# Chapter 1

# Introduction

In the *Monadology*, Wilhelm Gottfried Leibniz claimed that

> 7. Further, there is no way of explaining how a Monad can be altered or changed in its inner being by any other created thing, since there is no possibility of transposition within it, nor can we conceive of any internal movement which can be produced, directed, increased, or diminished there within the substance, such as can take place in the case of composites where a chance can occur among the parts. The Monads have no windows through which anything may come in or go out. The attributes are not liable to detach themselves and make an excursion outside the substance, as could *sensible species* of the Schoolmen. In the same way neither substance nor attribute can enter from without into a Monad. (Leibniz, 1979, pp. 251–2)

The Leibnizian idea is that monads, or minds, do not causally interact with things outside of themselves. They are, as we might say, closed causal systems. Instead, the apparent causal relations between one monad and the rest of creation are simply due to the infinite power of God to pre-establish a harmony among the internal workings of individual monads so that they *appear* to causally interact.

It is an understatement, however, to say that few philosophers or psychologists these days take seriously the idea that human or animal minds work as do Leibnizian monads.[1] The orthodox view in cognitive science

[1] Rockwell (2005), however, suggests that this claim is somehow surprising or controversial: "But – and here is the punchline – the causal nexus that is responsible for the experiences of a conscious being is *not* contained entirely within the brain of that being" (Rockwell, 2005, p. 58).

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maintains that minds do interact with their bodies and their environments. Cognitive processes within brains are not causally isolated from the rest of the world. Cognitive processing depends on the environment in ways too numerous to mention. The developing fetal brain can be poisoned by maternal alcohol consumption. Dense congenital cataracts can impair the development of normal visual processing, especially during a critical or sensitive period of child development. Years of practicing the violin can shape the amount of cortical material dedicated to representation of the fingers of the left hand. Humans and other animals causally interact with the world in order to perceive it by vision, olfaction, and audition. Cognitive processes are influenced by low oxygen concentrations at high altitudes and high nitrogen concentrations at great underwater depths. Cognitive processes are also influenced by any number of psychoactive drugs from alcohol to nicotine to $\Delta^9$-tetrahydrocannabinol. Cognitive processes clearly depend on the body and environment. In short, contemporary cognitive psychology is anti-Leibnizian: cognitive processes do causally depend on bodily and environmental processes.

Under the influence of the phenomenological tradition in philosophy, dynamical systems theory, and mobile robotics, the extended cognition movement has sought to move beyond mere anti-Leibnizianism. The extended cognition movement maintains that cognitive processes depend on bodily and environmental processes, but not merely causally. It is not just that bodily and environmental processes causally influence cognitive processes; they literally constitute or realize cognitive processes. Cognitive processes do not occur exclusively within brains; they span brains, bodies, and environments. Cognitive processes extend from brains into their surrounding bodies and physical environs. A handful of examples will illustrate the kinds of cases used to challenge orthodoxy.

A common method for finding the product of 347 and 957 is to write the problem down on a piece of paper, aligning the "3" in the hundreds place of the first numeral with the "9" in the hundreds place in the second numeral, aligning the "4" in the tens place of the first numeral with the "5" in the tens place of the second numeral, and so on.[2] This facilitates the application of the partial products algorithm in several ways. Since the numbers are written one above the other, one can rely on vision to keep

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[2] This kind of example appears in Clark and Chalmers (1998, p. 8) and Gibbs (2001, pp. 117–18).

the ones, tens, and hundreds places coordinated. One does not have to devote special attention or burden memory in order to accomplish this coordination. In addition, since one can write down a number that has to be carried above the column to which it will be carried, this removes the burden of remembering the number to be carried. Further, by recording one's work on paper at each step, one is spared the task of remembering where one is in the calculation and the results of past bits of computation. It is because the use of pencil and paper generally provides a faster and more reliable method of computing the products of large numbers that one so frequently turns to it.

