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The Cambridge Handbook of Situated Cognition

Edited by

PHILIP ROBBINS

University of Missouri–Columbia

MURAT AYDEDE

University of British Columbia

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CHAPTER 5

Why the Mind Is Still in the Head

Fred Adams and Kenneth Aizawa

Philosophical interest in situated cognition has been focused most intensely on the claim that human cognitive processes extend from the brain into the tools humans use. As we see it, this radical hypothesis is sustained by two kinds of mistakes, the confusion of coupling relations with constitutive relations and an inattention to the mark of the cognitive. Here we wish to draw attention to these mistakes and show just how pervasive they are. That is, for all that the radical philosophers have said, the mind is still in the head.[1]

1. The Issue

In Adams and Aizawa (2001), we defended a commonsense and scientifically standard view of the locus of cognition we called "contingent intracranialism." According to this view, as a matter of contingent empirical fact, human tool use is typically a matter of intracranially localized cognitive processes interacting with extracranial biological, chemical, and physical processes. Current human use of pencils and paper, computers, watches, telescopes, and hearing aids are all properly understood as cases in which cognitive processes interact with noncognitive processes. Although the tools we are familiar with are like this, not all tools are necessarily like this. Perhaps one day it will be possible to replace the rods and cones in the human retina with synthetic rods and cones. These synthetic cells – these microtools – might have the same size and shape as naturally occurring human rods and cones. They might have the same neurotransmitter-handling properties. They might have the same response properties to light. On the supposition that perceptual processes are cognitive and that they begin at the retina, it would turn out that in the future just described, there might well be individuals whose cognitive processes extend beyond their organismal boundaries, giving them transorganismal cognition.[2] Be the future what it may, our view is that these possible cases of tool use are unlike at least the vast majority of our contemporary cases of tool use.

In the face of both common sense and much contemporary science, an increasing

number of philosophers and psychologists have found themselves attracted to contingent transcranialism.[3] This is the view that, in ordinary tool use, we have instances in which cognitive processes span the cranial boundary and extend into extracranial space. As Dennett (2000) puts it, "*minds are composed of tools for thinking* that we not only obtain from the wider (social) world, but largely leave in the world, instead of cluttering up our brains with them" (p. 21, italics in original). This is the view that when a student takes notes in class, the student literally commits information to memory. When someone uses pencil and paper to compute large sums, cognitive processes extend to the pencil and paper themselves. In these cases, the processes involving the pencil and paper constitute cognitive processes. Not all transcranialists make as sweeping a proposal as does Dennett. Some transcranialists think that only certain types of tool use bring about the extension of the cognitive into the extracranial world. Some transcranialists think that only special brain-tool couplings will let the cognitive enter the artifactual.[4] Be these refinements as they may, all transcranialists we know of have enthusiastically embraced what they recognize to be a radical departure from orthodoxy.

So described, intracranialists and transcranialists are concerned with the manner in which processes are subdivided. When a person uses pencil and paper to compute a sum, the intracranialist maintains that there is a natural kind of process (recognizably cognitive) that happens to occur within the brain, where the transcranialist maintains that there is a natural kind of process (recognizably cognitive) that extends from the brain to the pencil and paper. The radical transcranialist thesis that concerns us here must be distinguished from many less radical but related theses with which it might be confused. One thesis is that it is possible for cognitive processes to extend beyond the boundaries of the brain. Susan Hurley (1998), for example, and Andy Clark (2005, in press) are quite interested in this possibility.[5] We are not, because we think it is part of the standard functionalist view of cognition that a properly organized configuration of processes can simultaneously cross the boundaries of the brain and constitute cognition. Another thesis is Ron McClamrock's (1995) claim that "the information available to us in deciding what to do . . . is not so clearly circumscribed at the boundary of the physical organism" (p. 89). Although McClamrock appears to think this is controversial, it seems to us quite clear that information beyond the boundary of our bodies makes a difference to our decisions. Written material often contains useful information. That is why reading it is so often helpful in decision making. Another tangential issue is Clark and Chalmers's (1998) claim that

> *if, as we confront some task, a part of the world functions as a process which,* were it done in the head, *we would have no hesitation in recognizing as part of a cognitive process, then that part of the world* is *(so we claim) part of the cognitive process. (p. 8)*

We agree with this, because it seems to us to say nothing other than that the difference between being in the head and being outside of the head does not constitute a mark of the cognitive. Yet another tangential issue is the thesis that cognitive psychology should attend to the interactions between organisms and their environments, or between minds and their environments.[6] Insofar as this thesis requires only that one attend to the interactions of cognitive processes with noncognitive environmental processes, the intracranialist can accept it.[7] Finally, we are not concerned with whether the concept of cognition requires that cognition only be found in the brain.[8] We do not think it does, but we also do not think that this is all that interesting a question. It is no more interesting than whether our concept of water requires that it be found only on earth or whether our concept of a penguin requires that it be found only in the Antarctic. The transcranialist thesis we care about maintains that organism-environment interactions are to be understood as entirely cognitive processes rather than merely partially cognitive and partially noncognitive

processes. Another way to put the matter is to say that the current issue is whether tool use is typically a matter of cognitive processes interacting with portions of the noncognitive environment (the contingent intracranialist view) or is typically a matter of cognitive processing throughout (the transcranialist view).

