are retentive and protentive structures intentional or subintentional components of cognitive acts? Retention, according to Husserl, involves consciousness preserving its just-past moments as an intentional (semantic) unity in the now moment of experience. Although we are not usually conscious of the actual mechan-

ism of retention we can, according to both Husserl and van Gelder, examine it by means of phenomenological reflection. Retention is thus construed as a structural feature of intentional consciousness, part of the very structure of perceptual and other noetic acts. Protention is very much like retention except that it is directed toward the immediate future. One can object, however, that the details of the retentional–protentional structure are not explicitly discoverable in consciousness (Gallagher, in press). Rather, one might suggest, this structure appears to be an ingenious theoretical construct that cleverly corrects the unworkable accounts of experience given by Meinong and Brentano. The retentional–protentional structure constitutes an excellent theoretical solution to the difficult problem of time-consciousness, but there seems to be no *phenomenological* evidence that retentional–protentional processes actually exist in consciousness (in the sense that phenomenological reflection would be able to provide direct intuition of such functioning). The phenomenologist may rightly claim that some such structure must exist or else it would be impossible for us to experience temporal objects; but this is theory rather than phenomenological intuition. Even if the theory is right and there are retentional functions, are they not more likely to be subpersonal operations? William James (1890), for example, describes very similar structures but theorizes that they are neuronal functions — and thus unavailable to phenomenological reflection.¹³

The supposition here, and in all the authors we have mentioned, from Husserl to Dennett, from Marbach to Dreyfus, is that there is a proper division of labour between phenomenology and cognitive science, between pure description and objective explanation. Phenomenology must stay strictly within its first-person descriptive programme; science must stick to rigorous third-person explanation. For some this makes phenomenology irrelevant to science; for others phenomenology poses relevant constraints on science. But are things really so neat? Are explanation and description completely separable? Do the facts to be described or explained exist completely independent of the approaches taken toward them? This is not the place to entertain controversies in the philosophy of science or in philosophical hermeneutics, but it may be of some benefit to consider briefly the underlying distinction between first-person and third-person levels of explanation.

It was hinted in our considerations of Dennett's insistence on third-person, objective, scientific explanation that neither heterophenomenological nor third-person explanations in general are entirely free of phenomenological elements. These elements may be repressed or considered to be reduced to some controllable third-person discursive categories, but they nonetheless operate at the level of supposition in third-person accounts. Third-person accounts of cognition are themselves produced in instances of first-person cognition. Husserl made this claim in the most general terms concerning science, and it motivated his transcendental idealism. The basic categories employed by science are directly or indirectly derived from the life-world — the world of everyday folk experience. Science, after all, is an enterprise conducted by finite, conscious persons and is about consciously knowing and explaining

¹³ James does not substitute isomorphism for explanation in this case. Rather, on the intentional level he describes what he calls the 'specious present', and then asks what sort of neuronal processes could possibly explain that experience. His theory of neuronal retention is not isomorphic with the specious present, but is meant to explain how the specious present could arise on the basis of brain processes (see Gallagher, in press).

the world. Heidegger too, as Okrent (1996) points out, locates scientific pursuits within a phenomenological–existential framework, one that necessarily constrains the scientific, third-person explanation of cognition. The hermeneutical insight gained by Heidegger and others is that third-person explanations are unavoidably constrained by first-person projects and historical effects.¹⁴

At the same time, the lesson to be learned from Descartes' failure is that there is no presuppositionless first-person perspective. This is precisely what motivates Husserl's phenomenological reduction (and his project to achieve what Descartes failed to achieve — a presuppositionless certainty) and, along different lines, what motivates Merleau-Ponty (1962) to claim that the phenomenological reduction, of necessity, can never be complete. First-person explanations or phenomenological descriptions are generated within the linguistic framework of a social world that always undermines the solipsism of the first-person perspective. Although within language one can develop the distinction between first- and third-person discourse, linguistic ability itself is not easily classified as exclusively a first- or third-person phenomenon. Given that the phenomenologist requires language to construct her descriptions, it is not difficult to understand the tendency of first-person phenomenological reflection to slip into third-person theoretical constructions.