Surely the best known example in the extended cognition literature is the Inga–Otto thought experiment, developed by Clark and Chalmers (1998). In this story, Inga is a normal human subject who hears from a friend that there is an interesting exhibit at the Museum of Modern Art and decides to go see it. She thinks for a moment before recalling that MOMA is on 53rd Street, and then sets off for 53rd Street. In contrast to Inga, Otto suffers from Alzheimer's disease and has numerous memory lapses. To help him compensate, he must rely upon cues in his environment. In order to handle addresses, Otto relies on a notebook in which he writes this kind of information. Thus, when he hears his friends talking about the interesting exhibit at the Museum of Modern Art, he reaches for his notebook to look up the address. Finding that the museum is on 53rd Street, he sets off.

Other examples involve the role of the body and movement in cognitive life.[3] During the course of normal human activity, the head and eyes typically move through space. This happens any time a person walks, drives a car, or turns her head. During these activities, the light entering the eye carries information about the relative distances of objects. The light projected from more distant objects changes differently than does the light projected from less distant objects. In a simple case, there is what occurs when one fixates on objects on the distant horizon. Here, nearer objects appear to be displaced farther in the direction opposite to the motion than do more distant objects. Humans are extraordinarily good at using this motion parallax as a guide to the relative distances of objects. As vision scientists often put it, motion parallax is a powerful monocular cue for relative depth.

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[3] These are the kinds of examples that appear in Noë (2004), Rowlands (1999), and Hurley (1998, forthcoming).

One hypothesis concerning these cases is that they are all instances in which human cognitive processes in the brain take advantage of non-cognitive tools found in the body and environment. On this orthodox construal of tool use, humans have a more or less stable set of cognitive capacities for learning, remembering, perceiving, and attending. Learning and training make for greater or lesser degrees of stability. Learning and training can yield dramatic changes in the cognitive processes involved in such abilities as playing a violin, tasting fine wine, and speaking natural languages. In many situations, however, humans do not seek to modify their cognitive apparatus. Instead, they live with the cognitive mechanisms they have and complement them with tools that enable them to compensate for their cognitive shortcomings. It is because of limitations on human short-term memory that humans use pencil and paper for computing the products of large numbers. Because the information about whether or not to carry a one is on the paper, it need not be kept in memory. Because of the alignment of the columns of numerals on the page, one need pay less attention to being sure that tens are added to tens and hundreds are added to hundreds. In the Inga–Otto case, the reason Otto uses the notebook to store information is obviously that his long-term memory is failing him. He lacks the normal memory resources that Inga possesses. The notebook enables him to compensate for this lack. Otto's use of the notebook is not exactly like Inga's use of normal long-term memory. The notebook is a tool that he uses, in conjunction with his spared cognitive capacities of seeing, reading, and writing, in order to achieve some tolerable level of functionality. The different ways in which bodily motions influence the play of light from objects near and far is a potentially useful tool for determining relative distance. Humans use this tool, among many others, because they cannot directly perceive the relative distance of objects.[4]

Recent work advancing the hypothesis of extended cognition offers radically new and different analyses of these cases. Advocates of extended cognition complain that orthodox cognitive science is in the grip of a picture of the locus of cognition. Orthodoxy maintains, without justification, so the story goes, that cognitive processing occurs within the brain. Advocates of extended cognition take the foregoing cases to show, or make

[4] Gibson (1979) maintained that humans can directly perceive the things that their environments provided for them. Humans can directly perceive affordances. Not to beg the question against Gibson, who has inspired many in the extended cognition camp, we might assume that the relative distance of objects in the environment is not an affordance.