In this debate, a recurring worry for transcranialists is, or at least should be, that the reconceptualization they urge will degenerate into a mere terminological dispute over how to use the word *cognitive* and related descriptors.[9] It is not enough for transcranialists to argue that something extends beyond brain boundaries.[10] It is not enough that there be some scientific taxonomy that groups the intracranial and the transcranial under one set of kinds or processes. Physics, biology, and chemistry might well do that. The transcranialists need to maintain that cognition extends beyond the brain. So, they cannot simply propose to use *cognitive* and its kin to describe any old scientific kind. There must be some appropriate theoretical affinity between what they call "cognitive" and what has traditionally gone under the name *cognitive*. Clark and Chalmers (1998) try to address this problem by saying that

> *in seeing cognition as extended one is not merely making a terminological decision; it makes a significant difference to the methodology of scientific investigation. In effect, explanatory methods that might once have been thought appropriate only for the analysis of inner processes are now being adapted for the study of the outer, and there is promise that our understanding of cognition will become richer for it. (p. 10)*

This seems to us inadequate for two reasons. The first stems from the distinction made in the previous paragraph. Intracranialists can perfectly well accept the idea that brain-tool interactions and brain-world interactions are worthy of scientific investigation. The study of human factors – the way in which humans interact with products, tools, and procedures – is fine by the intracranialist. Vision science is also a perfectly legitimate area of scientific research. What is at issue are the bounds of cognition. What regions of space-time contain cognitive processing? Clark and Chalmers's account is inadequate on another score. Grant, for the moment, their unsubstantiated claim that intracranialism and transcranialism lead to different scientific methodologies. This seems to us an insufficient basis to block the charge of this debate being a terminological dispute. Make up some terminological shift. Consider using *cognitive* to mean avian. Surely such a terminological shift will have dramatic methodological implications for the new cognitive science. So, as we said, there is reason to be dissatisfied with the solution that Clark and Chalmers propose.

It is not clear that the charge of terminological quibbling can be entirely avoided in favor of what all parties are interested in, namely, an understanding of brain-world interactions. Yet, here is our attempt. We maintain that there is something distinctive about the brain. There are natural kinds of processes that happen to occur only within the brain. These processes differ from neurophysiological processes insofar as they consist of (in general, poorly understood) causal operations on nonderived representations (representations whose content does not depend on other previously existing content). These processes also differ, we suppose, from typical processes that extend into the world from brains and from processes found in typical machines. In other words, we hypothesize that there are within the brain natural laws that are not identical to physical, chemical, biological, or neurophysiological covering laws spanning the cranium.[11] We are not offering a stipulative definition of the cognitive but some hypotheses about the nature of cognition. In taking this line, we suppose that it is recognition of the distinct type of information-processing capacities of the brain, rather than mere prejudice, that has inclined orthodox cognitive science to the view that cognitive processing is, in all actual cases, an intracranial affair.[12]

Reviewing the literature on this issue, one finds that there are two principal

mistakes that sustain transcranialism. First, transcranialists are insensitive to the difference between cognitive processes being causally connected to environmental processes and cognitive processes being, in part, constituted by environmental processes. Second, transcranialists are insufficiently sensitive to the problem of distinguishing the cognitive from the noncognitive. In this chapter, we wish to show how these two mistakes run through much of the philosophical literature defending transcranialism.

2. The Coupling Arguments

Coupling arguments are far and away the primary sort of argument given in support of transcranialism. What is common to these arguments is a tacit move from the observation that process X is in some way causally connected (coupled) to a cognitive process Y to the conclusion that X is part of the cognitive process Y. The pattern of reasoning here involves moving from the observation that process X is in some way causally connected (coupled) to a process Y of type ϕ to the conclusion that X is part of a process of type ϕ. In attributing this pattern of reasoning to advocates of transcranialism, we do not mean that they consciously and deliberately draw a distinction between the coupling claim and the constitution claim, and then explicitly assert that coupling is sufficient for constitution. Far from it. What typically happens is that writers just casually slip between one and the other. When presented with this analysis, defenders of transcranialism typically deny that they reason in this way. What we are offering is a reconstruction of what appears to be going on in many cases. To make this analysis stick, while being as sympathetic as possible to transcranialists, we adopt the inelegant practice of quoting extensively from the transcranialists.

In our view, the coupling arguments are fallacious.[13] They commit what we call the "coupling-constitution fallacy." We can see that it is in fact a fallacy by considering some examples. Consider the bimetallic strip in an ordinary thermostat. The expansion and contraction of this strip is closely coupled to the ambient temperature of a room and the air-conditioning apparatus for that room. Nevertheless, this gives us no reason to say that the expansion and contraction of the strip extends beyond the limits of the strip and into the room or air conditioner. The Watt governor provides another example. The combustion of fuel in the governed engine is tightly coupled to the rotation of the weighted arms, yet the process of combustion does not extend beyond the bounds of the engine.[14] This is the generic form of a coupling argument, but we find a range of specific variations in the literature.

2.1. *The Simple Coupling Argument*

In what we call the "simple coupling argument," all that is invoked in arguing for an extended cognitive process is a causal connection or looping between the cognizing organism and its environment. The inference is most commonly made in the suggestion that in the use of pencil and paper to compute large sums one's cognitive processes include the pencil and paper. But other examples are invoked as well.

