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Fluid Boundaries and Multiple Perspectives at the Interface of Cognitive Science and Phenomenology

by

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"We are not students of some subject matter, but students of problems. And problems may cut right across the borders of any subject matter or discipline."

-Karl Popper (1963, p.88)

The strategies we use to bring intelligibility to experience color our understanding of the world. Perhaps the clearest articulation of my point here is Werner Heisenberg's quote regarding his uncertainty principle: "we have to remember that what we observe is not nature in itself but nature exposed to our method of questioning" (Heisenberg, 1962, p. 58). When analytic thought dominates, we render the world intelligible through distinctions, often static and discrete. With an alternative strategy the world could look quite differently. When systems thinking dominates, when attempting to articulate the complexity of relations of the components of a system, the boundaries between those components are difficult to draw as the dynamical nature of systems comes into focus. Such an alternative strategy might question fundamental distinctions in the original strategy, or even the validity of the act of drawing distinctions as an adequate strategy to gain understanding in the first place. How does one reconcile two perspectives when they seem contradictory?

If the claim above were true in all cases, if we cannot help but project our methods of thinking onto the content of our thoughts, then it would follow that no perspective could be privileged absolutely. A lack of any absolutely privileged perspectives does not suggest that one perspective might not be better suited to grasp a particular aspect of phenomena. If Thomas and Maurice are facing one another, and there is a tomato between them; then of course Thomas is better suited to grasp the aspect of the tomato facing him, and likewise for Maurice. The entirety of the tomato, however, is not fully presented to either of them. There is no objective, view from nowhere (Nagel, 1986).

A view from nowhere does not exist, but approaching a view from everywhere seems at least plausible. Phenomena have many aspects that disclose themselves at various spatial and temporal scales. Certain perspectives are better suited to grasp some aspects rather than others. Multiple perspectives allow for a fuller presentation of phenomena, as Merleau-Ponty writes, "if it is to reach perfect density, in other words if there is to be an absolute object, it will have to consist of an infinite number of perspectives compressed into strict coexistence, and to be presented as it were to a host of eyes all engaged in one concerted act of seeing" (1962, p. 70). Once more, consider Thomas and Maurice. If Thomas explained how the tomato presented itself to him, Maurice would grasp Thomas's aspect of the tomato. But Maurice would also, in some sense, grasp the tomato as presented to Thomas.

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INTRODUCTION

There is a growing body of researchers that recognizes that, in order to understand subjective experience, there is a need for a philosophically sophisticated grasp of the findings of contemporary neuroscience. These researchers are situated within what Andrew Brook and Pete Mandik, in their introduction to *Cognition and the Brain,* describe as "a small movement dedicated to applying neuroscience to traditional philosophical problems and using philosophical methods to illuminate issues in neuroscience…[that] began 20-25 years ago and has been gaining momentum ever since." Such interdisciplinary work necessitates fruitful dialogue, which can only happen in a common language.

There are many disciplines that have set up camp on this intellectual landscape: philosophy of mind, phenomenology, cognitive neuroscience, cognitive science, and even contemplative traditions such as Tibetan Buddhism. Each of these disciplines has unique insights to bring to the table. For instance contemplative and phenomenological methods have been used in neuroscience (Varela, 1996; Lutz and Thompson, 2003), insights from phenomenology have also been used to guide experimental design in cognitive science (Gallagher, 2005). There have also been

arguments for a more open exchange between phenomenology and analytic philosophy of mind (Zahavi, 2002).

However, the prospect of collaboration presents a host of problems familiar to any interdisciplinary endeavor. Multiple bodies of literature, each with its own history and language, and long-standing interdisciplinary conflicts are some examples of the issues that need to be dealt with. In spite of these issues, a picture of fruitful collaboration is beginning to emerge. The philosophy and neuroscience movement is growing (see Brook, & Akins, 2005). Journals such as *The Journal of Consciousness Studies, Phenomenology and the Cognitive Sciences,* and *Consciousness and Cognition* create important spaces for the development of this dialogue.

The interdisciplinary nature of the investigation of subjective experience requires that the disciplines involved understand methodology and theoretical frameworks of their collaborators. The extent to which this is successful will depend on the adequacy of translation of the findings of one discipline into the language of another. For instance, in order for philosophers integrate the concepts of neuroscience into their work, they must first understand those concepts. However, not all philosophers would easily accept this prospect. Some philosophers worry that such integration would radically change the way philosophy is done, to the extent that a naturalized philosophy would not be philosophy at all. Likewise, there is a sense that, in grappling with the issue of how to scientifically study subjectivity, the cognitive sciences may have to revise some of their fundamental methodological obligations. Many have argued that without the inclusion of the first-person perspective the scientific study of consciousness would be inadequate, but such

inclusion seems fundamentally opposed to the methodological obligation to the third-person, objective perspective that has characterized modern scientific endeavors.

Just as two individuals will come away from a successful conversation with new ideas, the disciplines involved in this discussion will necessarily be altered by their interaction. The interdisciplinary nature of the endeavor, as well as the character of the phenomenon under investigation, seems to entail fluidity both in theory and method. The extent of the transformations resulting from this fluidity remains to be seen; this is what I would like to explore.

I present a nested set of case studies in which I attempt to illustrate the notion of fluid boundaries resulting from tight coupling of supposed separate units, and alternative perspectives taken on a system. Three narrative threads run throughout the piece to articulate this notion of fluidity. These threads run through the background of the entire piece rather than falling neatly into its three parts. The first thread is a discussion of interdisciplinarity in the abstract. The second thread is a discussion of the interface of the cognitive and brain sciences with phenomenology, as an example of interdisciplinarity. The third thread is a discussion of the subject matter at the interface of those disciplines, namely the mind, body, and world. In each case I argue for the fluidity of boundaries.

In the discussion of interdisciplinarity I intend to show that the engagement of multiple disciplines can lead to an integration of those disciplines. In spite of speaking of disciplines as singular entities, I argue that disciplinary boundaries are difficult to draw and necessarily get redrawn as new problems arise. If the resources of a single discipline are inadequate to address a problem, that discipline will engage

another. If this engagement persists, through coupling of these parent disciplines, a new discipline will arise. Biochemistry is offered as a historical example of the results of such engagement. Recent blending of the cognitive and brain sciences suggests many other examples will be available in the near future.

The second narrative revolves around the contemporary coupling of the cognitive and brain sciences with philosophy and phenomenology. Many fields within cognitive science, psychology, and neuroscience have intermingled in recent years. But, the complexity of problems related to the scientific study of subjective experience has catalyzed a coupling that bridges the gap between the sciences and the humanities. Subsequently, two prospective new disciplines have emerged: neurophilosophy, and neurophenomenology. The second narrative focuses on neurophenomenology, the engagement of the cognitive and brain sciences with phenomenology. With this discussion I suggest that the integration of the cognitive and brain sciences with phenomenology may entail a shift in theoretical and methodological orientation within the mind sciences. I sketch some practical issues that come along with interdisciplinary engagements in general, but that are especially important to consider when dealing with disciplines, such as phenomenology and cognitive sciences, that have very different explanatory strategies and theoretical frameworks. Not only will the engagement of phenomenology and cognitive sciences necessitate a shifting of disciplinary boundaries, but phenomenological insight also suggests reconceptualizing the traditional boundaries that those sciences use to delineate their subject matter.

The third narrative thread running through the piece, which comes out explicitly in the final sections, is the fluidity of boundaries separating the mind, the body, and the world. Again fluidity is mediated by coupling, but only seems apparent from a certain perspective. From the third-person perspective—the perspective engendered by reflection—mind, body, and world appear as separate entities best approached through abstraction. From the first-person perspective—that of embodied and situated experience—mind, body, and world comprise a single unified dynamic system. The entire piece is a manifestation of my struggle to reconcile these two perspectives.

The first part of the piece—Chapters 1 and 2—is meant to historically situate the reader to the contemporary situation in the cognitive sciences, and introduce the interface of cognitive science and phenomenology. Chapter 1 presents a brief history of experimental psychology as it relates to questions of subjective experience. Chapter 2 introduces the interface of the cognitive sciences with phenomenology through neurophenomenology, a research program proposed by Francisco Varela. Varela's proposal suggests each perspective can contribute to an interdisciplinary discussion without reducing the domain of one to another.

The second part of the piece—Chapters 3, 4 and 5—provides an account of practicalities involved in an interdisciplinary endeavor. Chapter 3 argues that historically rooted disciplinary differences and preconceptions must be addressed prior to an interdisciplinary engagement. By addressing such issues the relevant disciplines open to the possibility of fruitful dialogue. Chapter 4 returns to the interdisciplinary engagement of the cognitive sciences to argue that the massively

interdisciplinary endeavor necessary for understanding the mind would need a complimentary project of translation to enable and clarify interdisciplinary communication. Chapter 5 moves to the practical aspects of such a translation project by highlighting the need to resolve terminological ambiguity within single disciplines as well as across multiple disciplines. In light of this sort of ambiguity, I propose a role for what I call an interdisciplinary translator.

The third part of the piece—Chapters 6, 7, and 8—brings to light the three narrative threads articulating fluidity of boundaries. Chapter 6 engages the blurring of disciplinary boundaries with an account of how a new discipline can emerge, from the engagement of two parent disciplines. This is not intended to be a detailed historical account of emerging disciplines. Rather, this chapter presents disciplinary boundaries as one example of fluidity. Chapter 7 explicates a shift in theoretical orientation within the cognitive sciences resulting from its engagement with phenomenology through the works of Hubert Dreyfus and Alva Noë. In addition to playing a part in the interdisciplinary engagement of phenomenology and cognitive science, their work intimates that the traditional boundaries used to delineate the subject matter of cognitive science are questionable. Their critiques suggest fluid boundaries between mind, body, and world. The piece concludes with Chapter 8 in which this claim of fluidity is extended to the boundaries between self and other through a consideration of bodily experience.

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CHAPTER 1
Situating an Interdisciplinary Engagement

Many traditions have asked questions about the self and consciousness. Buddhism was conceived, in part, as a reaction to Hindu notions of the self. In the 2,500 years since this split, many of the scholarly disputes leading to further schisms within Buddhism also hinged on conflicting conceptions of self. In the West, a younger tradition builds on the writings of the writings of Hume, Descartes, and Kant. Even more recently, a sixty-year-old set of traditions under the heading of the brain and cognitive sciences, set in motion by the work of Hodgkin and Huxley, and Newel and Simon, is beginning to struggle with these questions as well. As a set of traditions, it is far younger than any of the other traditions that have been ruminating over questions of the self, yet its position in the contemporary milieu affords it overwhelming cultural currency. In the last decade, neuroscience has infused contemporary culture: magazines feature colorful images of brain activation; 'neuro-' prefixes politics, economics, ethics, esthetics, computation, linguistics, marketing, policy, philosophy, theology, technology, to name only a few; juries even make decisions based on the its findings.

The 1990's were designated "The Decade of the Brain." This designation drew media attention and funding to neuroscience research, and led to the widespread

use of techniques such as functional magnetic resonance imaging (fMRI). Subsequent advances in neuroimaging have allowed researchers to study the dynamics of brain activity in real time and complimentary statistical techniques have allowed researchers to analyze the data gained from these studies in a way that does justice to the nonlinear dynamics of the neural circuitry. These advances have led to a renewed excitement in the idea of a scientific study of subjective experience, and, with it, the potential for questions that have in the past been reserved for the armchair, or meditation cushion, to be asked at the lab bench. These are questions of the self, consciousness, and personhood. With these questions, come others regarding the adequacy of theoretical and methodological approaches within the sciences.

Each tradition in which such questions have been asked brings with it presuppositions, assumption, and corresponding methods. While an approach lacking any presuppositions is almost definitely impossible, it is crucial that those working within these traditions reveal, and remain cognizant of, those presuppositions. One must always remain aware of one's assumptions, as they will undoubtedly shape the way one looks and color the way one sees. Every set of methods has its limitations why would the sciences be any different?

The cognitive sciences arose in the mid-twentieth century, as a reaction to behaviorism, in concert with another emerging discipline, computer science. It is difficult to pull apart the dynamics of the co-evolution that unfolded between these two disciplines, especially considering that many histories place Artificial Intelligence within the cognitive sciences. Through this co-evolution, however, the mind came to be viewed as a computer, as a mechanism of symbol processing, and,

on this conception, the symbols with which the mind worked were representations in the form of propositional knowledge. The disciplines concerned with issues of the mind in the twentieth century largely accepted this conception of the mind, and these assumptions began to guide research characterized by, what Hillary Putnam, termed "methodological solipsism" (Wilson & Clark, in press). This approach differentiated cognitive states and structures as if the world beyond the individual was irrelevant.

Results of this research were explained in terms of information processing by cognitive systems. In contrast to preceding behaviorist approaches, these cognitivist approaches took the activity of cognitive systems as their primary focus. According to behaviorist models, either the cognitive life of the organism was nonexistent or inaccessible to scientific investigation, which was, according to some, equivalent to being non-existent. The general behaviorist model of the organism found its expression in the metaphor of a black box: input went into the black box by way of the perceptual faculties, and came out as action or behavior. The experimenter could not know what went on inside the black box. This account that left the mental life of the organism opaque, or in extreme cases entirely denied its existence, left proponents of cognitivism largely dissatisfied. Fueled by the newfound computer metaphor, experimentally oriented psychologists devised clever experimental paradigms to probe mental capacities of memory, attention, and reason. These experimenters could not, however, simply ask experimental participants how they performed a certain task. Given the history of experimental psychology, methods that employed introspection were viewed with caution.