Similar remarks can be made about the distinction between personal and subpersonal explanations. Here we need to examine what I termed in a previous section the 'current rules' of cognitive science. It is not clear that one can identify in an absolutely clear-cut manner the personal level with pure intentionality and the subpersonal with purely functional, syntactical, or physical relations. Rather, as recently suggested by Bermúdez (1995), in the actual analysis of cognitive processes like vision, it is not possible to delineate aspects of subpersonal processing, for example, at the computational level, without considering the environmental features that such processes are attempting to model. This means that neuronal processes have a semantic dimension and that 'when cognitive scientists refer to subpersonal states in intentional terms they do so out of necessity rather than convenience' (Bermúdez, 1995, p. 363). In the analysis of cognitive processes, as in the analysis of language, syntax can be defined clearly only in light of the semantics that it supports; one requires the intentional (or intensional) sense to make sense out of the related subpersonal (syntactical) structure.

The current rules of cognitive science require levels of explanation to be distinct and clear, or to the extent that intentional elements seem to unavoidably insert themselves into subpersonal explanations, the rules require the maintenance of an 'as if' clause. If, however, one can find principled reasons to question these rules even within cognitive science — if, that is, there is no purity, no strict line that divides intentional from extra-intentional processes — one can start to see a different role for phenomenology in cognitive science. In this regard, however, we need to turn to the existential versions of phenomenology represented in Okrent (1996) and McClamrock (1995).

¹⁴ Max Velmans (1995) makes a similar point about third-person scientific observation and first-person experience, and concludes that 'all phenomena in science are seen to be aspects of the phenomenal worlds of observers, and therefore *part-of* the world that they experience. "Qualia" are in there from the beginning. Indeed, the *whole* of science may be seen as an attempt to make sense of the phenomena that we observe or experience' (p. 265).

Existential Contexts, Externalist Insights and Ecological Solutions

Much of cognitive science, when not explicitly internalist on the theoretical level, is implicitly internalist on the level of scientific procedure. Internalism is reflected in strategies that discount intentional or experiential aspects of human behaviour or, at best, relegate intentionality to the status of explicandum. On this view, and at best, consciousness is what needs to be explained, rather than what might serve as part of the explanation. Specifically, for an internalist, explanations are to be found completely on the level of brain processes. The only scientific explanation will be one that is developed on the subpersonal level.

Existential phenomenology offers a challenge to internalism. It suggests that the conditions necessary for consciousness cannot be found complete in the artificial ecology of 'the brain in the vat'. Rather, consciousness is 'in-the-world' in the radical way that someone like Heidegger defines this. Okrent cites Bechtel and Abrahamsen's acknowledgment of Heidegger's insight, that 'our cognitive system exists enmeshed in the world in which we do things, where we have skills and social practices that facilitate our interaction with objects' (Bechtel and Abrahamsen, 1991, p. 126). Here it is not a matter of an independently formed consciousness thrown into an objective environment, or of a fully formed brain existing in a container we call the world. Rather, consciousness and the brain develop and function within a form of existence that is already defined by the world it inhabits. Moreover, embodied action in social circumstances, rather than intellectual cognition, constitutes our first interaction with the world. If Heidegger is right, Okrent suggests, then these facts indicate a set of conditions 'which must be satisfied by any system which could count as thinking in the same sense we think' (1996, §3). Specifically with respect to projects in artificial intelligence, this implies that a program which specifies only syntactical rules for manipulating formal symbols would not be able to satisfy the relevant set of conditions for human consciousness.