In chapter 8 of his book *Boundaries of the Mind*, Robert Wilson (2004) suggests that he plans to make a case for transcranialism (pp. 188–193). He then proceeds to describe a children's puzzle game, Rush Hour, wherein one moves wooden rectangles around in a wooden frame. Then following the presentation of the example, Wilson writes, "[when solving the puzzle] the mind extends itself beyond the purely internal capacities of the brain by engaging with, exploiting, and manipulating parts of its structured environment" (p. 195). In this context, it is plausible to read the inference from coupling to constitution into the following passage:

> *We solve the problem by continually looking back to the board and trying to figure out sequences of moves that will get us closer to our goal, all the time exploiting the structure of the environment through*

> *continual interaction with it. We look, we think, we move. But the thinking, the cognitive part of solving the problem, is not squirreled away inside us, wedged between the looking and the moving, but developed and made possible through these interactions with the board. (Wilson, 2004, p. 194)*

What one might expect that Wilson means in the foregoing passage is that, in this case, cognitive processing is not squirreled away in the brain but extends into the interactions with the board. Now, if this is what he means, although he does not literally say it, then he appears to be guilty of the coupling-constitution fallacy. Of course, Wilson might not really mean this. He might mean only that, in this case, cognitive processing is developed and made possible by interactions with the board. But then the contrast implied in the first part of the final sentence comes out infelicitous and Wilson turns out not to be providing an argument for transcranialism after all. Wilson perhaps has enough wiggle room to avoid the charge of committing the coupling-constitution fallacy, but recognizing the fallacy is important in the recognition that Wilson is providing no argument for transcranial cognition.

Alva Noë (2004) provides a nice illustration of the casual shift between causation and constitution. He begins by describing perceptual experiences as external in the sense that they depend on causal interactions between the animal and the environment.[15] He then frames a slightly different question that might be taken to bear more closely on the constitution issue; namely, What is the causal substrate of an experience? As an answer, he writes, "perhaps the only way – or the only biological way – to produce just the flavor sensations one enjoys when one sips wine is by rolling a liquid across one's tongue. In that case, the liquid, the tongue, and the rolling action would be part of the physical substrate for the experience's occurrence" (Noë, 2004, p. 220). This could be a claim about constitution. Discussing the use of pencil and paper in complex calculations, Noë makes a similar move: "Indeed, for a great many calculations that we can perform, the pencil and paper are necessary. If the pencil and paper are necessary for the calculation, why not view them as part of the necessary substrate for the calculating activity?" (Noë, 2004, p. 220). This, too, might or might not be a claim about constitution. Perhaps Noë is not in these passages guilty of committing the coupling-constitution fallacy, because he does not specifically draw the constitution conclusion. Avoiding the fallacy by discussing only the substrate of cognition, however, becomes more difficult when Noë describes, with apparent approval, an idea he attributes to Clark and Chalmers (1998):

> *According to active externalism, the environment can drive and so partially constitute cognitive processes. Where does the mind stop and the rest of the world begin? If active externalism is right, then the boundary cannot be drawn at the skull. The mind reaches – or at least* can *reach,* sometimes – *beyond the limits of the body out into the world. (Noë, 2004, p. 221)*

We think Noë's discussion here nicely illustrates our view that advocates of transcranialism are largely insensitive to the distinction between coupling and constitution and just casually slip between one and the other.[16]

Raymond Gibbs (2001) provides another case in point. He runs the simple coupling argument on intentions by appeal to what is involved in windsurfing:

> *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. 117–118)*

In this passage, Gibbs urges two separate claims. One is the methodological thesis that we should not study intentions without keeping an eye on the interaction between the organism and the environment. Gibbs evidently refers to this issue when he describes the putative consequences of focusing on the agent alone. As indicated previously, we think the charge that cognitive science does not attend to environmental interactions is overblown but in any case should not be confused with the issue we care about here, namely, the boundary of the cognitive. The other claim in the foregoing passage is the ontological issue of the bounds on cognition, how the processes involved in windsurfing might be divided into the cognitive and the noncognitive. Gibbs at least comes close to the ontological issue when he claims that the intentionality in windsurfing is best understood as a distributed cognitive behavior involving a person, a device, and the environment. Unfortunately, he gives no reason to think this is so. In describing the windsurfer case, Gibbs apparently assumes that, in virtue of a causal coupling, the windsurfer and his or her environment should be analyzed as a single cognitive/intentional whole.

Clark (2001) gives us another example that is strikingly similar to the ones we have just seen, a case of writing an academic paper[17]:

> *Confronted, at last, with the shiny finished product the good materialist may find herself congratulating her brain on its good work. But this is misleading. It is misleading not simply because (as usual) most of the ideas were not our own anyway, but because the structure, form and flow of the final product often depends heavily on the complex ways the brain cooperates with, and leans upon, various special features of the media and technologies with which it continually interacts. . . . The brain's role is crucial and special. But it is not the whole story. In fact, the true (fast and frugal!) power and beauty of the brain's role is that it acts as a mediating factor in a variety of complex and iterated processes which continually loop between brain, body and technological environment. And it is this larger system which solves the problem. . . . The intelligent process just is the spatially and temporally extended one which zig-zags between brain, body, and world. (Clark, 2001, p. 132; cf. Clark, 2002, pp. 23–24)*

Here the intracranialist can agree with everything up until that last sentence. Here we find a familiar pattern, a long description of the causal connections between the brain and environment followed by the move to the view that these causal loops constitute part of the cognitive process. This is the simple coupling-constitution fallacy.[18] We can note as well that it is common ground that the brain and the tools are jointly responsible for the product, the journal article.[19] This, however, does not require that both the brain and tools constitute a single cognitive process. It is the interaction of the spinning bowling ball with the surface of the alley that leads to all the pins falling. Still, the process of the ball's spinning does not extend into the surface of the alley or the pins. There is no extended bowling ball that meshes with the alley, nor do we see any particular intimacy between a bowling ball and the alley.[20] Moreover, the contingent intracranialist has no objection to saying that operation of the tools and the brain provide the basis for hypothesizing a single causal process. The problem is that this provides no reason to think that the tools and the brain constitute a single "cognitive" process.