According to conventional histories, the psychological sciences unfolded in roughly three stages: introspectionism, behaviorism, and cognitivism. Each, of course, reacted to what its proponents viewed as the inadequacies of the last. As we said, cognitivism, in its attempt to explain cognitive life, can be viewed as a direct reaction against the explicit rejection of such attempts within the behaviorist tradition. But what, in introspectionism, was behaviorism reacting against? Histories of experimental psychology often place its conception at the end of the nineteenth century with the introspectionist movement. As the name suggests, proponents of introspectionism such as Wilhelm Wundt, used the introspective reports of their experimental subjects as data. Attempting to maintain the rigor that was expected of other sciences of his day, Wundt attempted to probe the mental life of his subjects by confronting them with simple perceptual stimuli and having them report their experiences according to well-defined rules (Wallace, 2000). Wundt also maintained that proper scientific data could only be gathered with well-trained subjects. Consequently he would expose his subjects to this routine more than ten thousand times.

By the 1880s, the introspectionist movement had already begun to decline. Although historical accounts of this decline vary, it seems to have resulted from reasons both internal and external to the movement. The internal reason most often cited was methodological, due to the nature of the data. The reports given by the subject were the final word, and when these reports were in conflict the experimenter was left with no way out. External reasons for the decline of the introspectionist movement seem to have been due simply to the shifting focus of experimental

psychologists in the early late nineteenth century (Wallace, 2000; for a detailed history see Danziger, 1980). Nonetheless, introspectionism was subsequently seen as a defunct research program, and with it introspection was discredited as a method within a discipline struggling to be recognized as authoritative in the shadow of the positive sciences.

The rejection of introspection as a viable method within experimental psychology left the ground fertile for the behaviorist movement to take shape. But even after the limitations of behaviorism were recognized, and behaviorism was supplanted by cognitivism, introspection lacked a place in the methods of cognitive sciences. However, this conventional account has recently been challenged by Costall (2006), who suggests that introspection continues to be used within contemporary cognitive psychology. Nevertheless, experimental psychologists remain cautious of verbal reports as influential studies, such as Nisbett and Wilson's (1977), strongly suggest that introspection has no place in experimental psychology. With the recent surge of interest in the scientific study of consciousness, we have to ask: How such a study can proceed without the use of subjective reports? Regardless of the hesitance within contemporary cognitive psychology to accept such methods, voices from other disciplines have made strong arguments that such methods are necessary to study consciousness and subjective experience.

In his 1974 paper, "What is it like to be a bat?" Thomas Nagel argued that no matter how much we learned about the physiology of an organism, its perceptual faculties and nervous system, we still could not know the subjective character of its experience, the *what it's like.* In a similar vein, Joseph Levine (1983) claimed that

there is an "explanatory gap" between the domain of bio-behavioral data obtained through scientific inquiry and the domain of subjective experience. More recently, David Chalmers dubbed the bridging of this gap "the hard problem," and argues that the "task of a science of consciousness…is to systematically integrate two key classes of data into a scientific framework: *third-person data*, or data about behavior and brain processes, and *first-person data*, or data about subjective experience" (Chalmers, 2004, p. 1111).

. In *Principles of Psychology,* William James proposed a three-pronged approach to the study of the mind: through behavior, through physiology, and through introspection[1]. However, by the early 20th century Introspectionism had been declared defunct, and Behaviorism replaced it as the dominant tradition within psychology. It wasn't until the middle of the century that the stimulus-response model of cognitive life began to lose its hold. Echoing James more than a century later, Francisco Varela (1996) proposed "a methodological remedy for the hard problem," which he called neurophenomenology. Varela's method is an interdisciplinary approach toward understanding subjective experience that would establish mutual constraints between "phenomena present in [lived] experience and the correlative field of phenomena established by the cognitive sciences" (1996, p. 330). Contrasting reductive approaches with his notion of mutual constraints, Varela affords equal weight to both, and argues that accounts of both can be mutually illuminating. Varela's methodology calls for an expansion of the cognitive and brain sciences to include phenomenology—a move that complicates an already complicated interdisciplinary field.

[1] Thanks to Alan Wallace for bringing this to my attention.

CHAPTER 2
The Interface of Cognitive Science and Phenomenology

In this chapter Francisco Varela's proposal of neurophenomenology as "a methodological remedy for the problem" (1996) will be discussed as an example of an research program in which phenomenology and cognitive sciences complement each other. According to Lutz:

> The working hypothesis of neurophenomenology in an experimental context is the following: phenomenologically precise first-person data produced by employing first-person/second-person methods provide strong constraints on the analysis and interpretation of the physiological processes relevant to consciousness. In addition, third-person (biobehavioural) data produced in this manner might eventually constrain first-person data, so that the two would become one of dynamical reciprocal constraints (2004, pp. 328-329).

Similar proposals have been presented by Flanagan (1992), with his concept of "reflective equilibrium," and by Chalmers (2004). This notion of dynamical reciprocal constraints is fundamental to appreciating the nature of neurophenomenology. It will become clear that neurophenomenology can be implemented in a number of ways. Subsequently, the dynamics of these constraints differ with each implementation. The underlying principle, however, remains the

same: the insights gained from taking the first-person perspective seriously and the disciplined methods used to gain first-person accounts inform, contribute, and guide relevant experimental work in the cognitive sciences. Ideally the results of this work constrain further phenomenological inquiry.

Two aspects of Varela's proposal should be highlighted: the notion of mutual constraints and idea of expanding the cognitive and brain sciences to include phenomenology. Each of these aspects of the proposal intimate an overall respect for the each level of explanation and for each discipline. Varela's proposal suggests that no level of explanation is more fundamental than any of the others. It would follow that taking a reductive approach toward explanation, as the only approach, would be misguided. Instead, insight should be gained through taking multiple perspectives and through allowing each level of explanation to inform the others (for an example see Varela, 1999). Affording each level of analysis equal explanatory weight seems counter to much of the research programs shaping the contemporary landscape of the cognitive sciences where much of the funding is being funneled away from strict behavioral research toward research involving brain function. This flow of funding almost certainly reflects last century's reductionist pursuits toward the unification of the sciences. In contrast to reduction, Varela's is a proposal of expansion—an expansion of the disciplinary discussion to include phenomenology and an expansion of the proper scope of explanation.

In what follows I will present two examples of the employment of phenomenology in an experimental context to further clarify neurophenomenology and this idea of reciprocal constraint. These are two styles of integrating

phenomenology currently employed by cognitive scientists; there are, however, a growing number of other approaches (Gallagher and Brønsted Sørensen 2006). The first style, proposed by Varela (1996) as neurophenomenology, involves training experimental subjects in the phenomenological method. A study by Lutz and colleagues (2002) presents an example of this approach. The second style involves using the insights gleaned from phenomenological literature to guide experimental design. Gallagher and Brønsted Sørensen (2006) refer to this style as "front-loading phenomenological insights into phenomenological design."

Neurophenomenology

In his 1996 article, "Neurophenomenology: A methodological remedy for the hard problem," Varela begins with Chalmers' claim that first-person experience is an irreducible field of phenomena, but, instead of submitting to some sort of theoretical principles, Varela proposes the development of a method for directly exploring and analyzing the structure of experience as the link between mind and consciousness. Varela states that his position does not ascribe to any particular phenomenological lineage, but instead proposes a novel synthesis of phenomenology to address contemporary cognitive science.

Varela articulates four aspects of what he calls the "bare bones" of the phenomenological reduction to be used in the collection of first-person data:

(1) Phenomenological Reduction: Adopting an attitude that directs the attention away from the content of thought toward the arising of the thoughts themselves.

(2) Intuition: Gaining an intimacy with the experience itself through the reduction.

(3) Description: Translating the experience into something communicable; seeking experiential invariants.

(4) Training: Stabilizing one's capacity to hold the reduction.

The first two aspects of the method provide the opportunity to observe experience, the third allows for the sharing of experience, and the last aspect provides the opportunity for intra-experimental stability and inter-experimental reproducibility. The idea of mutual constraint is essential to Varela's conception of neurophenomenology, and suggests that phenomenology and cognitive sciences might inform and constrain one another. His approach, situated in an emerging trend within cognitive sciences which holds an embodied approach to cognition, seeks to account for cognitive phenomena of an experiencing subject situated in the world, an "embodied mind" (Varela, Thompson, & Rosch,1991).

An experiment by Lutz and colleagues (2002) provides an example of neurophenomenology in action. It illustrates the gathering of first-person data through disciplined phenomenological investigation and the use of that first-person data to reveal third-person data about physiology. In their discussion of neurophenomenology, Lutz and Thompson describe phenomenology, broadly construed, as "the project of providing a disciplined characterization of the phenomenal invariants of lived experiences in all of its multifarious forms" (2003, p. 32).

Participants in this experiment were asked to press a button when a 3D image emerged from a stereoscopic dot pattern. Initially the dot pattern held no depth cues, but after a 'preparation period' of seven seconds the dot pattern changed slightly to one with binocular disparities. EEG signals were collected throughout each experimental trial. Experimenters were particularly interested in the participants' experience during the preparation period, and participants were intensively trained in the task so that they could easily attend to variations in their subjective experience across trials. The subjects gained familiarity with their experience just prior to the emergence of the binocular disparities.

From this training, participants identified three categories, or phenomenological invariants, for their experiences in the preparatory period: steady readiness, fragmented readiness, and unreadiness. For example, steady readiness referred to a state in which the subject was attentive to the task and recognized the emergence of the 3D image as soon as the binocular disparities were introduced. Fragmented readiness corresponded to a state in which the subjects reported that they were less attentive, a state in which they had to make a voluntary effort to be ready to view the emergence of the 3D image. Alternatively, unreadiness referred to a subjective state in which the participant was surprised by the emergence of the 3D image, perhaps because of a lack of attention or mind wandering. In a state of unreadiness, the participants only saw the 3D image because their eyes were in the correct place. Importantly, these three categories were characterized based on the participants' descriptions of their experiences corresponding to the emergence of the 3D image in the training period. The three categories—readiness, fragmented

readiness, and unreadiness—were then used as shorthand for the participants to record their experience trial by trial over the course of the experiment.

With each trial the participants were presented with the emergence of the 3D image. The subjects also noted their subjective experience corresponding to the emergence of that image. The experimenters then used these phenomenological invariants to cluster EEG and behavioral reaction time data from individual trials: all trials in which the subject reported being in a state of steady readiness were grouped together, all the trials in which the subject reported being in a state of fragmented readiness were grouped together, and all trials in which the subject reported being in a state of unreadiness were grouped together. By analyzing the data in this way, the experimenters revealed distinct neural signatures for each cluster. As might be expected, the reaction times were faster in the steady readiness cluster, slower in the fragmented readiness cluster, and slower still in the unreadiness cluster. The EEG data also revealed distinct dynamical neural signatures corresponding to the separate clusters. Within the steady readiness cluster, the EEG data revealed a significant increase in long-range synchrony in brain activity in the frontal cortices just prior to the onset of the emergence of the 3D image. This result contrasted sharply with the unreadiness cluster in which no such increase in synchrony was found.

In their characterization of neurophenomenology, Lutz and Thompson state: "Neurophenomenology stresses the importance of gathering first-person data from phenomenologically trained subjects as a heuristic strategy for describing and quantifying the physiological processes relevant to consciousness" (2003, p. 32). Multiple exposures to the same stimulus produce EEG signals that vary a great deal.

Typically, this variability is treated as noise and discarded through averaging techniques. Lutz and colleagues (2002) effectively used phenomenological methods to make some sense of that noise using first-person reports gathered from participants.

Front-Loading of Phenomenological Insights

Whereas the above experiment by Lutz and colleagues used phenomenological methods within the experimental context, Gallagher and Brønsted Sørensen (2006) cite experiments utilizing phenomenological insights to guide experimental design. The experiments described below use the phenomenological distinction between a sense of agency and a sense of ownership to guide experimental design.

Within normal experience of voluntary movement, the sense of agency and the sense of ownership are indistinguishable. With phenomenological reflection however, the distinction becomes clear: a sense of ownership, being part of my experience, can be dissociated from a sense of agency, as caused by me. To further clarify, one can figure that voluntary motions are accompanied by both a sense of ownership and a sense of agency. In contrast, involuntary movements, such as when another person picks up your arm, are accompanied by a sense of ownership because it is my hand that is being moved. However, a sense of agency does not accompany involuntary movements; the intention to move does not belong to the owner of that movement.

Recent neuroimaging studies used this distinction to guide experimental design (Farrer & Frith, 2002). In these experiments, subjects used a joystick to manipulate an object on a screen while an fMRI imaged their brains. In one condition, the subjects were told that they had control over the object through the joystick. In another condition the subject moved the joystick as if she were manipulating the object knowing that the experimenter actually was controlling the object. In the first condition agency and ownership were components of the action. In contrast, the sense of agency was not available to the subjects in the second condition. The results of this study are secondary to this discussion: the important point is simply the use of phenomenological distinctions to guide the experimental design.

Brønsted Sørensen's (2005) adapted version of Nielsen's (1963) alien hand experiment provides another example of an investigation of the phenomenological distinction of ownership and agency within an experimental setting. Subjects were told that they were participating in a study of the subjective experience of drawing a line. Participants were asked to wear a glove and trace a line that had already been drawn. The experimental manipulation involved a clever use of mirrors to trick the participant into thinking that he was seeing his own hand when in actuality he was seeing the experimenter's hand. The participants' sense of agency was disturbed by the disparity between the intended action and perceived action while tracing the line. To measure this disturbance, experimenters used the participants' introspective reports. Thus, in this case phenomenological insights were used to guide the experimental design and to provide a useful framework for interpretation.