Okrent argues in an interesting way that this does not mean that in principle a properly designed computer would not be able to attain human consciousness. Heidegger, in fact, provides the conditions that are necessary for the proper design. Okrent, however, reduces these conditions, which for Heidegger constitute the unified basic structure of being-in-the-world, to the capacity for overt action (goal-directed behaviour) in the world. He contends (in opposition to the usual view taken in cognitive science, and attributable to thinkers like Fodor, Dennett and Davidson) that the intentionality of conscious experience is derivative from the intentionality of overt actions. An action is not goal directed because consciousness has already decided on a goal; rather, the action itself is intrinsically goal directed within the context of a meaningful world. Consciousness takes its bearing, and finds itself developing within intentional structures that are already established in the world of social relations. Although I think that Okrent over-emphasizes and makes essential what Heidegger meant only as important examples, namely, overt action and the use of tools, he is on the right track in pointing out that cognitive behaviour is not the primary form of human behaviour, but a derivative one. Thought, in a sense, is always an afterthought to involvement in a world which is primarily social. This latter aspect implies a certain dimension of normativity — our behaviour is akin to the behaviour of others and we find ourselves immersed in a world of already specified practices.

As Okrent himself notes (§§63 ff.), the implications of Heidegger's existential analysis can be clarified by a comparison to John Searle's Chinese Room. Searle and Heidegger agree that syntax alone just will not do the job, and Okrent makes this clear. The difference between Searle and Heidegger, however, does not concern the presence or absence of consciousness, as Okrent suggests, but the presence or absence of a world. Searle is an internalist who thinks that the right neurobiology is sufficient for semantics;¹⁵ Heidegger is an externalist and maintains that semantics is part of the structure of being-in-the-world. For Heidegger, it is not that we are in-the-world unconsciously, but that to be conscious is part and parcel, yet not the entire story, of what it means to be in the world.

In his sustained and critical analysis, McClamrock pursues this existentialist, externalist insight about the embeddedness of experience in the world, starting with issues in the philosophy of science concerning context-dependence and levels of explanation. He carries the discussion directly into considerations about the 'frame' problem and 'bounded rationality' in AI and thence to cognitive processes such as perception. From one perspective, the practical virtue of McClamrock's book is that he engages the argument almost exclusively within the discursive field of cognitive science — his interlocutors are Chomsky, Marr, Fodor, Putnam, Dennett, etc. — and only in the end does he reveal the philosophical implications — that cognitive science genuinely requires the insights of existential phenomenologists like Heidegger and Merleau-Ponty.

McClamrock begins by pointing out that if one attempts to provide explanations at subpersonal (syntactic, algorithmic, or even physical) levels, sorting out significant function from noise, for example, one needs to know what the system is meant to accomplish on a higher (semantic, intentional, or behavioural) level. Knowledge about intentional behaviour is not only a presupposition for developing an understanding of subpersonal processes, but intentional behaviour actually defines the requirements of the subpersonal processes. Such requirements, however, can be met in a number of different ways at the subpersonal level. (McClamrock's examples are taken from computer science, but one could also think about the degrees of redundancy and plasticity that one finds in the brain). This fact of multiple realizability is matched in complexity by the fact that context-dependence on the intentional or behavioural level 'allows the very same lower-level structure to implement different higher-level objects in different contexts' (p. 25). More precisely, behavioural context may be such that it causes an identical subpersonal process to play a different functional role by bestowing functional saliency to different properties of that process. What may be unessential or even noise in one context, may turn out to be key in a different context. Such complexities and contingencies make it requisite for the cognitive scientist to recognize that cognitive systems are not isolated from intentional and behavioural contexts. Consciousness, for example, does not simply supervene on neuronal activities; neuronal activities will depend on the behavioural context within which consciousness itself functions.

¹⁵ Searle states: 'The brain is all we have for the purpose of representing the world to ourselves and everything we can use must be inside the brain . . . Each of our beliefs must be possible for a being who is a brain in a vat because each of us is precisely a brain in a vat; the vat is a skull and the "messages" coming in are coming in by way of impacts on the nervous system' (1983, p. 230).

Thus McClamrock argues against various forms of internalism that would make cognition depend exclusively on formal or physical states completely internal to the organism, or that would assert a one-to-one, one-way correspondence between functional states and intentional psychology. He argues for a wide notion of content that recognizes that type-identical brain states may correspond to different intentional experiences since mental states are affected by social and environmental contexts. Experience is always embedded, the organism is always significantly tied to its ecological situation, which involves not only its behavioural environment, but its social circumstances.