2.2. *The System Version of the Coupling Argument*

In an early presentation of this version of the argument, we find Tim van Gelder (1995) claiming the following:

> *In this vision, the cognitive system is not just the encapsulated brain; rather, since the nervous system, body, and environment are all constantly changing and simultaneously influencing each other, the true cognitive system is a single unified system embracing all three. The cognitive system does not interact with the body and the external world by means of the occasional*

> *static symbolic inputs and outputs; rather, interaction between the inner and the outer is best thought of as a matter of coupling, such that both sets of processes continually influencing* [sic] *each other's direction of change. (p. 373)*

In this passage, van Gelder only claims that the brain, body, and environment constitute a cognitive system. Only later in the paper does he go further to claim that cognition extends outside the brain: "The Cartesian tradition is mistaken in supposing that mind is an inner entity of any kind, whether mind-stuff, brain states, or whatever. Ontologically, mind is much more a matter of what we *do* within environmental and social possibilities and bounds" (van Gelder, 1995, p. 380). Subsequently, Clark and Chalmers (1998) ran a version of the coupling argument inserting the idea that humans and their tools form a cognitive system.[21] They write:

> *In these cases [of external tool use], 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 components 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 & Chalmers, 1998, pp. 8–9)*

More recently, Clark (2003) developed the system version of the argument by claiming that humans are hybrid artifact-organism systems, or cyborgs.[22] Robert Wilson also runs a system version of the coupling argument with a different example:

> *Consider Kanzi, the human-raised bonobo that has been central to both the life and research of the primatologist Sue Savage-Rumbaugh. Kanzi has been thoroughly enculturated, and engages in sophisticated linguistic communication through a 256-symbol keyboard that he can carry with him. Given Kanzi's actual developmental environment, Kanzi plus a 256-symbol keyboard forms a cognitive system with memory and other cognitive capacities that far exceed those of just Kanzi. (Much the same holds true of Alex, Irene Pepperberg's African grey parrot.) My point here is not the trivial one that enriched environments can causally produce smarter critters; rather, it is that what metaphysically determines the smartness of at least some critters is their being part of wide cognitive systems. (Wilson, 2004, p. 195; cf. Wilson & Clark, this volume)*

In the system version of the coupling-constitution fallacy, the argument begins with the observation of important causal connections (couplings) among the brain and body and the environment, then infers that these causal connections warrant the conclusion that the brain, body, and environment form a cognitive system. From there, there is the tacit move to the conclusion that cognition extends from the brain into the body and environment. The system version of the coupling-constitution fallacy, thus, differs from the simple version because of the intermediate inference concerning a system.

We can grant for the sake of argument that the combination of a human being with pencil and paper constitutes a system, that a person with a laptop computer constitutes a system, that a person with a notebook constitutes a system, and so forth. We can also concede that humans and their tools constitute cognitive systems. Still, this does not establish transcranialism. It does not follow from the fact that one has an X system that every component of the system does X. Obviously there are systems that consist of many types of components and involve a multiplicity of process types. An air-conditioning system, for example, can involve a thermostat, a compressor, an evaporation coil, a fan, and so forth. Perhaps we can say that the process of the air cooling as it passes over the evaporation coils

is the process of conditioning the air, but surely the liquefaction of Freon and the electrical processes within the thermostat and the opening and closing of the circuit in the thermostat are not air-conditioning. Surely nothing forces us to lump all of these processes under a single descriptor, "air-conditioning." Another example is a personal computer, a computing system. Suppose, for the sake of argument, that we don't limit the notion of computing to what the central processing unit (CPU) does. Suppose that we understand computing broadly so as to cover many sorts of information processing. Thus, we might count the process of reading a floppy disk, reading a compact disc (CD), and turning the computer on as kinds of information processing, hence as kinds of computing. Even on this very broad understanding of computing, it is still not the case that every process in this computing system is a computing process. There is the production of heat by the CPU, the circulation of air caused by the fan, the transmission of electrons in the computer's cathode-ray tube, and the discharge of the computer's internal battery. Think of a sound system. Not every component produces sounds. The speakers do, but lasers in CD players, amplifiers, volume controls, and tone controls do not. Again, not every component of an X system does X. So, an appeal to the notion of a system does not help the transcranialist.

2.3. *Gibbs's Interpersonal Coupling Argument*

Gibbs (2001) claims that "intentions are, in many cases, emergent products of interactions between individuals, and between individuals and the environment, and that therefore they exist in a distributed manner across individuals" (p. 106). Clearly, Gibbs is a transcranialist about at least some intentions and, as we have seen, is prone to commit the simple coupling-constitution fallacy. In addition, however, he advances some more complicated versions of the fallacy. We will consider just one.