In addition to phenomenological methods being employed in an experimental context, as Lutz and colleagues did, and the front-loading of phenomenological insights into experimental design, as Brønsted Sørensen did in his investigation of the sense of ownership and agency, there is a third way phenomenology is beginning to influence cognitive sciences. This influence manifests in a shift in theoretical orientation within the cognitive sciences. Evidence for this shift can be seen the emergence of embodied cognitive science (Varela, Thompson, & Rosch, 1991; Clark, 1999) and situated cognition (Wilson & Clark, in press), which will be discussed later. First, let us consider disciplinary differences that can prove to be an obstacle to fruitful dialogue.

CHAPTER 3
Reconciling Disciplinary Differences

Differences in theoretical orientation often prove to be a first obstacle to interdisciplinary discussion. This is especially true when the relevant disciplines are situated at what are often conceived of as opposite ends of the academic spectrum. Engagement between the sciences and the humanities is the familiar and classic example of this sort of opposition. Students tend to find a place on one side of this divide early in education. One need not look further than the typical undergraduate curriculum to see manifestations of this opposition. A student studying English literature may balk at the prospect of taking a class in physics; likewise, most physics majors will shudder at the thought of reading Chaucer. Granted these are caricatures, but the simple point remains: the skill sets, or styles of thought, employed by different disciplines are taken to conflict.

Early in education, students assimilate into a discipline and develop the styles of thought of that discipline. This process of assimilation continues and solidifies with further education. Along with styles of thought, the student often acquires disciplinary biases that set her in opposition to other approaches. In this way, disciplinary differences are constituted and maintained. Although there are examples of scholars transcending disciplinary boundaries, and, more interestingly, penetrating

both of C.P. Snow's "two cultures" (see Edwards, 2008), the current situation seems to reinforce disciplinary distinctions.

Below I present two cases in which perceptions of disciplinary conflict hinder possibly fruitful dialogue: the case of phenomenology and analytic philosophy of mind, and the case of phenomenology and the cognitive sciences. Through openness to critical engagement two disciplines can use one another's conceptual resources to avoid redundancy when investigating similar phenomena, as is the case with analytic philosophy of mind and phenomenology. In addition to sharing conceptual resources, the cases presented in the previous chapter suggest the utility of the methodological resources of phenomenology to the cognitive sciences, however the traditional account of Husserlian phenomenology, as antinaturalist, must be addressed prior to collaboration.

The Case of Phenomenology and Philosophy of Mind

The relationship between analytic philosophy of mind and phenomenology provides an example of the possibility of reconciling disciplinary differences. Zahavi (2002) argues that the perceived split between analytic philosophy of mind and phenomenology robs discussions within analytic philosophy of mind of a wealth of conceptual resources regarding self-awareness. By ignoring the resources of phenomenology, Zahavi claims, analytic philosophy of mind runs the risk of redundancy. To demonstrate his claim, Zahavi describes recent developments in analytic philosophy of mind around notions of self-awareness. He then suggests that

if one were to probe the writings of Husserl, Heidegger, Sartre, or Merleau-Ponty one would discover that these developments are hardly novel.

José Luis Bermúdez's (1998) *The Paradox of Self-Consciousness* serves as Zahavi's main representative of analytic philosophy of mind. In his book, Bermúdez responds to accounts that suggest self-awareness necessarily involves what are often thought of as higher order cognitive functions, such as Baker (2000) who suggests that one must be able to conceive of oneself as oneself to have a first-person perspective. This conception of self-awareness motivates Baker to suggest that mastery of the first-person pronoun is necessary for self-awareness, as one can only conceptualize oneself through the use of the first-person pronoun *I*. In contrast, Bermúdez argues that there are more primitive forms of self-awareness than those commonly discussed within analytical philosophy, such as Baker's. Further, he suggests broadening the investigation to include pre-conceptual and pre-linguistic forms of self-awareness.

Bermúdez supports his arguments with evidence from developmental psychology. He uses the studies of infants' reaching behavior to suggest that infants possess *self-specifying behavior*. Infants are significantly more responsive to objects within there reach than to objects beyond there reach, which suggests that infants are to some extant aware of themselves, or at least to their body position in space. With this established, Bermúdez goes on describe how proprioception provides a non-conceptual self-awareness: in touching a table you become aware of the table, but at the same time you become aware of yourself touching the table. Bermúdez claims that these two forms of self-awareness are pre-linguistic and pre-conceptual. Further, he

claims that they serve as foundations for less primitive forms of self-awareness, and that they can develop into higher forms of self-awareness through social interaction.

According to Zahavi, this is nothing new to those familiar with phenomenology:

> In contrast to what is frequently the case, not only in psychological literature, but also in some contemporary analytical philosophy of mind, self-awareness is not taken [in phenomenology] to be something that only comes about the moment I realize that I am perceiving….or realize that I am the bearer of private mental states, or identify my own mirror image, or refer to myself using the first-person pronoun. (Zahavi, 2004, p.14)

Phenomenological literature is rich with expositions of primitive forms of self-awareness, such as those found in the work of Husserl, Heidegger, Sartre, and Merleau-Ponty, all of which are ignored by Bermúdez as he comes to his conclusions. Thus, Zahavi argues that, at the very least, those within the analytic tradition would save time by consulting the resources of phenomenology.

The Case of Phenomenology and Science

The editors of *Naturalizing Phenomenology: Issues in contemporary phenomenology and cognitive science,* open their introduction by quoting from Husserl's *Philosophie als strenge Wissenchraft*: "We are fighting against the naturalization of consciousness." (Roy et al., 1999, p. 1) The editors of this work acknowledge that they must address Husserl's staunch anti-naturalism: his contention that phenomenology is both more fundamental than the natural sciences, and incompatible with the mathematical formalizations championed by the sciences

dominated by mechanistic principles. Given the nature of their project—the naturalization of phenomenology in service of the naturalization of consciousness—the irony of the quote is striking. Lutz quotes Roy and colleagues as stating the overarching hypothesis of the project: "when provided with adequate characterization [of conscious phenomena] such as those conducted along the lines of Husserl's phenomenology, phenomenological data can be adequately reconstructed on the basis of the main tenets of cognitive science, and then integrated into the natural sciences" (Lutz, 2004, p. 326).

It is important to clarify what Roy and colleagues intend 'naturalization' to mean. The project of naturalization, in this context, is not to be taken as an eliminativist endeavor where explanation on the mental level is eliminated in favor of explanations in terms of a natural science such as neuroscience. On the contrary, as they conceive the project, mental explanations and neurobiological explanations "have to be integrated into a single hierarchized explanatory framework that demonstrates their mutual compatibility" (Roy et al., 1999, p. 45). For the editors mathematical reconstructions of phenomenological descriptions with accounts from lower level disciplines, such as the neurosciences, could be an avenue to such an explanatory framework.

The entire project is driven by the search for an acceptable method by which one can acquire a disciplined first-person characterization of experience as phenomenological data. Within their introduction, the editors of *Naturalizing Phenomenology*, give a key role to mathematics because, they claim, "it alone is seen as capable of generating naturalistically implementable reconstructions of

phenomenological data" (Roy et al. 1999, p. 49). Roy and colleagues acknowledge that Husserl was "deeply convinced of a necessary incompatibility between the general nature of phenomenological data (both in their loose and technically Husserlian senses) and the basic requirements of mathematization" (p. 42). But they argue that Husserl's opposition to naturalization is made largely obsolete by scientific progress, specifically by what Lutz refers to as "morphodynamical mathematics such as the theories of self-organization of non linear systems" (2004, p. 326).

Zahavi (2004) claims that Husserl's anti-naturalistic stance was not solely motivated by his confidence in the incompatibility of phenomenological data with mathematics, but also philosophically motivated by Husserl's distinction between empirical subjectivity and transcendental subjectivity, as Zahavi puts it, "the difference between being aware of oneself as an object in the world, and being aware of oneself as a subject of the world" (2004, p. 335). With this distinction in place, according to Zahavi, one can understand that Husserl's intention was not to investigate consciousness as another object in the world, as this would preclude significance of the first person perspective:

> For Husserl, the problem of consciousness should not be addressed on the background of an unquestioned objectivism, but in connection with overarching transcendental considerations. Frequently, the assumption has been that better understanding of the physical world will allow us to understand consciousness better and rarely that a better understanding of consciousness might allow for a better understanding of what it means for something to be real. However, one of the reasons why the theory of intentionality has often assumed a central position in phenomenological thinking is exactly because a study of the world-directedness of

> consciousness has been claimed to provide us with insights into not only the structure of subjectivity, but also into the nature of objectivity. (Zahavi, 2004, p. 336)

Zahavi also cites the contrast between positive science and philosophy, more specifically transcendental philosophy, as part of the motivation for Husserl's anti-naturalistic stance. Traditionally framed, in the context of this contrast, philosophy is more fundamental than the natural sciences. Whereas the natural sciences take their subject matter for granted, presupposing that nature is out there ready to be investigated, philosophy examines the very possibility of this investigation. Using neurobiology as an example, Zahavi quotes from Murray:

> For in seeking to lay bare the fundamental structures of experience, phenomenology is also seeking to establish the foundations of any possible knowledge. Consequently phenomenological accounts cannot simply be conjoined to neurobiological ones, because the ultimate purpose of the former is to ascertain the validity of the latter….For while the neuroscientist allegedly takes for granted the possibility of understanding the world, the philosopher believes there is a need for some kind of preliminary investigation into how such an understanding might arise. (Murray, 2002, pp. 30-31)

Zahavi's points provide an prospectus for how the relationship between phenomenology and cognitive science might develop. The first leaves open the possibility of what Varela (1996) terms "mutual enlightenment"- that phenomenology and cognitive science could inform and constrain each other. The second seems to suggest that phenomenology, being more fundamental than the positive sciences, might inform cognitive science, but that this flow of information would not be

reciprocal. Presently, the interface of phenomenology and the cognitive sciences does seem to be unfolding along these two paths.

CHAPTER 4

Interdisciplinary Translation

The September 2007 issue of *Science* magazine contained a letter titled "A Proposal for a Decade of the Mind Initiative." The authors of the letter say the approach should involve multiple disciplines: "Success will require research that reaches across disparate fields such as cognitive science, medicine, neuroscience, psychology, mathematics, engineering, and computer science. Additional important insights will need to come from areas as diverse as systems biology, cultural anthropology, social science, robotics, and automation technology" (Albus et al., 2007). The scholars discussed above would suggest including phenomenology to this list.

However, no discipline is homogeneous: each contains a variety of sub-fields. Within neuroscience, for example, there is cellular neurophysiology, developmental neurobiology, computational neuroscience, cognitive neuroscience etc. One could question the validity of referring to neuroscience as a single discipline. We can conventionally refer to various sub-fields within a discipline, but the boundaries of the fields can be difficult to draw. Additionally, it seems necessary to distinguish between neuroscience as a sort of discrete entity in the eye of culture, and the neurosciences as a set of fields studying the nervous system at different scales. The

popular perceptions of a discipline, while interesting, are beyond the scope of this discussion. The focus of this discussion will be the idea of translating across the various fields within a single discipline, as well as across disciplines, each of which uses a variety of methods and idioms.

Each field has its own methods, terminology, and theoretical assumptions. Again consider the neurosciences: neurophysiology investigates the dynamics of synaptic connections and the kinetics of ion channels through electrophysiological recordings and pharmacological manipulations; cognitive neuroscience uses functional magnetic resonance imagery (fMRI) and electroencephalography (EEG) to investigate and discuss the activity of brain regions and brain waves. Currently there are no accounts of the cellular underpinnings of brain waves; there are no neurophysiological translations of the data from either fMRI data, nor from EEG data. The measurements taken by an fMRI are of local blood oxygen levels as an indirect measure of local brain activity. The logic works like this: if there is more oxygen flowing to a particular area it suggests that there is a greater amount of glucose consumption in that area as well; greater glucose consumption suggests greater energy production; and if there is more activity in a particular region of the brain that area will need more energy. Thus, through quite a few steps of inference, activation apparent through fMRI is supposed to demonstrate that a particular area of the brain in more or less active. The logic is there—sort of. But the mechanism by which all of this happens is far from understood.

The same holds true with data from EEG studies: with an EEG one can measure the power of brain waves at various frequencies at many locations within the

brain; the source of the resulting data is the summation of currents within the extracellular space of mostly cortical regions; but how the activity of a population of neurons might translate to brain waves is far from settled. Even within the neurosciences, explananda have not been translated. If researchers working within a single disciple cannot find common ground, we have to ask if there is any hope for a massively interdisciplinary approach, such as the one proposed by the authors of the *Science* letter.

The metaphor of translation underscores the importance of communication, and suggests an arena from which interdisciplinary pursuits might gain some insight. A discipline is bounded by its terminology, which has been shaped by its history, and is, to some extent, determined by its methods. In much the same way, a culture is bounded by its language, which has been shaped by its history. A translator of languages must understand both the source and target cultures. In the same way, those engaging in interdisciplinary work must understand the history of the disciplines, their methods, practices, and their theoretical assumptions. This translation metaphor is intended to intimate a respect for each discipline involved in the discussion. It suggests a non-reductionist interdisciplinary enterprise, similar to the sort Darden and Maull describe with their notion of interfield theories: "the unity of science, not as a hierarchical succession of reductions between theories, but rather as the bridging of fields by interfield theories" (1977, p. 63). Mediated by translations, this sort of interdisciplinarity is one in which a discipline's value is found in its insights and methods rather than its cultural currency.

Take, for example, Varela's notion of neurophenomenology, which places neuroscience and phenomenology in a complimentary relationship. Varela and others propose that, with regard to questions of consciousness and the self, the literature of phenomenology can be mined for insights to guide experimental design and clarify explananda. In addition, the practice of the phenomenology, insofar as it facilitates flexibility and stability of attention, can be adopted as a method. For successful interdisciplinary discussion there must be some common ground for understanding. This is provided by the fact that all the involved disciplines are assumed be grasping toward a similar set of occurrences. The term discussion presupposes the conditions for communication, mainly a common language. Of course such an endeavor must also assume a common set of occurrences to which that language is supposed to refer.