McClamrock makes it clear that there are two questions involved in the project to explain cognitive behaviour. I'll pose them here in terms of consciousness. First, what mechanisms internal to the organism contribute to the event of consciousness, and how do they work? Second, what is the explanation of why and how consciousness happens? McClamrock argues that a complete or sufficiently meaningful answer to the first question depends on the answer to the second, and the answer to the second question depends on understanding the relations between organism and environment. Even with respect to something like memory, we need more than an explanation of how neuronal processes retrieve or reproduce perceptual processes. We need to see that much of the information which informs memory is 'stored' in the environment. Although this insight has been exploited by both cognitive scientists and phenomenologists (e.g. Simon, 1981; Casey, 1983), McClamrock introduces an insightful twist:

From the point of view of information, the interesting distinction is not the organism/world one, but something more like the inference engine vs. the database; and the database includes both things inside the organism like long-term memory, but also things outside the organism, including the structure of both the social and the local physical world (1995, p. 89).¹⁶

McClamrock's externalist analysis covers numerous topics, including issues in artificial intelligence, models of rationality, language, perception, and the problem of qualia. He consistently critiques those approaches that make context-independent assumptions, and in place he offers a model of ecologically embedded experience. Only at the end of these analyses, however, does he make clear the relevant philosophical backdrop. There are elements in Husserlian phenomenology that can clarify some of the issues regarding the relation between the computational model of the mind and meaningful experience. More importantly, the insights of existential phenomenology into concepts such as being-in-the-world (Heidegger) and embodied existence (Merleau-Ponty) can help to enlighten an externalist position that takes ecological embeddedness seriously.

From Husserl, McClamrock borrows the distinction between real noetic processes and intentional noematic aspects of consciousness. As Husserl explains this distinc-

¹⁶ The contrast between pure phenomenology, the cognitive internalist approach, and the existential-phenomenological externalist approach is nicely represented in the different views of memory presented, respectively, by Marbach (1993) — memory as a purely intentional representation of an original presentation — Damasio (1994) — memory as a 'synchronous activation of neural firing patterns' — and McClamrock (1995). Damasio's general position is otherwise quite consistent with the existential-phenomenological emphasis on the body proper (e.g. Merleau-Ponty) and the importance of the interaction with the world or environment (e.g. Heidegger), and thus with McClamrock's notion of existential cognition. The appropriate philosophical background, however, is missing in Damasio's book.

tion, he appears to build-in precisely the conceptions that McClamrock has been arguing for — multiple realizability and context-dependency. The noetic aspects of consciousness can realize a particular noema (meaning unity or sense) in a number of different ways; and, on an existentialist and naturalistic interpretation of Husserl, the noema is constituted as a particular meaning unity only to the extent that it is embedded in local world contexts.¹⁷ The relative stability of the noema through varying aspects of noetic processes also suggests to McClamrock a way to explain how object constancy maintains itself even through fluctuations of perceptual mechanisms, for example, saccadic eye movement (see p. 183).

McClamrock also finds value in an existentialized version of the phenomenological reduction. The right view of the reduction is not, as in Husserl, to bracket off the world in order to discover the pure, worldless structures of consciousness, but rather, as in Merleau-Ponty, to use the distance supplied by the reduction as a heuristic device to reveal the genuine play of the world, the often unconscious background of the world implicit in cognitive processes. Phenomenology on this model would be charged with specifying precisely what an intelligent system is meant to accomplish on a higher (semantic, intentional, or behavioural) level, within the real and ecologically sound contexts of the world, in a way that is not inconsistent with an information-processing account of consciousness.

That the mind is embedded in a world that is social as well as physical, and that the explanation of consciousness has to take into consideration this embeddedness, is the lesson that cognitive scientists can draw from existential phenomenology. Against internalist programmes, McClamrock poses the existentialist critique: ‘Thought and action only make sense against the presupposition of a particular structured world; and to attempt analysis in isolation from that world is to welcome failure’ (p. 192). McClamrock’s work suggests a different model for how phenomenology and cognitive science might work together. Rather than the model that makes one discipline a constraint upon the other (as in Marbach, Dreyfus, van Gelder and Okrent), we find in McClamrock what Varela *et al.* have called a model of ‘mutual illumination’ (Varela *et al.*, 1991, p. 15).