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plausible, the view that cognitive processing literally extends from the brain into the bodily and environmental tools that humans exploit. The manipulation of pencil and paper in the computation of large products becomes a literal part of one's cognitive processing. The notes in the notebook that Otto keeps with him constantly constitute part of Otto's memory and the physical basis of part of his stock of beliefs. The use many animals make of bodily motions to induce motion parallax constitute part of their perceptual processing. In short, according to the hypothesis of extended cognition, the tools many organisms use (often) become part of their cognitive processors. This view is so radical that one might well be skeptical that anyone really means to assert such a thing. Yet there are many clear and simple assertions of it:

> Cognitive processes span the brain, the body, and the environment. (van Gelder and Port, 1995b, p. ix)
>
> Cognitive processes are not located exclusively inside the skin of cognizing organisms. (Rowlands, 1999, p. 22)
>
> What I am claiming is that not only thoughts, *but also feelings and sensations*, must be seen as supervening on the entire brain–body–world nexus. (Rockwell, 2005, p. 71)
>
> Cognitive processes are partly constituted by physical and bodily movements and manipulations of objects in real-world environments. (Gibbs, 2006, p. 12)[5]

Not satisfied with noting the causal dependencies between cognition and bodily and worldly processes – not satisfied with simply rejecting Leibnizian monadology – the advocates of extended cognition champion a constitutive dependency.

What motivates this bold new hypothesis? In our reading of the literature, we have come across essentially five distinct types of arguments for the hypothesis of extended cognition. The most pervasive type focuses attention on the way in which structures outside of the brain causally interact with parts of the body and external world. We group these arguments under a broad category of "coupling arguments." They invoke one or another type of causal connection or coupling relation between the brain and the body/external world in order to make the case that the non-brain

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[5] See also Rowlands (2003, ch. 9) and Wilson (2004, p. 195).

components should be understood as realizing cognitive processes. According to Mark Rowlands,

> cognitive processes are not located exclusively inside the skin of cognizing organisms because such processes are, in part, made up of physical or bodily *manipulation* of structures in the environments of such organisms. (Rowlands, 1999, p. 23)

The psychologist Raymond Gibbs, discussing intentions rather than cognitive processing *per se*, reasons in essentially the same way:

> The windsurfer continually affects and is affected by the set of the rig, so the behavioral intention to successfully windsurf emerges as a result of the interaction between the person and environment. Focusing on the agent alone, or on how the agent responds to the environment, fails to capture the complex nuances of windsurfing behavior. Just as it is important to understand the significance of paper and pencil when one does long division, where the cognition of doing long division is in part "offloaded" into the environment, the intentionality in windsurfing is best understood as a distributed cognitive behavior involving a person, a device, and the environment. (Gibbs, 2001, pp. 117–18)

These examples are among the more succinct presentations of this argument.[6]

Another type of argument might be thought of as a version of a coupling argument. These arguments begin by drawing attention to causal connections between the brain and parts of the body or environment, but then, rather than concluding that cognition extends into these parts of the body or environment, they conclude that the brain and the body, and perhaps the environment, constitute a cognitive system. They conclude that there is an extended cognitive system. From this conclusion, there is a tacit shift to the conclusion that cognitive processing extends from the brain into the body and the environment. Part of Haugeland's articulation of embodied and embedded cognition involves this two-step argumentation.[7] Clark and Chalmers may also have some version of this in mind.

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[6] Cf., in addition, Clark (2001, p. 132), Clark (2002, pp. 23–4), Wilson (2004, p. 194), Noë (2004, pp. 220 and 221), Rockwell (2005, p. 46), and Menary (2006, p. 331).

[7] Haugeland (1998, pp. 208–9).

After describing some examples where they believe there is extended cognition, they write

> In these 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. All the components in the system play an active causal role, and they jointly govern behavior in the same sort of way that cognition usually does. If we remove the external component the system's behavioral competence will drop, just as it would if we removed part of its brain. Our thesis is that this sort of coupled process counts equally well as a cognitive process, whether or not it is wholly in the head. (Clark and Chalmers, 1998, pp. 8–9)

Notice that Clark and Chalmers move from a claim about a brain and an external object constituting a cognitive system – the cognitive system hypothesis – to the claim that cognitive processing is not wholly in the head – the extended cognition hypothesis. That is, the argument has the implicit two-step structure we mentioned above: first infer from the existence of certain causal interactions that there is a cognitive system involving brain, body, and environment; and then infer from the cognitive system hypothesis that there is extended cognition.