This assumption that each discipline is discussing a common set of occurrences is not a trivial point. The linguistic plurality corresponds to the many scales at which an explanation can operate, and it is possible that some of these scales cannot be explained in terms of one another. However, this consideration carries less force when we are speaking within a single discipline in which all subfields subscribe to materialism. If, however, one attempts to discuss a similar plurality across disciplines with vastly different theoretical—or metaphysical—assumptions, it would be much more questionable whether these disciplines are referring to a common set of occurrences. It follows that a necessary initial step toward interdisciplinary work would be to question the theoretical assumptions of the respective disciplines. Subsequently, some sort of common language would need to be established. With shared and precisely crafted terminology, those engaging in the interdisciplinary work

can articulate explanandum, and clarify the conceptual space of the engagement. This would entail mining relevant literatures, identifying key terms, resolving terminological ambiguity, and standardizing an idiom from which the language of that interface can evolve and be refined.

If done well, this exercise should clarify the questions that need to be asked to address existing issues, and identify new issues that may have emerged in the process of establishing the idiom of the interdisciplinary interface. While this exercise could be termed something to the effect of carving the conceptual space of the interface, this term may invoke too strong a notion that this is merely a philosophical or linguistic exercise. Rather, it should be taken as joint empirical, phenomenological, and analytic exercise. As such, the exercise presupposes the interdisciplinarity toward which it is directed. However, understanding and interpretation are always founded on some prior understanding. The key is to deepen that understanding with ongoing revision.

After the initial clarification of the interdisciplinary idiom, methods must be chosen to address the explanandum. In the case of interdisciplinary approaches toward understanding mind, these methods must also be interdisciplinary. Some problems will require the tools of phenomenology; others will require the tools of the cognitive sciences and the neurosciences. Further, continuously pulling resources from multiple disciplines will blur the distinctions between those fields. The success of such an endeavor depends on individuals familiar with the terms and methods of a variety of disciplines. One can think of these individuals as disciplinary translators. Again, the crucial aspect of this process is to use subsequent findings to refine that

interdisciplinary idiom. In this way, there would be a co-evolution of the communication and the knowledge gained. The knowledge gained in the process will be embodied and transmitted in the refinement of the idiom.

CHAPTER 5
Resolving Terminological Ambiguity

Issues of terminology are rarely settled in a given discipline. Central terms tend to be the most difficult to define, which results in writers using these terms in subtly, or not so subtly, different ways. For example, Strawson (1999) counts 21 different conceptions of 'self' being used within contemporary literature, which leads to considerable misunderstanding in interdisciplinary discussions. The linguistic framework of a discipline does not always grow at the same rate as its conceptual framework: communal terminological distinctions may not be made to correspond to conceptual distinctions as they arise in the minds of individuals.

Not only does this make the literature incredibly difficult to penetrate for someone unfamiliar with the discipline, but it also makes it quite difficult for those researchers within the discipline to communicate. Debates can grow fierce before the debaters realize that they are using the terms differently. Older disciplines sometimes have the good fortune of having a codified set of well-defined terms, but not always. After long debates about the proper definition of a certain term within a discipline the debaters may settle on a working definition. When drawing from the resources of multiple disciplines, these problems are compounded, both by the fact that outsiders lacking the disciplinary context will have difficulty penetrating a literature with

confused terminology, and because those outsiders will have their own set of terms relevant to the issue addressed.

Success of any interdisciplinary pursuit depends on clearly defined terms with which the researchers from different disciplines can begin to communicate. Within a single discipline the pursuit of terminological clarification can unfold over the course of a consensus-reaching debate within the literature, at a particular professional conference the purpose of which could simply be terminological clarification, or clarification may come about after the publication of a seminal text. However, as disciplines must adapt to new information, the ideal of complete terminological clarity is rarely reached. When a second or third discipline is introduced into such a discussion, settled definitions might need to be rethought in light of new knowledge. Alternatively one of the new disciplines might have a different term for a concept than the one designated by the original discipline. Or again, the disciplines may be using the same terms differently.

In such cases it would be useful to have an individual, or a group of individuals whose role is to translate across disciplines. Collins and Evans (2002) develop the notions of interactional expertise and contributory expertise in discussing the relationship between the scientific elite and the public. But these notions can also be used to clarify the roles of those involved in an interdisciplinary endeavor. One with interactional expertise can speak fluently in the terms of a discipline as if trained in that discipline. To this extend, one with interactional expertise in multiple disciplines could act as, what I will call, a disciplinary translator. William James could be thought of as such a translator. More recently, Shaun Gallagher, who is

discussed below, serves as an example of such a translator with his work on embodiment. In contrast, one with contributory expertise cannot only speak fluently in terms of a given discipline, but can also practice the methods of that discipline. To gain contributory expertise, however, one often needs to train extensively and intensely in a single discipline. The interdisciplinary communication might than be mediated by those with interactional expertise, who can communicate in terms of more than one discipline, and with those with contributory expertise within a single discipline. There is no reason, in principle, that one with contributory expertise could not also have interactional expertise. However such individuals are rare due to demands of developing contributory expertise in a single discipline. That is not to say that these individuals are precluded from the process of interdisciplinary terminological disambiguation. Those with contributory expertise are vital to the process.

Terminological ambiguity is often, but not always, an indication of underlying conceptual confusion. This is what one might expect considering we carve out, and share, a conceptual space primarily through language. Avoiding scholarly distinctions, especially in empirical disciplines, lacking foundations in the phenomena actually under investigation often necessitates returning to empirical investigations when clarifying terminology. This may take the form of returning to the literature to see if there are grounds for making a certain distinction, but it may also entail further experimentation to legitimate, or justify dispensing with, certain terminological distinctions. Contributory expertise is vital in the cases where experimentation is necessary.

The two approaches presented in Chapter 2, neurophenomenology and front-loading, represent the interface of cognitive science and phenomenology in the experimental setting. Neurophenomenology seeks to train subjects to attend to their experience, and uses the first-person accounts to uncover patterns in the data that would otherwise go unnoticed. Front-loading of phenomenology utilizes insights gleaned from phenomenological literature to guide experimental design. The process of front-loading involves both sorts of expertise mentioned above. The experimenter must be trained as a cognitive scientist; she must have contributory expertise. Her collaborators, with interactional expertise, bring insights from phenomenology, and, through collaboration, the experimental design is constructed. Progress in cognitive science is not limited to the experimental setting; theoretical work must compliment the work done in the lab. Shaun Gallagher (2005) does just this sort of theoretical work in his interdisciplinary effort to clarify the understanding of embodiment.

At its outset every interdisciplinary undertaking will need to take stock of the terminology relevant to the problem domain. The meaning of the terms used will almost certainly vary across disciplines, or in many cases, within a single discipline. After the initial stocktaking of terminological ambiguity, it must be determined whether this terminological ambiguity reflects underlying conceptual confusion. If so, the next step toward successful interdisciplinary collaboration will be to clear away any such conceptual confusion. Ideally this clarification will facilitate some common conceptual ground on which the relevant disciplines can then conduct their investigations. Gallagher's efforts provide a perfect example of this approach toward interdisciplinarity.

Acknowledging that such an approach necessitates clarifying terminology, he begins with a review of the ambiguity attached to concepts of body image and body schema within psychology, neuroscience, and phenomenology. He aims to clarify these terms and to develop a common vocabulary for an interdisciplinary discussion of embodiment. According to Gallagher, despite a long history of terminological confusion, the notions of body image and body schema should not be abandoned and the distinction between the two is not simply conceptual. Body image, Gallagher writes, "consists of a set of perceptions, attitudes, and beliefs pertaining to one's own body" (2005, p. 25). In contrast, he suggests body schema is "a system of sensory-motor capacities that function without awareness or the necessity of perceptual monitoring" (2005, p. 25). These notions are critical to his discussion, and he works them out in detail—first, phenomenologically through contrasting them with one another, then through case studies of pathology in which body image and body schema are dissociable, in the style of cognitive neuropsychology.

Gallagher's approach illustrates a respect for the contributions of each discipline, the ideal of mutual enlightenment proposed by Varela (1996). His explicit appreciation for the fact that terminologies and conceptual frameworks vary across disciplines serves as a testament to his interdisciplinary acuity. Gallagher sees his project as expanding the fields. By establishing a common terminology he allows for interdisciplinary discussion and mutual illumination, and he situates himself as an interdisciplinary translator.

The vantage point of a translator, to some extent, is that of an outsider. As such, it allows the translator to take stock of the theoretical assumptions that may be

transparent to those working within the discipline. Acknowledging such assumptions sheds light on the biases that might creep into analysis as a result of these assumptions.

The translator also has a broad perspective on the methods that could be employed to address a particular problem, as well as the limitations of such methods. Again Gallagher exemplifies this aspect of the interdisciplinary translator. He writes, "phenomenology runs into certain natural limitations when it comes up against non-phenomenal processes" (2005, p. 40). He suggests that the body schema is such a process. As such he takes a different approach, that of examining pathology, to characterize the body schema in more detail. This leads him to collaborate with neuropsychologist Jonathan Cole and to the study of Ian Waterman (Gallagher and Cole, 1995). A researcher trained in a given discipline will likely have a good sense of the available methods within the various subfields, however the translator is in the best position to suggest methods from other disciplines.

Coinciding with the ease of information transfer and the unprecedented proliferation of information across the globe, the ground is more fertile for interdisciplinary research than ever before. Initiatives are emerging to restructure graduate programs to prepare scholars for such research.[2] The National Academy of Sciences (2005) has published a report, titled *Facilitating Interdisciplinary Research,* detailing how institutions and funding organizations can enable such research. We can expect to see more scholars like Gallagher come out of this trend toward interdisciplinary research. We can also expect to witness shifting boundaries between

[2] For examples see: "Formation of Interdisciplinary Scientists: New Concepts in Graduate Training and Assessment" at programs.ssrc.org/ki/fis/ ; or www.igert.org, a National Science Foundation funded initiative.

existing disciplines and the emergence of new disciplines, which is the topic of what follows.

CHAPTER 6
Interdisciplinary Engagement vs. Disciplinary Integration

When considering the fluidity of interdisciplinary boundaries, a distinction can be made between an interdisciplinary engagement and an integration of disciplines. An interdisciplinary engagement is temporary. In contrast, the integration of two disciplines is relatively permanent. In an engagement, the respective disciplines pool resources to address a particular problem. Once the problem is solved, if there is no reason for the engagement to persist, the representatives of the disciplines no longer interact. Examples of interdisciplinary engagement can be found in urban planning and engineering projects. Sometimes, however, such an engagement does persist, and it is a step in the process toward integration. The integration of two disciplines forms a new discipline. Biochemistry and the neurosciences exemplify the results of such integration. Through continuous and reliable coupling of existing disciplines, a new discipline is formed. The neurosciences have emerged relatively recently, and subfields are still shifting. In contrast, biochemistry emerged just after 1900, which has allowed historians of science ample time to trace its origins.

Tracking the exact historical contributions to the genesis of biochemistry proves to be a very complicated endeavor, however studies of the emergence of a new scientific discipline suggest that the process unfolds gradually in three stages: a preparatory phase, a transitional stage, and a stage of emergence (Strabanova, 1985). In the preparatory phase, science turns its attention to new problems that could not be adequately addressed within the scope existing disciplines. In the case of biochemistry, this took place until the 1870's with new problems related to the chemical processes of organic matter. Knowledge generated at this stage accumulates in articles and monographs. New concepts emerge. Perhaps specialized labs are also created.

The transitional stage involves the establishment of institutional frameworks and avenues of communication in which the research can be carried out and results can be transmitted. In the case of biochemistry, this took place around 1900, when disciplines such as physiology and organic chemistry developed closer ties. This tight coupling of disciplines results in the development of conceptual tools and in the establishment of a scientific community.

The final stage of the development, the actual emergence of the discipline, can be said to be complete when all the components that characterize a discipline are in place for the new discipline. These include the formation of methodological systems, terminological systems, scientific societies, journals, and institutional recognition. For biochemistry, this took place after 1900 when it was recognized as the study of the chemistry of live matter. By this time it had a base of publications and institution, and had an international scientific community.

The past 30 years has seen a similar process unfolding around the cognitive and brain sciences. The term 'cognitive neuroscience' emerged to refer to the use of the tools of neuroscience to address questions from cognitive psychology. Additionally, neuropsychology emerged as the clinical study of neural underpinnings of pathologies characterized by psychological. The recent engagement of neuroscience and cognitive psychology brings to mind questions familiar to many interdisciplinary engagements. What does each discipline have to contribute to the engagement? If the engagement persists, will the domain of one discipline be reduced to the domain of the other? This second question seems more pressing in the sciences, where there can often be a tacit hierarchy of legitimacy residual of positivist and reductionist programs of the twentieth century.

In the shadow of these programs, there is a question of whether the domain of the "softer" discipline will be reduced to the domain of the "harder" discipline grounded in physical mechanism. In the case of cognitive neuroscience, Uttal (2001) argues that, rather than one discipline reducing to another, presently cognitive neuroscience requires the insights of cognitive psychology to guide and constrain research questions. The suggestion is that the distinctions and the theoretical questions familiar to cognitive psychology could be useful to cognitive neuroscience. This argument is similar to Varela's proposal of neurophenomenology aside from one fundamental difference. Whereas cognitive psychology provides neuroscience with distinctions for the investigation of cognitive processes, phenomenology provides neuroscience with distinctions for the investigation of subjective experience.