Conclusion

For obvious reasons we have an easier time explaining how an automobile can move across the surface of a road than we have in explaining how the human mind does what it does. The combustion engine was created by the human mind, whereas the human mind came on the scene in quite a different way. We might think here of a distinction made by another existential-phenomenologist, Gabriel Marcel. He suggested that science is very capable of dealing with *problems*, those things, natural and artificial, that can be adequately explained from an objective point of view. There exists a different category of issues, however, that transcend even the hardest problems; he called them *mysteries*.¹⁸ Mysteries are precisely defined as those phenomena

¹⁷ McClamrock is not always precise in his characterization of Husserl’s distinction. In Husserlian phenomenology, for example, noetic acts or phases are not, as McClamrock suggests, united into noematic unities (see pp. 182–3). In the context of McClamrock’s discussion, however, this is a minor and easily correctable point.

¹⁸ Marcel (1952). It is interesting to note that Damasio (1994, p. xviii) makes use of this same distinction which he finds in Chomsky. Of course the distinction is commonly used to discriminate between scientists and ‘mysterians’ in regard to the question of whether consciousness will ever be explained.

which do not allow the scientific investigator a complete or objective point of view, because within such phenomena the investigator is already fully immersed. Love, existence, and one's own body are on Marcel's list of mysteries. Neither cognitive science nor phenomenology wants to place consciousness on that list. Both disciplines view consciousness as a solvable problem and affirm its openness to scientific, objective interpretation. In this case it is only the gap that continues to persist between phenomenology and cognitive science that seems mysterious. In the authors that we have considered here, however, that mystery is starting to dissipate.

References

- Bechtel, W. and Abrahamsen, A. (1991), *Connectionism and the Mind* (Oxford: Basil Blackwell).
- Bermúdez, José (1995), 'Syntax, semantics and levels of explanation', *The Philosophical Quarterly*, **45**, pp. 361–7.
- Casey, Edward (1983), 'Keeping the past in mind', *Review of Metaphysics*, **37**, pp. 77–95.
- Chalmers, David (1995), 'Facing up to the problem of consciousness', *JCS*, **2** (3), pp. 200–19.
- Chalmers, David (1997), 'Moving forward on the problem of consciousness', *Journal of Consciousness Studies*, **4** (1), pp. 3–46.
- Damasio, Antonio, R. (1994), *Descartes' Error: Emotion, Reason, and the Human Brain* (New York: Grosset/Putnam).
- Dennett, Daniel (1969), *Content and Consciousness* (London: Routledge and Kegan Paul).
- Dennett, Daniel (1978), *Brainstorms: Philosophical Essays on Mind and Psychology* (Cambridge, MA: MIT Press / Bradford Books).
- Dennett, Daniel (1991), *Consciousness Explained* (Boston, MA : Little Brown).
- Dreyfus, Hubert, L. (ed. 1982), *Husserl: Intentionality, and Cognitive Science* (Cambridge, MA: MIT Press / Bradford Books).
- Dreyfus, Hubert L. (1996), 'The current relevance of Merleau-Ponty's phenomenology of embodiment', *The Electronic Journal of Analytic Philosophy*, (<http://www.phil.indiana.edu/ejap/>), **4**, Special Issue: Existential Phenomenology and Cognitive Science, ed. Mark Wrathall and Sean Kelly.
- Gallagher, Shaun (in press), *The Inordinance of Time* (Evanston: Northwestern University Press).
- Husserl, Edmund (1983), *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy*, Book I, trans. F.Kersten (The Hague: Martinus Nijhoff).
- Husserl, Edmund (1991), *On the Phenomenology of the Consciousness of Internal Time (1893-1917)*, trans. John Brough. Collected Works IV (Dordrecht: Kluwer Academic).
- James, William (1890), *The Principles of Psychology* (New York: Dover, 1950).
- Köhler, Wolfgang (1947/1970), *Gestalt Psychology* (New York: Liveright).
- Kosslyn, St. M. (1978), 'Imagery and internal representation', in *Cognition and Categorization*, ed. E. Rosch and B.B. Lloyd (Hillsdale: Lawrence Erlbaum).
- Kosslyn, St. M. (1980), *Image and Mind* (Cambridge, MA: Harvard University Press).
- Kosslyn, St. M. (1984), 'Mental representation', in *Tutorials in Learning and Memory: Essays in Honor of Gordon Bower*, ed. J.R. Anderson and St. M. Kosslyn (San Francisco: W.H. Freeman).
- Lyons, William (1986), *The Disappearance of Introspection* (Cambridge, MA: MIT / Bradford).
- Marbach, Eduard (1993), *Mental Representation and Consciousness: Towards a Phenomenological Theory of Representation and Reference* (Dordrecht: Kluwer Academic).
- Marcel, Anthony J. (1983), 'Conscious and unconscious perception: An approach to the relations between phenomenal experience and perceptual processes', *Cognitive Psychology*, **15**, pp. 238–300.
- Marcel, Gabriel (1952), *Homo Viator* (Chicago: Regnery).
- McClamrock, Ron (1995), *Existential Cognition: Computational Minds in the World* (Chicago: University of Chicago Press).
- Merleau-Ponty, Maurice (1962), *Phenomenology of Perception*, trans. Colin Smith (London: Routledge and Kegan Paul).
- Millikan, Ruth Garrett (1993), 'Content and vehicle', in *Spatial Representation: Problems in Philosophy and Psychology*, ed. Naomi Eilan, Rosaleen McCarthy and Bill Brewer (Oxford: Basil Blackwell).
- Okrent, Mark (1996), 'Why the mind isn't a program (But some digital computer might have a mind)', *The Electronic Journal of Analytic Philosophy*, (<http://www.phil.indiana.edu/ejap/>), **4**, Special Issue: Existential Phenomenology and Cognitive Science, ed. Mark Wrathall & Sean Kelly.