One of Gibbs's arguments is based on a dialogue he observed in a bar. The dialogue begins after John spills a beer:

> John: I wonder if there is a towel behind the bar.
> Nicole (goes over to the bar and grabs a towel): Here you go.
> John: Oh thanks! I wasn't actually asking you to get a towel for me. I just was thinking aloud about whether there might be a towel that I could get from the bartender. But thanks. (Gibbs, 2001, p. 109)

Gibbs begins his analysis of this dialogue by saying, "John intends his utterance with a particular meaning, but changes his mind and accepts Nicole's interpretation of what he said" (ibid.). We think that Gibbs's treatment of this case is flawed in many ways, so it will take a while to work through these problems before we can ultimately relate it to the other coupling arguments. So, first off, we think that Gibbs simply misunderstands John's comment. John is not changing his mind about anything. He is not adopting Nicole's interpretation of what he said; in fact, he is explicitly rejecting it. John says, "I wasn't actually asking you to get a towel for me," which is an explicit rejection of what he thinks Nicole thinks (or might think) he intends. When he says, "But thanks," he means that, even though he did not intend for Nicole to get him a towel, he is thankful that she did it anyway. It looks as though John's initial intention remains constant throughout the whole episode.

Not to rest our argument too much on what Gibbs might take to be our idiosyncratic understanding of the foregoing dialogue, we might try to develop an imaginary scenario in which John does change his initial intention. How would the scenario have to be different for John to have really changed his original intention? Let's say that at t_0 he had the intention merely to wonder out loud and so he proceeded to utter, "I wonder if there is a towel behind the bar." Nicole then goes and gets the towel and says, "Here you go." Now at t_1 let John

say, "Thanks. I'm glad you discerned what I intended." Now at least Nicole's actions have provoked a kind of conflict between the intention John had at t_0 and the intention he implies (at t_1) he had at t_0. This, however, is still not an instance of the actions at t_1 changing John's intentions at t_0. Indeed, the mechanics of this exchange are that of a comic scene with Inspector Clouseau. Clouseau clearly intends one thing, has something unexpected arise, but then tries to play off the surprise as what he intended all along. What reason is there to think that John changed the intention he had at t_0 rather than that he changed his interpretation of the intention he had at t_0? It could be that John suffers from a failure of memory or self-deception. It must surely be admitted that self-deception or failures of memory can lead to distorted interpretations or assessments of the intentions one had in the past. So, why not in these types of cases? Gibbs provides no reason to prefer the view that John changed his intentions at t_0 to the view that John merely changed his assessment of his intentions at t_0. Worse, Gibbs appears to be insensitive to this distinction. Nowhere is this more evident than when he writes: "The fact that John altered *what he believed to be* his original intention shows that Nicole's interpretation of his intention actually shaped John's *own conception* of what that intention may be" (Gibbs, 2001, p. 110, emphasis added). What Gibbs says here can be conceded by the intracranialist. What Gibbs is hoping for, but has provided no argument for, is much stronger; namely, that John's intentions at t_0 were changed.

But suppose we set aside the infelicity of Gibbs's original example wherein John says, "I wasn't actually asking you to get a towel for me." Further suppose that at t_1 John really is able to do something to alter the intention he had at t_0. In particular, let us suppose that there are no problems with backward causation, that there is nothing wrong with events at t_1 causally influencing temporally prior events at t_0. (We think we are being especially generous here.) Still, Gibbs must come to grips with the fundamental flaw in coupling arguments; namely, the fact that events at one time causally influence cognitive events at another time does not make it the case that those first events constitute part of a single cognitive process that includes the cognitive events. More concretely, the fact that Nicole's and John's actions made some cognitive difference to John's intention at t_0 is not enough to establish that Nicole's and John's actions are part of the same cognitive process or state as John's intention at t_0.

Further evidence that Gibbs is guilty of confusing constitution relations and causal relations in the analysis of this case is supported by his claims following another sample dialogue. He notes that "speakers' intentions also clearly shift as a result of conversation and may at times not be viewed as solely a product of an individual speaker's mind" (Gibbs, 2001, p. 111). It is surely common ground that intentions change over the course of a conversation. I ask you to pass the salt. That, against a backdrop of other factors, might cause you to form the intention to pass the salt. And, of course, in such a case, there is a perfectly good sense in which your intention is not solely a product of your mind; namely, your intention is not caused exclusively by events within your own mind. Yet such an admission does nothing to challenge the intracranialist position. For all that has been conceded, the intracranialist can still maintain that your intention to pass the salt is entirely constituted by events and processes within your cranium. So, even under quite generous concessions, Gibbs has not produced an argument for transcranialism.

Having surveyed a wide range of ways of committing the coupling-constitution fallacy, it should be clear how pervasive it is. What would help transcranialists at this point is a plausible theory that demarcates the cognitive from the noncognitive. Yet, as we will now argue, they do not have one.