It seems at least possible that the interface of the cognitive sciences and phenomenology will necessitate redrawing the boundaries of the component disciplines. Science is popularly spoken of as a static unity with definite characteristics and a singular method. In actuality, it is an umbrella term referring to set of nested specialties, each with its own characteristic theories and methods. Perhaps, what we think of as the defining boundaries of Science, conceived as a third-person approach to an objective world, will need to be reconsidered in light of the fact that one the most pressing question in 21st century science is about the biological basis of subjective experience, and the theories and methods needed to address such a question may be diametrically opposed to only considering a third-person perspective.

Recall the arguments of Nagel: if consciousness necessarily has a subjective component, and third-person approaches inadequately account for that subjective component, then methods must be devised to adequately account for the subjective component of consciousness. Nagel proposed an "objective phenomenology," as such a method; however what he meant is unclear. The most likely candidates for such methods are first-person approaches (Varela & Shear, 1999). Introducing such approaches within a scientific framework seems contradictory to the understanding of the scientific endeavor cited above. Pressing questions regarding the place of first-person experience in the scientific study of subjective experience, suggest a reformulation of the scientific endeavor, if only as it relates to subjective experience.

Fluidity Boundaries at the Interface of Cognitive Sciences and Philosophy.

The interplay of the form of interdisciplinary engagement, and the content of that engagement at the interface of the cognitive sciences and phenomenology is the focus of what follows. Within each of these disciplines there are various schools, subfields, and streams of thought. Again consider the many subfields of neuroscience: cellular neurophysiology, developmental neurobiology, computational neuroscience, cognitive neuroscience, to name just a few. If there are boundaries between these subfields, they are not fixed. As one may expect, the boundaries that are drawn depend on the objectives one has while drawing them. Additionally, with tighter coupling of disciplines, as one draws on the methods of another and as the flow of information increases across disciplines, the boundaries between them can easily shift. There is an element of a subtle calculus as the focus of each discipline narrows with time: the fluidity that comes along with finer approximation often obscures boundary points.

Recall the emergence of biochemistry as an example of this sort of fluidity. One way to think of biochemistry would be as the offspring of biology and chemistry, or more specifically physiology and organic chemistry (Strabanova, 1985). As the tools and techniques of each discipline became sharper, researches began to acknowledge continuity. As the literature grew, communication flow increased, techniques became more specialized, and the discipline of biochemistry was born. This sort of interdisciplinary fluidity resulting from tighter coupling is unfolding at boundaries of the cognitive and brain sciences. The emergence of terms such as neurophilosophy (Churchland, 1986) and neurophenomenology suggest a parallel

occurrence of fluidity at interface of these sciences with philosophy and phenomenology. Additionally, the form of interdisciplinary foretells of fluidity in of the boundaries of the traditional objects of study for those sciences.

The form of the interdisciplinary interaction reflects the content of that interaction. At the interface of cognitive sciences and phenomenology—in its manifestations in embodied cognitive science and situated cognition—a recognition of the continuity of mind, body, and world implies a conception of a fluid cognitive agent. Contrasting the individuated cognitive agent of traditional cognitive sciences, the conception of the cognitive agent emerging at the interface of cognitive science and phenomenology has boundaries that undulate depending on situated action and dynamic coupling with the world. With engagement, the shape of the disciplines change, and correspondingly the shape of their objects of investigation change as well.

Expressions of Fluidity and Context within Science

In recent years, a few scientific disciplines have emerged seeking to explore dynamic systems in all their complexity. Within the realm of evolutionary biology, for instance, developmental systems theory suggests that "The organism is part of a larger system that produces, maintains, and changes it…Its boundaries are fluid, because organisms and their worlds change, but also because the practicalities of scientific study may dictate particular inclusions and exclusions" (Oyama, 2004, p. 4). This sort of proposal emphasizes the need to consider the dynamic nature of the system, the notion that boundaries are not fixed and that the system is situated within

a context. In this case, context describes the time and place of the organism's situation, as well as the practicalities and motivations of the scientific endeavor for which the organism and its environment are an object.

Within the domain of neuroscience, dynamic systems theory has been applied to the study of the dynamics of neural activity (Abarbanel & Rabinovich, 2001; Freeman, 2000). Much of the neuroscience work on cognitive function assumes the brain to be modular, and, in many cases, linear. In contrast, the neurodynamical approach takes the interconnectedness of the brain as fundamental. Rather than trying to render the brain intelligible through fragmentation, it employs sophisticated methods for analysis of non-linear systems to make this dynamic interconnectedness intelligible in its spatio-temporal unfolding. Considerations of the fluid boundaries and the dynamic states of the system are fundamental principles of this approach.

Expressions of Fluidity and Context in Philosophy

Various philosophical traditions exemplify the theme of permeable boundaries and the emphasis on considerations of context as well. Within the phenomenological tradition, Heidegger, in his rejection Husserl's reduction, also emphasized the need to consider context and situation. In his reformulation of phenomenology, Heidegger suggests that Husserl's phenomenological reduction takes one away from the everyday involvement with the world, which is precisely where Heidegger feels phenomenological investigation must begin. He writes of Husserl's reduction: "We start from the real consciousness in the factually existing human, but this takes place only in order finally to disregard it and to dismiss the reality of consciousness as such.

In its methodological sense as a disregarding, then, the reduction is in principle inappropriate for determining the being of consciousness positively" (Heidegger, 1992, 109). Even superficially in his characteristic compound constructions, for example "Being-in-the-World," Heidegger makes clear his emphasis on dynamic unity.

More recently, within analytic philosophy of mind expressions of permeable boundaries of mind and world have manifested in various ways as externalist accounts of mental content. Contrasting internalist views that depend on representation for mental content, externalist accounts propose that for an intentional state to have content, it must be related to the external environment in one way or another. The most radical of these accounts, the active externalism proposed by Andy Clark and David Chalmers (1998), seriously questions the notion that the mind stops at the boundaries of the skull.

Clark and Chalmers suggest, that in some cases, "the human organism is linked with an external entity in a two-way interaction, creating a *coupled system* that can be seen as a cognitive system in its own right" (1998, p. 644). To illustrate this idea, Clark and Chalmers cite examples such as the rearrangement of scrabble tiles to facilitate word recall, or the use a pen and paper to perform long calculations (Kirsh, 1995; McClelland et al. 1989; cited in Clark and Chalmers, 1998). In each case the artifacts in the world aid and drive the cognitive process. In both cases, however, the engagement is too brief to convey the full possibilities and implications of this sort of coupling. The duration and reliability of the coupling prove to be crucial to the idea of an extended mind.

To develop their thesis, Clark and Chalmers describe Otto, a patient with Alzheimer's disease who relies heavily on the use of a notebook to keep track of information he needs. Otto brings his notebook everywhere, and needs to refer to it for almost everything. One day, Otto decides to go to the Museum of Modern Art; he looks in his notebook to find the address to the museum; he proceeds to the address he finds within its pages. Otto consults his notebook, just as one might consult their memory. It serves as his memory. Clark and Chalmers suggest further still that, in the same way one might have the belief that the Museum of Modern Art is on 53rd Street prior to consulting one's memory, Otto has the belief that the Museum of Modern Art is on 53rd Street because that information is in his notebook. They write, "the information in the notebook functions just like the information constituting an ordinary non-occurent belief; it just happens that this information lies beyond the skin" (1998, p. 647). With these suggestions, Clark and Chalmers place two canonical aspects of the mind—memory and belief—outside of Otto's head through reliable coupling with aspects of the world. By doing so, they call into question traditional conceptions of the mind.

CHAPTER 7

Post-Cognitivism: Embodied and Situated Cognition

Clark and Chalmer's proposal of active externalism, alternatively called the Extended Mind Hypothesis, finds a comfortable position in recent movements within cognitive sciences: embodied and situated approaches to cognition. The terms, embodied and situated, refer to a loose knit body of approaches in cognitive sciences, rather than a codified research program, thus they are difficult to characterize precisely. Situated cognition has been described negatively, "as opposed to Platonism, Cartesianism, individualism, representationalism, and even computationalism about the mind" or by referring to certain influential thinkers from both phenomenology and ecological psychology such as Gibson, Heidegger, or Merleau-Ponty (Wilson & Clark, in press, pp. 2-3). In what follows, the term Post-Cognitivist approaches will be used to collectively refer to embodied and situated approaches to highlight the contrast between them and the traditional Cognitivist approaches.

Neither approach is settled, however there are a few dimensions on which the differences seem clear. According to Gallagher and Varela (2001), the first formulation of cognitive science, characterized as Cognitivism, "is a study of how the subpersonal, non-phenomenological mind manipulates discrete symbols according to a set of syntactical procedures, and how this might be cashed out in neurological

terms" (2001, p. 18). Cognitivist approaches abstract cognition from body and world often in the form of propositional knowledge, whereas Post-Cognitivist approaches consider cognition as necessarily embodied and situated in an environment. Cognitivist explanatory appeals tend toward representation, while explanatory appeals to action seems to dominate Post-Cognitivism (Rowlands, 2007). In addition, Cognitivist explanations tend to be static, while Post-Cognitivist explanations seem to be dynamic (see Thelen & Smith, 1994). Below I will describe the work of two philosophers, Hubert Dreyfus and Alva Noë, to further clarify the distinctions between cognitivist and post-cognitivist approaches—traditional cognitive sciences, and embodied and situated cognitive sciences, respectively.

Critiques of Cognitivism and the Development of Post-Cognitivism

What follows are critiques of aspects of cognitivist notions of mental representation by Alva Noë (2004) in the domain of perception in his development of the enactive approach to perception, and by Hubert Dreyfus (1996) in his account of skill acquisition. First, Dreyfus' critiques of early efforts in Artificial Intelligence research will be reviewed as it anticipates many of the contemporary critiques of cognitivist, and the resulting shift to post-cognitivist approaches. Dreyfus's later work on skill acquisition, for which he draws on the work of Merleau-Ponty, will be reviewed to illustrate focus on the role of the body in situated action in post-cognitivism. In a similar vain, Noë's enactive approach to perception illustrates the post-cognitivist focus on the role of the body in situated action. Contrasting traditional views of the visual system that involve only the structure of the eye and

the visual cortices, Noë's critique suggests a broader view of the perceptual system to encompass the entire organism situated and acting in an environment.

Noë develops a phenomenologically driven critique of what he calls the snapshot view of perception, the notion that our experience is built up of sequential representations of reality. In doing so, he also develops an argument for an alternative to the representationalist accounts of perception dominant in the cognitive sciences. His critique is similar, if only in its roots, to Dreyfus' phenomenological account of skill acquisition as the basis of a non-representationalist cognitive science.

Dreyfus's critique of Artificial Intelligence

The cognitive sciences do not have a long history, but no shorter is the history of critiques of cognitive science. Hubert Dreyfus directed one of the first toward the early projects of Artificial Intelligence (AI). As it relates to the cognitive sciences, Dreyfus's work can be organized in two separate but related periods. In the first period, he critiques the project John Haugeland (1998) calls GOFAI, the attempt to develop artificial intelligence through formalization of atomistic bits of information.

In his bluntly titled, *What Computers Can't Do,* Dreyfus (1979) deflated the ambitions of early AI researchers. He evaluated problems facing AI researchers in four pursuits that dominated AI's research efforts at the time: game play, specifically chess; language translation; problem solving; and pattern recognition. After indicating that trouble with AI research was due to the underlying assumptions of what was later to be called cognitivism, Dreyfus suggests alternative perspectives from the phenomenological tradition and Gestalt psychology. Dreyfus highlighted the

limitations of early AI through considerations of the role of the body in ordering experience, the role of situation and context in disambiguating experience, and the role of values and interests in shaping experience.

Dreyfus contends that the project of AI, at least in its early stages was limited by its assumption that the world is articulatable in terms of elementary atomistic concepts. This broad assumption took the form of a rationalist epistemological assumption, that we understand things in terms of discrete packets of meaning, as well as an analogous ontological assumption, that such "a set of determinate independent elements" exist in the world ready to be understood (Dreyfus, 1972, p. 118). He traces these assumptions back to Plato who believed that if one could not explicitly state one's know how, then one did not have knowledge, but instead only had belief.

For AI researchers, one of the main problems of chess play was the combinatorial complexity, the exponential growth of the number of possible moves and responses, resulting from the attempt to address the problem by making all of the steps of game play explicit. This attempt to explicate every possible step parallels cognitivist attempts to represent knowledge as set of propositional statements. Researchers had begun to employ the notion of heuristically guided searches in an effort to mitigate the problem of combinatorial complexity, but the programs that initially resulted from this strategy still failed to play well, even when faced with novice competition. In the case of language translation, Dreyfus details the difficulty of resolving the problem of semantic interpretation, an issue that Oettinger describes as the "very mysterious semantic processes that enable most reasonable people to

interpret most reasonable sentences unequivocally most of the time" (as cited in Dreyfus, 1979, p. 20).

> In game playing, the exponential growth of the tree of these alternative paths requires a restriction on the paths which can be followed out; in complicated games such as chess, programs cannot now select the most promising paths. In problem solving, the issue is not only how to direct a selective search among the explicit alternatives, but how to structure the problem so as to begin the search process. In language translation, even the elements to be manipulated are not clear due to intrinsic ambiguities of a natural language; in pattern recognition, all three difficulties are inextricably intertwined, as well as the fact that similarity and typicality seem to be irreducible characteristics of perception (1979, p. 41).

Setting the stage by reviewing the claims and failures of AI's attempts to simulate chess play, translate language, recognize patterns, and solve problems, Dreyfus examines the underlying assumptions of the AI researchers. Dreyfus writes, "Underlying their [AI researchers] optimism is the conviction that human information processing must proceed by discrete steps like those of a digital computer, and, since nature has produced intelligent behavior with this form of processing, proper programming should be able to elicit such behavior from digital machines, either by imitating nature or by outperforming her" (1979, p. 67). With this acknowledgement, and the failures of AI's early attempts at cognitive simulation, Dreyfus offers phenomenologically derived views of human information processing as an alternative model. He considers three things: first, the role of the body in ordering our experience of objects; second, the role of situation in providing a

background for that order; and third, the role of human purposes and values in organizing the situation.