A third pattern of argument supposes that there are cases in which processes that span the brain and body, or brain, body, and environment, are in all relevant respects just like cognitive processes that occur within the brain. Add to this the tacit premise that if there is this equivalence, then the processing spanning the brain and body, or brain, body, and environment, is cognitive processing. This yields a simple *modus ponens* argument for extended cognition.[8]

The fourth type of argument sits uneasily with the third. These are "complementarity arguments." The cognitive equivalence arguments rely on putative equivalences between cognitive processes thought to occur in the brain and processes occurring in the brain, body, and environment. This is the kind of thinking one finds underlying the claim that Inga is, in all important and relevant respects, exactly like Otto. By contrast, the complementarity arguments rely on the fact that, because brain processes

[8] One way of reading the so-called "parity principle" from Clark and Chalmers (1998) invokes this kind of reasoning. Hurley (forthcoming) also invokes this kind of reasoning about acallosal subjects to suggest that they may be cases of extended cognition.

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are of one character and bodily and environmental processes are of another, brain processes and bodily and environmental processes work well together. The combination of intracranial and extracranial processes achieves results that are in some sense superior to those achieved by just the brain alone. It is the fact that the brain alone figures out large products relatively slowly and with relatively low reliability, where the brain – in conjunction with sensory and motor skills and pencil and paper – more quickly and more reliably computes large products, that argues for the view that cognition extends into the arms, hands, pencil, and paper. What makes for a tension between these two lines of thought is – to put matters crudely – that, in the first line, one is making the case that Otto and Inga are cognitively the same, but in the second that Otto and Inga are not cognitively the same.

The fifth, and most distinctive, of all the arguments contends that the theory of evolution by natural selection supports the view that cognition extends into the environment. The major premise of the argument is that, if some cognitive feature is adapted to work in conjunction with some feature of the environment, then that feature of the environment is really part of the cognitive apparatus of the mind. This is an argument developed in considerable detail in Rowlands (1999) and briefly reviewed in Rowlands (2003).

Given that there is so much to be said in favor of the hypothesis of extended cognition, one might wonder what could possibly sustain the old-fashioned hypothesis of brain-bound cognition. The advocates of extended cognition have a short answer: mere prejudice. Haugeland begins his discussion of embodied and embedded cognition by paying homage to René Descartes's enduring influence on contemporary cognitive science orthodoxy.[9] Descartes, of course, did not maintain that the mind is causally isolated from the material world. He was a two-way interactionist, famously believing that mind and body interacted by way of the pineal gland. What Descartes did maintain was that reason is constituted by a distinct thinking substance that survives bodily death. One way to be anti-Cartesian would, thus, be to endorse some form of physicalism and maintain that reason, or the mind, or cognition, is realized or constituted by the brain. Something like this is cognitive psychological orthodoxy. Haugeland, however, champions a more radical course. He proposes that the mind is constituted not just by the brain, but by the brain, body, and environment. The mind

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[9] Haugeland (1998, pp. 207–9).

is embodied in flesh and blood and the larger causal nexus of the world. Rowlands (1999, 2003) and Rockwell (2005), in their own ways, also conjecture that the current demarcation of the boundaries of cognition is a remnant of a largely discredited Cartesian view of cognition.[10] The charge appears again in a plainer form in Clark and Chalmers (1998), Clark (2003), and Clark (2005). There, the idea is simply that the hypothesis that cognition is brain-based is merely an unjustified prejudice. Rockwell (2005), for his part, provides a somewhat different diagnosis of the prejudice: "But I also maintain that to say a mind must be embodied only by the brain of an organism is a hangover from a justly discredited epistemology that builds its foundation on atomism and sense-datum theory" (Rockwell, 2005, p. 49).