3. The Mark of the Cognitive

When we claim that transcranialists have paid inadequate attention to the problem of

the mark of the cognitive, we do not mean to imply that they have entirely ignored the issue. For example, Clark and Chalmers (1998) consider the idea that consciousness is the mark of the cognitive:

> *Some find this sort of externalism unpalatable. One reason may be that many identify the cognitive with the conscious, and it seems far from plausible that consciousness extends outside the head in these cases. But not every cognitive process, at least on standard usage, is a conscious process. It is widely accepted that all sorts of processes beyond the borders of consciousness play a crucial role in cognitive processing: in the retrieval of memories, linguistic processes, and skill acquisition, for example. So, the mere fact that external processes are external where consciousness is internal is no reason to deny that those processes are cognitive. (Clark & Chalmers, 1998, p. 10)*

Clark and Chalmers clearly deserve credit for broaching the issue. Further, they deserve credit for providing reasonable arguments against this theory of the cognitive. Yet their paper comes up short in its failure to specify what they believe does distinguish the cognitive from the noncognitive. Further, Clark and Chalmers, like all the other transcranialists we have read, do not address any version of the rules-and-representations conception of cognition – arguably the received view of the nature of cognition. Adams and Aizawa (2001) drew attention to this conception by venturing two hypotheses concerning how the cognitive would turn out to be different from the noncognitive. The first hypothesis was that cognitive processing involves nonderived content, that is, that cognitive states have the content they do in virtue of the satisfaction of certain naturalistic conditions that do not depend on the existence of other content-bearing, representational, or intentional states. The second was that cognitive processes are to be distinguished by certain sorts of principles that are found to operate in the brain but not elsewhere. As examples, we noted the existence of certain laws of memory formation and retention and certain psychophysical laws, such as Weber's law. Because we have already twice defended our original articulation of this view, which is in any case a common view in cognitive science, we will not here belabor our positive account.[23]

Inattention to the mark of the cognitive figures into the debate over intracranialism and transcranialism as follows. If one views the world simply in terms of causal processes, then one will likely miss the difference between what goes on inside the brain and what goes on outside. After all, causal processes are transcranial. Alternatively, if one is only interested in a science of the artificial, rather than cognitive science, one is likely to be drawn to transcranialism. Alternatively, if one is only interested in finding systems, or cognitive systems, one is liable to miss the point at which cognitive processes leave off and noncognitive processes begin. Consider, now, some of the others more subtle ways in which theories of the mark of the cognitive abet transcranialism.

3.1. *Cognition as Information Processing*

Clark (in Wilson & Clark, this volume) and Rowlands (1999) suggest that cognition is information processing.[24] We have considerable sympathy for this as a part of a theory of the cognitive, but we think that cognitive processing is only a narrow subspecies of information processing. Not all information processing is cognitive processing. Compact disc players, DVD players, FM radios, digital computers, cell phones, and so forth, are all information processors, but none of them is a cognitive processor. Any theory of the cognitive that does not notice the difference is clearly missing something relevant to cognitive psychology. This difference is presumably part of the difference between a scientifically interesting cognitive psychology and a scientifically uninteresting consumer electronics.

3.2. *The Cognitive as the Computational*

Similar in spirit to the idea that cognition is information processing simpliciter, there is the idea that cognition is computation

simpliciter. This appears to be how Edwin Hutchins motivates the view that, in the navigation of a ship by a team of sailors, cognition is extended throughout the team in a kind of supermind over and above the minds of the individual sailors:

> *Having taken ship navigation as it is performed by a team on the bridge of a ship as the unit of cognitive analysis, I will attempt to apply the principal metaphor of cognitive science – cognition as computation – to the operation of this system. In so doing I do not make any special commitments to the nature of the computations that are going on inside individuals except to say that whatever happens there is part of a larger computational system. But I do believe that the computation observed in the activity of the larger system can be described in the way cognition has traditionally been described – that is, as computation realized through the creation, transformation, and propagation of representational states. (Hutchins, 1995, p. 49)*

If cognition is just any sort of computation, then by this relatively broad theory of the mark of the cognitive, then it should not be so surprising that cognition is found in hitherto unsuspected places, such as spanning the boundary of brains, bodies, and environment of a group of sailors. But, then again, by this standard, we would have cognition in personal computers. As we understand it, the orthodox computational theory of the mind maintains not that any computation is a kind of cognition, but that only some specific forms of computation (yet to be discovered and characterized) constitute cognition.[25]

3.3. *The Cognitive as the Meaningful*

Haugeland (1998) urges another theory of the cognitive, or of human intelligence. Haugeland contrasts the representational and the meaningful. Representations are symbolic markers that denote things; they are the data structures of computational theories of mind. The meaningful, however, is a broader kind. Representations have one kind of meaning or significance, but the meaningful is more inclusive. As Haugeland (1998) tells it:

> *A hammer, for instance, is significant beyond itself in terms of* what it's for: *driving nails into wood, by being wielded in a certain way, in order to build something, and so on. The nails, the wood, the project, and the carpenter him or herself, are likewise caught up in this "web of significance", in their respective ways. These are the meaningful objects that are the world itself; and none of them is a representation. (p. 233)*

So, we may now ask, "What kind of significance constitutes the cognitive?"[26] Were we to review Haugeland's arguments in favor of using the broader notion of the meaningful in cognitive science, we would find that they are simply the system versions of the coupling argument, an argument form we have found inconclusive. Note as well, however, that even if there were a science of the meaningful, this would not necessarily constitute a cognitive psychology. Surely, the vast differences between hammers and saws, on the one hand, and cognition, on the other, are part of what interests cognitive psychologists.[27] Surely a cognitive psychology that ignores such differences is ignoring something important.