Dreyfus holds that the problem with early work in AI is the assumption that the task of information processing must proceed by formalization, which he sees as misguided. Instead, he argues, a non-formalizable form of understanding, only possible for embodied beings, is what AI needs (1979, p. 149). Dreyfus claims that the body contributes three functions that computer programs at the time had yet to achieve:

1. "the inner horizon, that is, the partially indeterminate, predelineated anticipation of partially indeterminate data"
2. "the global character of this anticipation which determines the meaning of the details it assimilates and is determined by them"
3. " the transferability of this anticipation from one sense modality and one organ of action to another" (1979, p. 167)

He goes on to say that these functions are all included in the ability to acquire bodily skill, which is a notion that becomes central to his later work. Contrasting the underlying assumption of AI that we can understand the world in terms of atomistic bits of information, Dreyfus claims: "Bits or aspects of object are not experienced as isolated facts but as nested in a series of contexts" (1979, p. 174). He is drawing our attention to the necessity of a context or situation in experience. We are always already present in a situation that colors the way those objects are to be processed. Although his critique did not lead to a sweeping re-envisioning of the entire project of AI, it is telling that certain researchers, such as Clark (1999), Varela and colleagues (1991), in cognitive sciences are beginning to take the notion of embodiment and contextual embeddedness seriously.

The relevance of facts, or even the constitution of those facts, depends on situation. Dreyfus contends that the facts remain neutral with the context independent nature of the facts as they are presented to a program. Due to possibly infinite number of facts, the processing of these facts remains an insurmountable computational problem. In contrast, "We can and do zero in on significant content in the field of experience because this field is not neutral to us but is structured in terms of our interests and our capacity for getting at what is in it" (1979, p.174). These interests and pragmatic concerns, which come along with having a body, are precisely what a computer lacks. This could be interpreted as a thesis of behavior driven by the desire to survive, but Dreyfus intends a much broader but more situation dependent account of interests: "man's ultimate concern is not just to achieve some goal which is the end of a series; rather, interest in the goal is present at each moment structuring the whole of experience and guiding our activity as we constantly select what is relevant in terms of its significance to the situation at hand" (1979, p. 187).

The critique of GOFAI, undoubtedly influenced by Heidegger's concentration on everyday activity, led to the development of Dreyfus's account of practical coping, how it is that we comport ourselves in the everyday human world. The body takes center stage in this account, as it did in the earlier critique of AI: "The intentionality of practical coping is a directedness of bodies rather than minds" (Rouse, 2000, 9). Rouse sums the three points that figure into Dreyfus's account of practical coping as follows:

1. Comportment is not mediated by mental representation.

2. The things that are disclosed are interconnected settings organized around ones practical concerns.
3. Comportment is not a self contained sequence but a flexible responsiveness.

Emphasizing the dynamic nature, or flexible responsiveness, of coping and context, in contrast to static representationalist accounts of behavior, enables a transition to skill acquisition as a characteristic example of practical coping. Dreyfus describes the process:

> Generally, in acquiring a skill—in learning to drive, dance, or pronounce a foreign language, for example—at first we must slowly, awkwardly, and consciously follow the rules. But then there comes a moment when we finally transfer control to the body. At this point we do not seem to be simply dropping these same rigid rules into unconsciousness, rather we seem to have picked up the muscular gestalt which gives our behavior a new flexibility and smoothness. (1979, p. 160-161)

With this notion of bodily action as practical coping, let us move to Dreyfus's development of a non-representationalist account of skillful action.

Two central ideas from Merleau Ponty's *Phenomenology of Perception*—that of the intentional arc and that of maximum grip—inform Dreyfus's account of skill acquisition and learning without appeal to representation. Dreyfus views skill acquisition as an example, if not the example, of the establishment of the intentional arc, the "tight connection between the agent and the world" (Dreyfus, 1996, p.1). Dreyfus claims, "that, as the agent acquires skills, these skills are 'stored,' not as representations in the mind, but as more and more refined dispositions to respond to the solicitations of more and more refined perceptions of the current situation"

(Dreyfus, 1996, p. 1). Maximal grip refers to the body's tendency toward harmony between the situation and the "agent's sense of an optimal gestalt" by responding to those solicitations in a specific way.

Dreyfus suggests that two components of intelligent behavior—learning, and skillful action—can be described and explained "without recourse to mind or brain representations" (Dreyfus, 2002, p.367). He uses Merleau-Ponty's notions of the intentional arc and maximal grip to give weight to this suggestion. According to Dreyfus, the intentional arc "the tight connection between agent and world as active body acquires skill;" and, maximal grip is "a body's tendency to refine its responses so as to bring the situation closer to an optimal gestalt" (2002, p.367). The following examples should clarify these notions.

Let us first consider the intentional arc. In his discussion of the spatiality of the body Merleau-Ponty writes:

> that the life of consciousness—cognitive life, the life of desire or perceptual life—is subtended by an 'intentional arc' which projects round about our past, our future, our human setting, our physical, ideological and moral situation, or rather which results in our being situated in all these respects. It is this intentional arc which brings about the unity of the senses, of intelligence, of sensibility and motility. (Merleau-Ponty, 1962, p. 136)

What does he mean exactly? It is clear that Merleau-Ponty intends the intentional arc to encompass much more than a single moment of experience (if such a thing exists, outside of analysis). The intentional arc refers to that which allows one to cope, and couple, with that single moment of experience. The agent's current situation—bodily, mental, and cultural—as well as his past activities, and expectations for the

future constitute the intentional arc. Outside of analysis, in lived experience, the intentional arc is temporally extended; it is the continual coupling the agent with the world through skillful action. Once this intentional arc is established, the coupling naturally tends to get tighter; it tends toward attaining maximal grip on the world.

Merleau-Ponty provides the example of viewing a picture in gallery to clarify the notion of maximal grip:

> …for each picture in an art gallery, there is an optimum distance from which it requires to be seen, a direction viewed from which it vouchsafes most of itself: at shorter or greater distance we have merely a perception blurred through excess or deficiency. We therefore tend towards the maximum of visibility, and seek a better focus as with a microscope. (Merleau-Ponty, 1962, p. 302)

The fact that this tendency towards maximum visibility is natural and does not involve a prior representation of that visibility is crucial for Dreyfus's critique. Dreyfus claims that, rather than a representation of an end result of the attainment of maximal grip, we only have a sense of what Merleau-Ponty refers to as "excess or deficiency."

Let me provide an example from my own experience that helped me clarify these two notions, and there relation. While learning to rock climb I paid careful attention to how my perception of the climbing wall changed each time I climbed. The very first time the wall was gray rock face with many colored, disordered, and oddly shaped objects jutting from it. When attempting to scale it I did my best to grab whichever objects were within reach without loosing my balance. With subsequent trips to the wall, I learned that those colorful, oddly shaped objects are called holds, and, rather than being disordered, they are set in routes marked with tape.

Furthermore I learned that experienced climbers do not see a path made of single, sequentially placed holds leading up the wall as I tried to do. But instead the experienced climber perceive wall with climbable routes. To some extend the experienced climber sees through the holds to the routes.

As I practiced, my body became stronger, my balance improved, and I was able to do more on the wall. This practice shaped my body, but it also shaped my perception of the wall. With greater strength, balance, and dexterity, I gained the ability to use holds that I previously could not, and as such these holds presented themselves to me as possibilities. One may be reminded of Gibson's (1979) notion of affordances. According to Gibson, the objects in my environment become salient due to what they afford me as an agent acting in the world. With more practice, the routes began to present themselves as well. My experience of the wall was redefined with changes to my body and perception.

In this example the intentional arc could be thought of as everything that allowed me to make contact with the wall, both perceptual contact, in terms of seeing the wall, and bodily contact, in terms of actually placing my hands and feet on to the wall. Maximal grip, in this example, could be thought of subsequent revisions that were made to my perceptual experience that allowed it to move from "gray rock face with many colored, disordered, and oddly shaped objects jutting from it" to clear routes that I could follow up the wall. Or perhaps even more clearly, maximal grip could simply be thought of in terms of gaining a better grip on a single hold. With practice, my hand gains strength, and, with experience, a more refined understanding of how to place my fingers. In both cases, I have no prior representation of what that

grip will be. Again this lack of prior representation is crucial for Dreyfus's account of skill acquisition.

With these notions of the intentional arc and maximal grip, Dreyfus breaks the process of skill acquisition into five stages: that of the novice, that of the advanced beginner, that of competence, that of proficiency, and that of expertise. At the stage of the novice, the task is decomposed into *context free* features, and explicit rules are provided to deal with those features. In contrast, advanced beginner, through experience, gains the ability to recognized *situation specific* features

The stage of competence seems to be a pivot point. At this stage, "the number of potentially relevant elements that the learner is able to recognize becomes overwhelming" (Dreyfus, 2002, p. 369). The learner must restrict the number of relevant features by adopting a perspective that renders some features of the task environment more salient than on others. Think of the point at which the holds became routes in the previous climbing example. It is also at this stage that Dreyfus highlights the role of emotion in the process of skill acquisition: "As the competent performer becomes more and more emotionally involved in his tasks, it becomes increasingly difficult to draw back and to adopt the detached rule following stance of the beginner" (2002, p.370). The role of a goal also seems to be important in determining the perspective the learner takes, which in turn determine which features of the task environment become salient. However the goal state need not be clearly represented.

At the stage of proficiency, the fourth stage, it becomes clearer what Dreyfus means by suggesting that this process can be explained without recourse to mental or

brain representations. At this stage Dreyfus suggests: "The performer's theory of the skill, as represented by rules and principles, will…gradually be replaced by situational discriminations accompanied by associated responses. Proficiency seems to develop if, and only if, experience is assimilated in this atheoretical way and intuitive behavior replaces reasoned response" (2002, p.371). The notion of the intuitive response seems to be doing a huge amount of work for Dreyfus, but he stops short of giving an account of how exactly this replacement takes place. It would seem that he wants to deny that the initially explicit rules become implicit. But without detailing how this replacement takes place, his reader is left wondering. How is it that the learner suddenly "simply sees what needs to be achieved rather than deciding, by calculative procedure, which of several possible alternative should be selected" (2002, p.371)? With this question left unanswered Dreyfus moves on to describe the expert.

What separates the proficient learner from the expert is that, in addition to seeing what needs to be achieved, the expert also sees how to achieve this goal. The expert climber will not only see the routes that are available to him, while climbing the expert can navigate these routes with little to no explicit reasoning: "The expert…, generally without any awareness,…knows how to perform the appropriate action without calculating and comparing alternatives" (2002, p.371).

To emphasize the non-representational character of this process Dreyfus appeals to Walter Freeman's (2002) model of feedforward neural nets, suggesting that they are structurally isomorphic to Merleau-Ponty's notion of maximal grip. Freeman's models of feedforward neural nets involve a state space within which

activity naturally tends toward attractors. According to Freeman, perturbations of ongoing endogenous global activity in the brain, by an external stimulus for instance, cause that activity to move toward one or another attractor around which network activity organizes. Under these models, endogenous network activity is continuous, but, with external perturbations, can self-organize around particular attractors. This organized network activity creates a meta-stable state contrasting the relatively unorganized endogenous network activity that serves as the transition state in this example. These attractors dictate patterns of brain activity. An attractor, in utterly simplified terms, could be thought of as a trough in a physical landscape into which rain might flow after falling to the ground. Of course, the rain need not represent the trough to flow toward it. The rain's follows its natural tendency toward the trough, just as the endogenous brain activity naturally tends toward the attractor, and our experience tends toward maximal grip.

Noë employs a method similar to Dreyfus's to develop a critique of notions of mental representation within orthodox theories of vision, and in developing his enactive approach to perception. Noë draws on the insights from the phenomenological tradition, but he also places an emphasis on formulating better descriptions of perceptual phenomenology to inform the cognitive sciences.

Noë's critique of the snapshot view of perception

Again, the notion of mental representations shapes much of the current cognitive science research. For instance, the orthodox theory of vision, primarily

attributed to David Marr,[3] holds that vision involves the construction of a detailed internal representation of the external world. Alva Noë describes the orthodox conception of vision as follows: "vision is a process whereby the brain, starting from a retinal picture, produces a better more detailed neural picture" (2004, p. 39). To perceive the world, on this view, one must first create a detailed representation of it.

Undoubtedly there are some mental processes that necessitate mental representations. In memory for instance, when the relevant features of the world are absent, it seems natural that we need to create some sort of representation of those relevant features in order to draw on information from the world. This is not to say that the representation of something absent has the character of a snapshot. Evan Thompson suggests that, for instance, the character of a visualization or imagining is not that of a snapshot, but rather "to visualize X is to mentally re-present X by subjectively simulating or emulating a…perceptual experience of X" (2007, p. 292). If I am in the supermarket trying to remember if I need milk or not, I may inspect the contents of my refrigerator in my memory. In contrast, if I am standing in front of the open refrigerator, it seems overly complicated that I should first have to create a detailed mental representation of the visual scene before me in order to conclude that I am out of milk.

To further highlight the distinction between the orthodox view and his enactive view Noë draws an example from Dana Ballard's animate vision program (Ballard, 1991; 2002). He presents two strategies you could use to navigate a strange city to find a castle on a hill at the center of the city. The first strategy involves a map, the representation. You locate your position on the map with respect to the

[3] Thanks to Professor Horst for pointing this out.

castle, trace out a path to arrive at the castle, and, if the map corresponds well enough with the landscape, you arrive at the castle. The second strategy involves no map; you simply sight the castle, there on the top of the hill, and walk toward it. Provided that you can keep the castle in sight, you also arrive at the castle without the expense of buying, and the complication of following, a map. Why then would vision scientists discard the direct, more parsimonious account to insist that detailed mental representations are necessary for perception?