Despite the growing popularity of the hypothesis of extended cognition, we remain defenders of orthodoxy. We argue that there are principled reasons for believing that the kind of cognitive processing cognitive psychologists care about is, essentially without real-world exception, intracranial. Two principal hypotheses about the nature of cognitive processes support this. In the first place, we maintain that cognitive processes involve non-derived mental representations; that is, cognitive processes involve representations that mean what they do in virtue of naturalistic conditions that do not include the content-bearing states, properties, or processes of other entities. Because these representations are typically found inside, but not outside, the brain, cognitive psychologists have one principled reason to think that cognition is typically intracranial. Second, cognitive psychologists attempt to distinguish the cognitive in terms of its underlying mechanisms. Cognitive processes are those that take place in virtue of certain mechanisms. Although these mechanisms could (conceptually, metaphysically, and physically) occur outside of the brain, they typically do not. In general, these mechanisms are often poorly understood, but they have features that are familiar to any serious student of cognitive psychology. For example, there is Miller's (1956) discovery that short-term memory has some sort of "size capacity." Consider a task such as listening to a string of distinct letters of the alphabet presented one per second, and then repeating the sequence. Normal human subjects are generally quite capable of performing this task for strings of five, six, and seven letters. But for eight-, nine-, and ten-letter strings, recall falls off dramatically. The standard hypothesis is that short-term memory has a fixed capacity of seven,

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[10] Rowlands (1999, pp. 1–7), Rowlands (2003, p. 7), Rockwell (2005, pp. xi–xxii).

give or take two, items. Seven items fit comfortably in memory, where more tend to "fall out" and be forgotten. We do not mean to propose that in order to be short-term memory, something must respect Miller's rule. Rather, we propose that findings such as this should guide us in determining what memory is like and what really differentiates cognitive processes and mechanisms from non-cognitive processes and mechanisms. Our empirical hypothesis, the one we think is embraced by the majority of cognitive psychologists, is that there are many, many mechanisms that underlie these sorts of phenomena, and that they are found in human brains, but not in the bodily or extracorporeal environment. Although one might build a mechanical or electronic device that has the capacities of a normal human brain, those found in the mundane use of pencil and paper to compute large products and to keep track of addresses are not like this. These sorts of observations, and they are truly legion, provide a second principled basis for thinking that cognitive processing is typically intracranial.[11] So, the way we see it, there are two principal features of intracranial processes – their use of non-derived representations governed by idiosyncratic kinds of processes – that serve to distinguish cognitive from non-cognitive processes. These features constitute a "mark of the cognitive" and they provide some non-question-begging reason to think that cognition is intracranial.

As for the case supporting extended cognition – namely, the five kinds of arguments briefly introduced above – we believe that they are based on insufficient attention to three plausible distinctions. First and foremost, not enough attention is paid to the difference between the claim that a process is causally connected to some cognitive process *Y* and the claim that the process constitutes part of some cognitive process *Y*. Time and again in the literature, one finds a more or less detailed narrative of some sequence of events or some putative psychological phenomenon that emphasizes one or another type of causal interaction between the brain, the body, and the environment. There then follows a quick move from the observation of these causal connections to the constitution claim of extended cognition. The circulatory system causally supports cognition. Many humans (especially yogi) can causally affect their heart rate by thought alone. So there is two-way causal coupling between cognitive

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[11] Both of these considerations in favor of brain-bound cognition were broached in Adams and Aizawa (2001). The concern for the nature of cognitive processing also appears in Wilson (2002) and Rupert (2004).