3.4. *Operationalizing the Cognitive*

Another way that transcranialists attempt to provide a mark of the cognitive is by a tacit operationalism. They may well reject this characterization of their project, but one can see it in their tacit assumption that whatever process or mechanism accomplishes a given task must be a cognitive process or mechanism. In the closing pages of his paper on embodied and embedded cognition, Haugeland invites us to consider the ability to go to San Jose. He observes that there are many ways one might accomplish this task, such as retaining a horse that is trained to go to San Jose or picking a road that leads to San Jose. And, of course, he is right that there are many ways of getting to San Jose. Further, he is right that not all of these ways involve

representation of the sort postulated in the familiar rules-and-representations kind of cognitive science. But it also appears that not all of the ways to get to San Jose involve cognitive processing. A train on rails has the ability to go to San Jose from a point out of sight. A cloud can blow to San Jose from a point out of sight. An intercontinental ballistic missile has the ability to go to San Jose from a point out of sight. These abilities require no intelligence, no cognition. There are lots of combinations of cognitive abilities that one might deploy to get to San Jose, but not every way of getting to San Jose involves cognition. Once one abandons the idea that the ability to move to a point out of sight is a criterion for the cognitive, these possibilities should be clear.

In truth, a more famous case of tacitly operationalizing the cognitive is in Rodney Brooks's discussion of his robot Herbert. Brooks (1997) reports that Herbert has the task of finding soda cans in offices at MIT, picking them up, and bringing them back to a start point. Brooks tacitly presupposes that this task requires intelligence, that any device that can accomplish this task must be intelligent. So, if one adds to this the view that Herbert lacks representations of the sort postulated by rules-and-representations theories of cognition, one can infer that intelligence without representation is possible. Yet suppose we challenge the idea that any device that can collect soda cans in the offices at MIT must be intelligent or must be a cognitive agent. In that case, a different analysis becomes available. That is, one is free to suppose that, although the soda-can collection task can be accomplished in the way humans do it, namely, by deploying cognitive processes, other devices can also accomplish the task through chains of simple noncognitive mechanisms. To decide between these two analyses of what Herbert is doing, we need a substantive theory of what constitutes the cognitive.

The most extensive example of transcranialists operationalizing the cognitive is found in Rowlands (1999). When he begins his discussion of perception, he claims that he is not presupposing any controversial definition of cognition. He proposes that cognitive tasks involve the acquisition and employment of information, information in the sense of a nomological dependence between event types. Further, he suggests that a cognitive process is one that is essential to the accomplishment of some cognitive task and that involves operations on information-bearing structures.[28] As we see things, this is a species of operationalism and is fundamentally misguided.

Here is a task: make sure that when the electric garage-door opener lowers the door, the door does not close on anyone. This task apparently requires that the garage-door opener have some more or less reliable mechanism for detecting the presence of a person beneath the door. In other words, the opener must acquire and use information regarding the presence or absence of a person beneath the closing door. So, by Rowlands's account, this task is a cognitive task. The most common way electric garage-door openers gather this information these days is by passing a light beam from a source on one side of the entrance of the garage to a detector on the other side. If some object, such as a person, breaks the beam, the door opener will raise the door. The system is not perfectly reliable, however. A person positioned in just the right way beneath the door need not break the beam. It is also possible to have other sorts of objects break the beam, resulting in false-positives for the presence of a person. Presumably, the light source, detector, and accompanying wiring are essential to the accomplishment of the task and use information about the presence of objects in the light path. Thus, by Rowlands's account, the light source, detector, and its accompanying wiring constitute a cognitive processor.

Contrast the foregoing method of ensuring that the door does not close on anyone with a more old-fashioned way. Not so many years ago, whenever a garage door was to be closed, a person would position him- or herself so as to have a clear view of the space where the door will close, then start the garage-door opener when he or she could see that the path is clear.

Clearly there is some difference between the new way and the old way of operating an electric garage-door opener. A very reasonable empirical hypothesis is that the process by which the electric eye works to detect objects beneath the door is different from the process by which the human eye and visual system detects objects beneath the door. It also seems very reasonable to us to suppose that figuring out what is going on in the human eye and visual system is part of what has interested cognitive scientists who have studied vision in recent years. It is this difference that makes the study of the human eye and visual system intellectually challenging, where the electric eye is a boring piece of hardware you can buy at Sears. So, even if Rowlands were given the term *cognitive* to use as he pleases, there still appears to be a natural kind of process, at least reasonably construed as cognitive, that is worthy of scientific investigation.

Now Rowlands will say that both the new way and the old way of avoiding accidents with electric garage-door openers involves information processing, hence that both are cognitive. As we saw, however, the problem with Rowlands's approach is that even if we accept his conception of the cognitive as essentially information processing, there remains a scientific natural kind of processing that appears to be worthy of scientific investigation in its own right, a scientific, natural kind of processing that traditional intracranialist cognitive scientists have been investigating. Perhaps the human brain is an information processor in just the sense in which a CD player, a DVD player, a television, a cash register, and an automobile gas gauge are information processors. But it is presumably the specific differences between the brain and these other devices that have engaged intracranialists. What interests cognitive psychologists, in part, are the specific ways in which the brain processes information.

3.5. *Rowlands's Evolutionary Argument*

Although Rowlands has a theory of the mark of the cognitive, he seems to lose sight of it during the course of an evolutionary argument for transcranialism. At the least detailed level, Rowlands's evolutionary argument might be viewed as having the form of modus ponens:

1. Development of our cognitive capacities has followed the most efficient evolutionary path.
2. If development of our cognitive capacities has followed the most efficient evolutionary path, then cognitive processes are an essentially hybrid combination of internal and external processes (cf. Rowlands, 1999, p. 25).
3. Therefore, cognitive processes are an essentially hybrid combination of internal and external processes.