A central question, perhaps the central question, in 20th century vision science is how a relatively impoverished, two-dimensional retinal image could give rise to a three-dimensional experience of the world rich in detail. How can a three dimensional visual scene that is projected onto a two dimensional retina, be experienced as three-dimensional? Vision scientists often appeal to things such as depth cues and shadows that allow our visual system to construct mental or neural representations of the visual scene. Another puzzling feature of visual perception, the blind spot, seems to motivate the representationalist view in theories of visual perception. The spot on the retina where the optic nerve exits the eye has no photoreceptors. One might expect that there would be a corresponding blind spot experienced by the perceiver. But, a casual inspection of one's visual field does not reveal a blind spot.

Orthodox vision theory uses the idea of an internal, either mental or neural, representation to fill in this blind spot and account for this paradox: "the brain fills in the discontinuity in the retinal image; it produces a gap-free picture that can serve as the internal substrate of our gap-free experience of the world" (Noë, 2004, p.39). Noë

questions the assumption of vision science that we need mental or neural representations to fix the imperfections of the retinal image to "support our detailed, high-resolution, gap-free, snapshot-like…visual experiences of the world…"(p.39). Further, he suggests that the assumption that we experience the world as gap free, in high and uniform resolution is misguided. If we don't, Noë suggests, "then vision science has been barking up the wrong tree when it seeks to explain how, on the basis of the relatively information-poor patterns of light striking the retina, we are able to enjoy colorful, detailed, high resolution, picture-like visual experiences" (p.49).

Essentially, if our percepts are not as richly detailed as we think they are, than perhaps there is less of a puzzling gap between retinal image and percept. The indistinctness of peripheral vision is experienced every moment, but one rarely attends to it. Wherever one looks, the world is presented in detail. This is not due to richly detailed representations, but rather to one's ability to move one's eyes. Noë suggests that we do not actually experience the world in all of its detail, and it is only through exercising our sensorimotor capabilities, and the implicit knowledge of the impact this exercising will have on our sensory experience, that we are able to experience the world as detailed as we feel we do. With this suggestion, Noë gives a central explanatory role to the body in action.

Noë makes his arguments in the context of developing what he calls the enactive approach. One central claim of the enactive approach is that the "sense of perceptual presence consists in knowledge, my implicit understanding, that by a movement of the eye or the head or the body I can bring bits of the object into view that are now hidden." In defining the problem of perceptual presence, Noë asks, "how

it is we can enjoy perceptual experience of unattended features of a scene"(2004, p.59). Or more generally, "In what does our sense of the presence of the detailed environment consist, if not in the fact that we see it? How can it seem to us as if the world is present to us visually in all its detail without it seeming to us as if we *see* all that detail?"(p.60)

He provides the visual perception of a whole cat from partial sensory stimulus, a cat obscured by fence posts, as example to beg the question. How are we able to perceive a cat as a whole rather than as an odd series of fragmented cat parts? Our sense of the presence of the whole cat, he claims, consists in the implicit sensorimotor knowledge that we employ in those experiences.

> In general, our sense of the perceptual presence of the detailed world does not consist in our representation of all the detail in consciousness now. Rather, it consists in our access now to all of the detail, and to our knowledge that we have this access. This knowledge takes the form of our comfortable mastery of the rules of sensorimotor dependence that mediate our relation to the cat and the bottle. My sense of the presence of the whole cat behind the fence consists precisely in my knowledge, my implicit understanding, that by a movement of the eye or the head or the body, I can bring bits of the cat into view that are now hidden. (2004, p.63)

To help clarify how this talk of cats relates to the experience of a detailed world, consider another example provided by Noë, but taken from Grimes (1996). If one holds one's gaze on a particular word on a page of written text, one will notice that it is quite difficult to make out the words even immediately above and below that word. Grimes uses an eye-tracking device to vary the stimulus presented to the

experimental participant as the participants gaze shifts. The underlined letter indicates the location of the participants gaze.

T1: XXXX XXX XXXX thundered XXXX XXX XXX XX X XXX

T2: XXXX XXX XXXX XXXXXXXed into the sky XX XXX

Despite there being X's peripheral to the fixation point and the fact that they are seeing a "moving window of text," the participant has the experience of reading normal text. In light of this experimental work, one must seriously question the intuition that we represent the world in full detail. Noë suggests that the detail is present in the sense that it is available. It is virtually present and immediately accessible in the world through the actions of the perceiver. In the same way, Noë suggests the detail of our broader visual scene is available.

Crucial to Noë's approach is the need to accurately describe the phenomenology of perception. With a better understanding of the phenomenology, the role of the body and sensorimotor knowledge, rather than mental representation, becomes central to the understanding of perception. "If we get clearer about the phenomenology…then we can see that our sense of perceptual presence of the cat as a whole now does not require us to be committed to the idea that we represent the whole cat in consciousness at once" (2004, p. 63). Noë suggests that visual theorists consider the "perceiver not as the brain-photoreceptor system, but rather as the whole animal, situated in the environment, free to move around and explore…" (p. 20).

Recall Clark and Chalmer's (1998) Otto, who is reliably able to access the information in his notebook, which provides for a coupling between Otto and his notebook. Chalmers and Clark suggest that the information in Otto's notebook, that the Museum of Modern Art is on 53rd Street, "functions just like the information constituting an ordinary non-occurent belief; it just happens that this information lies beyond the skin" (1998, p. 647). This is the ground for claiming an extended mind.

Noë suggests that we can perceive, not because of our capacity for mental representation, but through our understanding or sensori-motor contingency, how sensory stimuli change with action, and through a reliable coupling of body and world. This conception of perception depends on a sensori-motor coupling of mind, body, and world that questions the boundaries often placed between those three things. In this way, the relevant boundaries of the cognitive-perceptual system extend beyond the skull, beyond the skin, and into the world. Such a conception seriously questions the treatment of the individual cognitive agent as conceived by traditional cognitive science. With reliable coupling the agent has continual access to the world. Rather than building a richly detailed internal representation of the world, the agent can continuously reference the world with its understanding of sensori-motor contingency. Under such conditions, the relevant boundaries of the system extend beyond the individual to the world.

We are left with two alternative perspectives on the mind, body, and world. The first and more traditional, taken by cognitivism, abstracts the mind from body and world through representations. One can see this stance reflected in the methods cognitive psychology. The cognitive process of interest is investigated in a lab

severed from the bodily agent acting in a world. The results of implementing those methods, in turn, re-enforce that perspective. One of the most potent critiques of cognitivist programs is the ecological critique that questions the generalizability of results obtained in the lab. The alternative perspective situates cognitive processes as bodily action in a world, in which the relevant boundaries of the system cross over all three components of the mind, body, and world. One conception should not be taken as more valid than the other, rather each should be considered as a product of the perspective from which it came.

Consider Heidegger's account of tool usage (1962). He writes that it is not until breakdown—until the pen runs out of ink, or the hammer hits our finger—that we explicitly represent the tool. We are able to shift back and forth from a mode in which we are engaged and do not use representations, to a mode where representation is necessary. Rather than consider all mental phenomena from the representationalist standpoint, the cognitive sciences should take the phenomenological recommendations seriously, and begin to consider alternatives where appropriate. Two such examples have already been discussed: that of visual perception, and that of skill acquisition. Each of these examples gives a primary role of action rather than representation. Noë's enactive account of perception suggests that an organism's ability to perceive depends on the capacity of that entire organism to act in the world. Additionally, Dreyfus's account of skill acquisition suggests our active bodily coping as the primary mediator of learning.

The focus on action in these accounts sharply contrasts the focus on representation in traditional accounts of the same processes. For instance, as Andy

Clark writes, "real world action, in … 'pure vision' paradigms, functions merely as a means of implementing solutions arrived at by pure cognition. The animate vision paradigm, by contrast, gives action a primary role" (Clark, 1999, p. 345). This dimension of the shift in thinking within cognitive sciences—from representation to action—offers a conception of the cognitive agent situated in a temporal unfolding.

The focus on the temporal unfolding of mental life afforded by an embodied and situated approach to cognition is but one dimension of the shift in perspective that these approaches indicate. By acknowledging experience as a dynamic process of many parts constantly interacting with and influencing one another through complex relations, it seems misguided to abstract a single component from the system in order to better understand it. Nevertheless, this has been the traditional approach at multiple levels of analysis: the relevant unit of cognition has been the individual abstracted from the world; mental life has been abstracted from the body and the world; cognitive processes have been modularized and dissociated from one another; brain regions have been dissociated from the complexity of network activity. Through analysis the life, the dynamics of the system, has been frozen to facilitate dissection. We have of course gained a great deal from this approach, but a great deal has also been lost, or at least neglected.

The interface of phenomenology and the cognitive sciences, as it manifests in embodied and situated approaches to the study of cognition, addresses those aspects of experience neglected by traditional cognitive sciences. The shift in perspective facilitated by this interface, and the correlative shift in theoretical orientation, draws attention to the neglected aspects of the mind-body-world system. The insights of

phenomenology provide resources for the cognitive sciences to address the neglected first-person perspective. In the same way the study of cognition provides the brain sciences with distinctions to guide the neuroscientific investigations of cognitive processes (Phelps, 1999), phenomenology can also provide both the cognitive and brain sciences with distinctions, and resources to guide the investigation of phenomenal processes.

CHAPTER 8
Bodily Experience and Fluid Boundaries

The discussion of interdisciplinarity introduced the notion of fluid boundaries. The logic of the argument for such fluidity is explicitly this: through prolonged and reliable engagement, or coupling, boundaries between the entities involved in the engagement become fluid. Two parameters of the engagement mediate the dissolution of boundaries: duration and intensity. By duration, I mean the temporal extension of the engagement. Intensity is a bit more complicated; the nature of the intensity seems to vary with example. Clark and Chalmer's extended mind hypothesis, provided a second example of fluid boundaries. Recall, with their example of reliable coupling between Otto and his notebook Clark and Chalmers argued that, in some cases, the mind extends beyond the boundaries of the skull. The work of Dreyfus and Noë introduced the notion that a shift in perspective can also facilitate redrawing the relevant boundaries: when considering from a post-cognitivist perspective, the cognitive agent is necessarily embodied and situated. The boundaries of the self must be drawn to include the body, mind, and world.

A parallel process occurs in the engagement of mind, body, world, and other minds. What follows is an attempt to make sense of this statement through an account of bodily self-awareness. The focus of this account will be on the body. Given the traditional neglect of the body, this account will begin by asking the question: Why study the body bodily experience? It will then be necessary to give an account of the

phenomenological distinction between the body-as-object (Körper*)* and the body-as-subject (*Lieb*). With this distinction in place, I will give an account of the permeability of our corporeal boundaries, through which the fluidity of our epidermal boundary will come to light. This allows for considerations of the boundaries of the body-as-subject, or the experiential body.

Why investigate bodily experience?

The investigation of bodily self-awareness seems an apt starting point to explicate many of the themes common to interdisciplinary investigations of cognitive function. This may seem counterintuitive given the fact that, for many traditions interested in these issues, questions have been framed in terms of the mind and the brain. Descartes of course is probably the most well known thinker among these traditions. Hopefully it will become clear that bodily self-awareness provides a point of conceptual as well as methodological confluence rather than separation.

The claim that third-person approaches inadequately account for experience is brought to the fore in the case of the body. We know a great deal from physiology and neurophysiology about the mechanisms of proprioception and somatosensation. We understand that various receptors are distributed throughout muscle and skin tissue to sense pressure, temperature, muscle strain, etc. We understand the three pathways that the signals from these receptors take through the spinal column toward the areas in the brain in which they terminate. However it is still unclear how the experience of bodily awareness arises from these mechanisms (Bermúdez, 1999).

There are a number of other traditional philosophical problems into which an investigation of bodily experience provides a convenient entry point. In everyday life one's body often becomes transparent, not in the sense of being invisible but rather in the sense that one is rarely consciously aware of the body. Nonetheless, the locus of one's action, of agency, is the body. In what other ways do we act in the world apart from the actions of our body? It seems inescapable, which makes the body an appropriate place to begin asking questions about agency, and the will.

Considerations of bodily experience are also relevant to questions of personal identity. Whether founded upon ideas of a personal history comprised of memories, or more directly on the continuity of the body, the experience of the body becomes central to inquiries into personal identity. Research shows that our memories of the past are constantly changing with each retelling, and that false memories can easily be injected. Common sense tells us that each moment we are adding new information to memory. With such changeability, how could any notion of identity find foundation in memory? Even if one stubbornly insists upon memory as a foundation for identity, the relevant sort of memory would likely be episodic memories that are necessarily seen from an embodied perspective. Encoding and intelligibility of such memories would be made impossible without the body.

The body provides the foundation for our interactions with others, the genesis of our intersubjectivity. Not only does it provide material boundaries by which we are able to distinguish self from other, but it also provides the means by which we transcend those boundaries. Through gesture, speech, and expression we can communicate and convey meaning—or, according to Merleau-Ponty, orient the other

in a field of meaning. It is the most intimate contact of bodies that often can engender the most profound sense of self-transcendence.

Both philosophers and scientists are beginning to recognize the importance of social and environmental situation as crucial to considerations of the nature and content of mental states. The role of the body in providing the conditions for those situations will be vital to understand. Perhaps the most pertinent reason to investigate bodily self-awareness is best stated by Sean Gallagher: "The human body, and the way it structures human experience, also shapes the human experience of self, and perhaps the very possibility of developing a sense of self. If the self is anything more than this, it is nonetheless and first of all this, an embodied self" (Gallagher, 2005, p. 3).