processes and circulatory processes, but it is false that cognition extends into the circulatory system. Thought is not circulation. We dub this fallacious general pattern of reasoning "the coupling-constitution fallacy." Second, there is inattention to the difference between the claim that *Y* constitutes part of a cognitive system and the claim that *Y* constitutes part of a cognitive process. This is the distinction between the extended cognitive system hypothesis that asserts that Otto and his notebook form an extended cognitive system and the extended cognition hypothesis that asserts that cognitive processing extends from Otto's brain into his notebook. Where one should certainly allow for stylistic variations in the expression of philosophical ideas, it turns out that the extended cognitive system hypothesis is much weaker than the extended cognition hypothesis. Third, there is insufficient attention to the development of a plausible theory of the cognitive or a plausible approach to a theory of the cognitive. If one is to maintain that cognition extends beyond the boundaries of the brain, one needs a theory of the difference between the cognitive and the non-cognitive. One at least needs a plausible sketch of how to find such a difference. Nevertheless, the few accounts of the mark of the cognitive one finds in the extended cognition literature are clearly inadequate. In fact, these few accounts employ a transparent strategy in trying to support the hypothesis of extended cognition. They invoke a promiscuous standard for the cognitive or a promiscuous method for finding what is cognitive. So, if one wants to find cognition in new and unexpected places, such as the body and the physical and chemical environment, it turns out to be convenient to have easily satisfied conditions in a theory of the cognitive. The theory that any sort of information processing constitutes cognitive processing is just such a theory. If just any sort of information processing is cognitive processing, then it is not hard to find cognitive processing in notebooks, computers, and other tools. The problem is that this theory of the cognitive is wildly implausible and evidently not what cognitive psychologists intend. A wristwatch is an information processor, but not a cognitive agent. While it is plausible that information processing is necessary for cognition, it is outlandish to suppose that such a notion of the cognitive is sufficient to describe the kinds of processing that cognitive psychologists typically care about. What the advocates of extended cognition need, but, we argue, do not have, is a plausible theory of the difference between the cognitive and the non-cognitive that does justice to the subject matter of cognitive psychology. Further, they lack even a plausible strategy for finding an adequate theory. This, of course, brings us back to our

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observation that what provides the principled basis for saying that the cognitive is intracranial is what we take to be a plausible theory of the cognitive embodied in orthodox cognitive psychology.

We think that recognition of these three principal weaknesses in the extended cognition literature will illuminate much of what is problematic there, and we hope that it will go a long way to dispelling any rational appeal that the hypothesis of extended cognition might enjoy. In the most optimistic case, it will direct attention to some of the more subtle and useful ideas that appear elsewhere in the extended and embodied cognition literature. However, these three recurring problems do not exhaust the difficulties with the case for extended cognition. There are also problems with the more idiosyncratic arguments for extended cognition, namely, those based on the complementarity of intracranial and transcranial processes and the use of evolutionary theory. Regarding the complementarity arguments, we have to wonder why the combination of cognitive processes in the brain with apparently non-cognitive processes found in tools should lead us to conclude that they make up a process that is wholly cognitive. Regarding the evolutionary argument, we must wonder why the theory of evolution, a theory of biology, should be expected to tell us anything about where in the world cognitive processes are found. Shouldn't a theory of cognition be invoked in the service of determining this?

Those familiar with our paper "The bounds of cognition" will recognize much of what we have just set out. This book is an elaboration and clarification of many of the views first broached there. It takes into account comments and criticism we have received since its publication. In addition, however, it extends this earlier work by covering some of the more recent developments in the literature. Our hope is that a more careful articulation and defense of some of our assumptions will bolster the case we have already made against extended cognition. Further, we hope that our attempts to address the more recent arguments for extended cognition can be developed in compelling detail on our first run through them in this book. At the very least, we hope our account will articulate what critics of the hypothesis of extended cognition would like to see better supported.

Our plan for redirecting the extended cognition agenda will begin in earnest in Chapter 2, where we will further clarify the issues. In Chapters 3 and 4, we develop and defend in more detail our positive approach to the mark of the cognitive, namely, that cognitive processes differ from

non-cognitive processes in terms of the kinds of mechanisms that operate on non-derived representations. We offer this as part of a theory of the cognitive, rather than as (part of) a definition of the term "cognitive." We do not mean to stipulate that this is just what we mean by "cognition."[12] Nor do we mean to be offering an account of what "folk psychology" or common sense maintains about what cognition is. One consequence of offering a partial theory of the cognitive, rather than any of these other things, is that we can refine it only as far as (we take) the current evidence in cognitive psychology to warrant. Chapter 3 will explain what we intend by non-derived content in contrast to derived content and explain what commitments we think we have in virtue of it. It will also defend the hypothesis of non-derived content against objections. Chapter 4 will describe in more detail what we mean when we claim that cognitive processing is to be identified in terms of underlying mechanisms and principles.[13] We will use some textbook examples from the theory of memory, attention, and visual processing to substantiate our claim that cognitive psychology proceeds in this manner. We will also describe cases from other sciences indicating how they too use a scientific methodology in which kinds are individuated in terms of their causal principles. Together, Chapters 3 and 4 will describe a generic form of what we take to be the orthodox view of the cognitive in cognitive psychology. This is not to say that the view is universally accepted. Nor do we mean to imply that it is the only kind of theory that can provide a principled reason to think that cognitive processing is typically intracranial. Instead, we take it to provide one modest, empirically motivated means for rebutting the charge that nothing more than mere prejudice favors the view that cognition is by and large intracranial.