- Pylyshyn, Z.W. (1973), 'What the mind's eye tells the mind's brain: A critique of mental imagery', *Psychological Bulletin*, **80**, pp. 1–24.
- Schacter, D.L., Reiman, E., Curran, T., Yun, L.S., Bandy, D., McDermott, K.B. & Roediger, H.L. (in press), 'Neuroanatomical correlates of veridical and illusory recognition memory: Evidence from Positron Emission Tomography', *Neuron*.
- Schwartz, Robert (1994), *Vision: Variations on Some Berkeleyian Themes* (Oxford: Blackwell).
- Searle, John (1983), *Intentionality: An Essay in the Philosophy of Mind* (Cambridge: CUP).
- Simon, H. (1981), 'The psychology of thinking: Embedding artifice in nature', in *The Sciences of the Artificial* (Cambridge, MA: MIT Press).
- van Gelder, Tim (1996/97), 'Wooden iron? Husserlian phenomenology meets cognitive science', *The Electronic Journal of Analytic Philosophy*, (<http://www.phil.indiana.edu/ejap/>), **4**, (1996) Special Issue: Existential Phenomenology and Cognitive Science, ed. Mark Wrathall and Sean Kelly. Also in *Naturalizing Phenomenology: Issues in Contemporary Phenomenology and Cognitive Science*, edited by J. Petitot, F.J. Varela, J-M. Roy and B. Pachoud (Stanford: Stanford University Press, 1997).
- Varela, Francisco J. (1996), 'Neurophenomenology: A methodological remedy for the hard problem', *Journal of Consciousness Studies*, **3** (4), pp. 330–49.
- Varela, Francisco J. (1997), 'The Specious Present: A Neurophenomenology of Time Consciousness', in *Naturalizing Phenomenology: Issues in Contemporary Phenomenology and Cognitive Science*, edited by J. Petitot, F.J. Varela, J-M. Roy and B. Pachoud (Stanford: Stanford University Press).
- Varela, Francisco J., Evan Thompson and Eleanor Rosch (1991), *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge, MA: MIT Press).
- Velmans, Max (1995), 'The relation of consciousness to the material world', *Journal of Consciousness Studies*, **2** (3), pp. 255–65.

Paper received October 1996