Bodily Extension

We often think of our bodies as bounded by our skin. We are reminded of this every time we come into contact with an object, every time we touch something. However the skin is far from impermeable; it is constantly perspiring and absorbing chemicals. Furthermore, to stay alive we need to eat, drink and breathe, which creates a constant exchange of bodily matter with that of the environment. Simply considering the body as a self-organizing system of matter leads to questions of boundaries. When considering the body as lived, the boundaries seem only to grow more permeable. What are the limitations of the extension afforded by this permeability? What are the implications of the limitations of this permeability for our

understanding of the self as separate from the world, and from others? Biologist and philosopher Francisco Varela suggests:

> The self is…an ongoing process every time new food is ingested, new air is breathed in, or the tissues change with growth and age. The boundaries of the self undulate, extend and contract, and reach sometimes far into the environment, into the presence of multiple others, sharing a self-defining boundary with bacteria and parasites. Such fluid boundaries are a constitutive habit we share with all forms of life: microorganisms exchange body parts so often and so fast that trying to establish body boundaries is not only absurd, but runs counter to the very phenomenon of that form of life. (Varela, 2001, p. 263)

It seems that most of us have a conception of our selves and of our bodies as utterly separate from our surroundings. That's not to say that anyone would deny the fact that we take in parts of our environment (e.g. food and drink), and integrate those parts within our body, but most seem to take this as having no implications for the inherent existence of our bodies. Without internalizing those parts of the environment into the body, it would cease to exist. The conception of self as isolated and abstract found in western philosophy undoubtedly plays a role in the derivative conception of the body. To take the conception of an isolated body to its logical conclusion shows clearly the absurdity of the idea: the living body would die, and the corporeal body would decay. These considerations strongly suggest that the conception of the body as isolated from its environment is quite flawed. How far can we go from this conception of the body as isolated? What limitations will we find? And, what will the implications be for the corresponding conceptions of self?

Body-as-Object and Body-as-Subject

The above discussion intimates the distinction between the corporeal body (Körper), with its corresponding notion of self-as-object, and the lived body (*Leib*), with its corresponding notion of the self-as-subject. These of course are not meant ontological distinctions, which would suggest that these two bodies are in some way difference substances. These distinctions are rather meant to taken as phenomenological distinctions, distinction between two ways that the body is experienced resulting from different perspectives. In terms of neurobiology one can begin to think of the sense of the corporeal body as mediated by visual perception and tactile perception. Whereas the sense of the lived body might be better thought of as mediated by interoceptive, and for the most part sub-personal, capacities such as proprioception and the sense of bodily orientation provided by the vestibular system (Gallagher, 2005). In what follows I'd like to explore the interplay of these two notions as a possible foundation for the undulations of self mentioned by Varela in the opening quote, and the role of habit, or familiarity, in modulating those undulations.

Through Merleau-Ponty's classic example of a blind man using a stick, we can begin to appreciate the notion of bodily extension. Merleau-Ponty suggests that with habit the stick becomes integrated into the blind man's body schema, his set of sensori-motor capacities.

> Once the stick has become a familiar instrument, the world of feelable things recedes and now begins, not at the outer skin of the hand, but at the end of the stick…the stick is no longer an object perceived by the blind man, but an instrument *with* which

> he perceives. It is a bodily auxiliary, an extension of bodily synthesis. (Merleau-Ponty, 1962, p.152)

One might not accept the stick as an extension of his corporeal body, of course his skin does not cover the stick, but at least one can accept it as an extension of his lived body. The cane becomes transparent to experience for the blind man in the same way that one simply looks through the lenses of a pair glasses. One might object that the cane and the glasses cannot be thought of as bodily extensions as they are mere objects.[4] However, the fact that they integrate so seamlessly into his body schema as to be relatively invisible suggests otherwise. It seems ridiculous to consider the arm as equipment for the body. The cane, in this case, is no less the locus of the bodies perceptual capacities than the arm.

With this integration, the dual nature of the body becomes even more salient. The stick, which was once a mere object, is now integrated into the sensori-motor capacities of the body. Perhaps the fact that the body itself has this dual nature as both subject and object facilitates the fusing of the body with what had, prior to appropriation, been simply a stick. Through the habit of using the stick, through reliable coupling with the stick, the stick is transformed from simply an object of experience to part of a subject. Considered from the perspective of the blind man, the subject with the stick are not separate, but rather they are an experiential unity. Phenomenological accounts of intersubjectivity have also appealed to this dual nature of the body as a foundation for intersubjectivity. As both subject and object in unity, body provides the foundations for many sorts of bodily extension.

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[4] There is also a growing body of research exploring more technologically advanced extensions of the sensory systems such as the prosthetic visual system that Noë (2004) discusses with which a person is able to form some sort of visual representation of a scene with the aid of an array of tactile stimulation.

Similar proposals of extension have come from the analytic tradition and cognitive science. Recall Clark and Chalmers (1998), who put forth what they call "active externalism," and suggest that the mind is not confined within the boundaries of the skull, and can spread into the world through reliable coupling with the world. Chalmers and Clark are primarily concerned with cognition of an individual agent coupled with an inanimate artifact. Could such a view be extended to incorporate other agents? In *Cognition in the Wild*, Hutchins (1995) proposes just this sort of extension. Going against the grain of mainstream cognitive science, Hutchins pursued the study of naturally situated cognition. This pursuit brought him to the navigation bridge of a naval vessel and to the suggestion that "social organizational factors often produce group properties that differ considerably from the properties of individuals" (Hutchins, 1995, p. xiii).

Hutchkins work suggests that in certain cases of coordinated action the relevant boundaries of the cognitive system extend beyond the individual to encompass the others. Consider the experience of having a conversation. Each contributor constitutes that conversation. The ideas expressed by each conversant intertwine toward construction of meaning. The agency constituting the conversation is shared, and, in some sense, the conversants become a single agent constituted by both ipseity and alterity. As Merleau-Ponty writes: "In the experience of dialogue…my thought and his are interwoven in a single fabric…We have here a dual being, where the other is for me no longer a mere bit of behavior in my transcendental field, not I in his; we are collaborators for each other in consummate reciprocity" (Merleau-Ponty, 1962, p. 354). We have to ask what allows for this blending? Prior

to thinking about the dynamics of the interaction, we can ask how such an interaction is even possible. How can we use perceptions of another person's body as a window into that persons mind? How can we approach the other as a minded body in the first place?[5]

Classically this question has been addressed with the argument from analogy (Zahavi, 2005). I can observe that in certain instances my body responds in a certain way that corresponds to a certain feeling that I experience: when I place my hand on a very hot surface I scream, retract my hand from the surface, and I feel pain. In this way, if I observe another place her hand on a hot surface, watch her pull her hand away, and scream. I then infer that she is in pain. This way of thinking about this process seems overly intellectualist. It seems rather to be an example of abstract analysis being read onto the phenomenon.

When confronted with the face of another, I do not see pursed lips and a furrowed brow and infer from those observations and my own experiences with pursed lips and furrowed brows that this person must be sad. Rather, I see this person's face as a sad face. Only in analysis can the face be split into components: "…in a face-to-face-encounter, we are not confronted with a mere body, or with a hidden psyche, but with a unified whole…It is only subsequently, through the process of abstraction, that this unity can be divided and our interest then proceeded 'inward' or 'outward'" (Zahavi, 2005, p. 150).

To perceive the other's body as an expressive whole presupposes approaching that body as a minded body in the first place. Such an approach assumes that in the

[5] This question and the proceeding one suggest two alternative ways of framing the same inquiry. The former assumes the existence of internal states on which the expressions of the body can give a window. The latter suggests a more unified conception of bodily expression and mental activity.

interaction there is a possibility for intersubjectivity. Phenomenologists such as Scheler, Husserl, and Merleau-Ponty have debated the foundations of intersubjectivity, and most reject the argument from analogy as providing such foundations. Scheler argues that "the argument from analogy underestimates the difficulties involved in self-experience and overestimates the difficulties involved in the experience of others" (as cited in Zahavi, 2005, p. 150). Surely if the experience of others necessarily involved some sort complicated inferential structure it would be beyond the capacity of an infant, but this does not seem to be the case.

Gallagher (2005) argues that even in the womb the very construction of our body prepares us for the intersubjective dimension of experience. Studies of neonate imitation suggest that infants are able to recognize that "the other is in fact of the same sort as oneself" (Gallagher, 2005, p. 225). The intersubjective dimension of experience infuses us as early as 12 hours after birth. It is much more likely that the infant experiences the face of another in a more direct way. Recently, there has been much discussion about the existence of mirror neurons as the foundations for such imitation (see Hurley and Chater, 2005). These brain cells are said to fire both when an action is performed as well as when one sees another perform the same action. Beyond shared neural activation, recent studies have also shown that the observer and the other also share muscular activation.

Oberman and colleagues (2007) found that selectively blocking an observers ability to mimic the facial expressions of another can hinder an observer's recognition of that facial expression. Why would this be the case? Using an electromyography (EMG) to measure muscle contraction of the muscles involved in facial expressions,

these researchers, have shown that when observing the facial expression of another there is a subthreshold activation of the muscles involved in generating that facial expression in the observer. Such discoveries give new meaning to Merleau-Ponty's statement, "I live in the facial expressions of the other, as I feel him living in mine" (cited in Zahavi, 2005, p. 153). Rejecting the inferential account of intersubjectivity entailed by the argument from analogy, phenomenologists have instead suggested that we are able to experience others because our own being is comprised of both subject and object. We experience our self as both self-as-subject and self-as-object, which provides for us a crucial point of overlap for intersubjectivity.

On this two sidedness of the body as preparation for intersubjectivity, Zahavi quotes Husserl, "One reason I am able to recognize other embodied subjects is that my own bodily self-experience is characterized by this remarkable interplay between ipseity and alterity" (Zahavi, 2005, p. 157). A sentiment which Merleau-Ponty echoes: "The other can be evident to me because I am not transparent for myself and because my subjectivity draws its body in its wake" (Merleau-Ponty, 1962, p.352). If intersubjective experience begins as young as infancy, we can assume that by adulthood a person would more than likely have a great deal of practice, and, as with the habit of using the stick, therein lies the possibility of dissolution of a subject-object distinction. "In reality, the other is not shut up inside my perspective of the world, because this perspective itself has no definite limits, because it slips spontaneously into the other's, and because both are brought together in the one single world in which we all participate as anonymous subjects of perception" (Merleau-Ponty, 1962, p. 353).

It would be difficult to claim, however, that in every face-to-face contact or for the entire duration of a single interaction that distinction dissolves. The possibility for absorption, and coupling, is again mediated by familiarity: familiarity with the person with whom one is speaking, as well as familiarity with the topic of conversation. Again, take the example of the conversation. There are undoubtedly times when the separation between self and other becomes apparent: when you are unsure of what the other meant, or when you couldn't hear what was said. At these moments there is a break in unity similar to the way in which Heidegger suggests the "ready-to-hand loses its readiness-to-hand" in the context of tool use (Heidegger, 1962, p.104). The fact that this break is possible indicates that even in those moments when one is absorbed in the other there is a pre-reflective self-awareness that is always operative. When there is a breakdown in the "consummate reciprocity" this pre-reflective self-awareness provides a foundation from which reflection can occur and at the moment it does the schism between self and other becomes apparent.

It is here that we must consider the role of reflection. The boundaries of the self are in constant flux. The boundaries of the corporeal body are hardly fixed, and the boundaries of the lived body are even more dynamic. The self and world, experienced pre-reflectively, cannot be separated. Separation comes about only through reflection, through a change in perspective. While learning to use a complicated piece of equipment, we often need to reflect. With this reflection, comes the sense of a gulf between the object and oneself. However, as we gain familiarity with the equipment, that gulf begins to close and we no longer need to reflect in order to use the equipment—in the same way we do not need to reflect to use our hand.

This process is inherently dynamic. As Heidegger writes, in *Being and Time,* if the equipment breaks, the gulf re-opens until we can fix the problem and re-appropriate it. One might object that it is precisely this possibility that calls the notion of blending of self and world into question. There is always the possibility that the equipment might break and thus it can never be thought of as fully integrated into the body. The same objection could be applied toward organs within the body. Indeed patients do report something of a fragmentation of the body when an organ fails (Varela, 2001). We could consider this potential as grounds for claiming fragmentation, or rather a manifestation of the dual aspects of the bodily self-as-subject and -as-object. These phenomena instead make apparent the otherness that constitutes our identity, and the varying perspectives from which they can be viewed.

Fluidity and Context in Considerations of the Self

The Kantian notion of the self as a transcendental unity seems out of place in contemporary considerations of selfhood in which situation and context are fundamental to meaning. With the alternative perspective provided by embodied and embedded approaches to experience the interdependence of things that have long been conceived of as independent is difficult to ignore. Self and other, body and mind, society and individual—rather than continue to regard these things as separate, we must develop a framework to consider them as a dynamical unity, always interacting and influenceing each other in complex ways. A task of this nature is in danger of quickly becoming unmanageable, incomprehensible and chaotic. How can the notions of an individual self survive in the face of such interdependence? How

shall one respond to criticisms that developing such a framework would leave us without "the standard object of cognitive theorizing, viz., the stable persisting individual" (Rupert, in press; as cited in Wilson & Clark in press, p. 24)? Many Buddhist traditions suggest that it simply cannot, and that the reason that we suffer so much is because we grasp on to this notion of self where there is none. Rather than suggest that no self exists, I would like to suggest developing the ability to shift, and broaden, perspectives such that the dynamical unity of the mind-body-world system can be respected while not allowing the notion of an individual entity to melt into incomprehensibility.

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