Chapters 5 through 9 constitute our critique of the arguments for extended cognition. Chapter 5 examines some of the extended cognition attempts to say what cognition is or how we might discover what it is. What we find is that these attempts fail to do justice to the subject matter of cognitive psychology. In fact, were these conditions taken seriously by advocates of extended cognition, the argumentation given in the literature would be much different. Given just the implausible theories of what

[12] This comment is meant to distance us from the view described by Menary (2006, p. 334).

[13] We think that Rupert (2004) does a fine job of presenting this kind of argument for memory.

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cognition is, one would have no need to exotic coupling-constitution arguments, complementarity argument, evolutionary arguments, and so forth. Chapters 6 and 7 review the sundry forms of the coupling-constitution fallacy. These include the rather simple examples, such as the ones by Rowlands and Gibbs presented above, and more complicated "systems" versions given by van Gelder, Haugeland, and Clark. These chapters will also review some attempts that have been made to dismiss, sidestep, or rebut the fallacy. Chapter 8 will return to the observation that there is a cognitive parity or equivalence between transcranial processes and familiar intracranial cognitive processes. Relying on the examples of cognitive processes developed in Chapter 4, we will indicate how a cognitive individuation of processes recognizes dramatic differences between the intracranial and the transcranial. In other words, we will directly challenge the empirical claims about cognitive equivalence. Chapter 8 will also review the complementarity arguments. In an attempt to turn the evident cognitive differences between intracranial and extracranial processes to their advantage, some advocates of extended cognition try to use this as evidence in support of extended cognition. Additionally, Chapter 8 will critique Rowland's evolutionary argument for extended cognition (cf., Rowlands, 1999, ch. 4; 2003, ch. 9). Chapter 9 will examine one specific theory of extended cognition, Alva Noë's (2004) theory of enactive perception. The arguments Noë gives are naturally construed as a species of inference to the best explanation, a kind of argumentation unlike much of what is found in the extended cognition literature. Here we will argue that, Noë's suggestions notwithstanding, the orthodox view of the locus of cognition provides a better explanation of the available data than does his theory of enactive perception.

By this point, one may have noticed that the primary targets for our criticism will be philosophers. This is not to imply that the extended cognition movement is only embraced and advanced by philosophers. There are obviously clear statements of the hypothesis of extended cognition in the work of developmental psychologists, roboticists, dynamical systems theorists, and cognitive psychologists. And, of course, many philosophers draw some measure of their intellectual inspiration for the hypothesis of extended cognition from the work of scientists. We will note examples of this from time to time in the course of the book. Nevertheless, we find that it is the philosophers who have most consistently, explicitly, and elaborately defended the radical extended cognition hypothesis according to which cognitive processes span the brain, body, and

environment.[14] So, while we believe that asking where in the world cognitive processes are to be found is an empirical question ultimately to be settled by scientific investigation, we also believe that at this point in time, while the extended cognition movement is still in its early stages of development, there are some basic conceptual or theoretical issues that can be profitably dealt with by philosophers.

Chapter 10 will briefly review our overall position and indicate topics that we think merit further exploration, directions in which much of the extended cognition energies might be better directed. Part of this discussion will review some of the more interesting and plausible features of the extended cognition literature that have perhaps been eclipsed by the hypothesis of extended cognition.

[14] For a discussion of some of the scientific literature in the extended cognition movement, see Adams and Aizawa (forthcoming c).