Matters would have been simpler had Rowlands just presented this argument and stood by it. At least this argument has the virtue of having a conclusion that is inconsistent with intracranialism. Unfortunately, various reasons move Rowlands to depart from this. In running the argument, Rowlands wants to mark the conclusion as a defeasible inference. Thus, in his version of the consequent and the conclusion, we are told that we should expect our cognitive processes to be an essentially hybrid combination of internal and external processes. Yet the conclusion of this argument is logically consistent with intracranialism, and so technically irrelevant. So, we should probably interpret what Rowlands writes to make its relevance clearer, namely, in the way presented previously. Second, in a desire not to rely too heavily on empirical assumptions about evolutionary history, Rowlands wants to assert only something like the second premise. Yet premise 2 is logically consistent with intracranialism, and so not particularly germane to the debate. Third, it should be noted that essentially all of Rowlands's discussion in chapter 4 of his book is directed toward the exposition and defense of something like premise 1, where nothing at all is said in defense of premise 2. Reading Rowlands as interested only in premise 2 is, in this regard, a distortion of the argumentation of

his book. We propose not to be a part of it and instead hold Rowlands to the preceding argument.

So, what are we to make of the foregoing argument? Aside from the fact that Rowlands provides no evidence or argument for premise 2, we think this premise is clearly false.[29] In general, an inference of this form is no good, because the second premise is false:

1. Development of our capacities for X has followed the most efficient evolutionary path.
2. If development of our capacities for X has followed the most efficient evolutionary path, then processes for X are an essentially hybrid combination of internal and external processes (cf. Rowlands, 1999, p. 25).
3. Therefore, processes for X are an essentially hybrid combination of internal and external processes.

Consider human spermatogenesis. Even if this were a capacity that had followed the most efficient evolutionary path, it is evidently not a process that extends into the external world. Consider the phosphorylation of ADP to form ATP. Even if the phylogenetic development of this capacity had followed the most efficient evolutionary pathway, it is pretty clearly an intracellular process if anything is. Consider the transcription of DNA into RNA, meiosis, the phases of mitosis (prophase, metaphase, anaphase, and telophase), the secretion of bile, filtration of the blood in the kidneys, and pumping of blood. All are intraorganismal processes. What does it matter how efficiently they evolved?

Nor are counterexamples to the preceding form of argument limited to processes that are clearly internal to the body's functions. Even processes that have presumably been selected for their role in aiding an organism in responding to its environment have their easily recognized internal subprocesses.[30] Presumably the patellar reflex was selected for to prevent injury to the patellar tendon. Still, we recognize that the process of extending the lower leg involves subprocesses of distinct kinds internal to the leg. There is the stretching of the proprioceptive cells in the tendon, the firing of the proprioceptive cells, the propagation of the action potentials to the spinal cord, the release of neurotransmitters in the spinal cord, the firing of motor neurons in the spinal cord, the propagation of the action potentials to the sundry muscles of the thigh, the release of neurotransmitters at the neuromuscular junction, and the contractions of the muscles, just to name a few. None of these processes extends into the environment, despite their interaction with the environment. Take the isomerization of rhodopsin in the retina on absorption of light. Presumably this chemical change has been selected for, but there is no temptation to suppose that the chemical change extends into the environment. Consider dilation of the pupil in response to low light. The process of dilation is causally linked to environmental stimuli and the explanation of why a pupil dilates on a given occasion may make some reference to the level of ambient lighting, but, all the same, the process of dilation takes place within the eye.

Rowlands may well wish to say that these counterexamples merely clarify what he had already conceded, namely, that the inference he is making is defeasible. His idea is really that, if the development of a capacity has followed the most efficient evolutionary path, then this gives us some defeasible reason to think that the process is a hybrid combination of internal and external processes. This, however, misses what should be the moral of the counterexamples. The point is that there is no reason to link the property of being a product of natural selection with the property of extending into the environment. They appear to be entirely orthogonal concerns.

Here is another way to make the foregoing point. Rowlands spends the bulk of chapter 4 of *The Body in Mind* making a kind of plausibility argument for the view that using tools makes for greater fitness than not using tools. We concede, just for the sake of running another argument more

simply, that this is so. Our objection to Rowlands's evolutionary argument is that, even if organisms that use tools are more fit than organisms that do not, this has nothing to do with how we discriminate among types of processes and their subcomponents. Surely, the most reasonable thing to expect evolutionary theory to do is provide a theoretical taxonomy of processes based on evolutionary theory, not a theoretical taxonomy of processes based on cognitive theory. Evolutionary theory parses the world up into units that are significant in terms of evolution, not in terms of cognition. So, one should expect that appeals to evolutionary theory are entirely orthogonal to the intracranial-transcranial debate. Here again, we think that, were consideration of the mark of the cognitive brought to the fore, this sort of misdirected argument might be avoided.

4. Conclusion

In this chapter we have drawn attention to what appear to us to be the two principal weaknesses in current developments of transcranialism. They are that transcranialism is regularly backed by some form of coupling-constitution fallacy and that it does not have an adequate account of the difference between the cognitive and the noncognitive. A more nagging worry, however, is the motivation for transcranialism. What reason is there to make this proposed conceptual shift? Why parse up causal processes in the transcranialist way rather than in the intracranialist way? We have tried to motivate the intracranialist approach by drawing attention to the existence of distinctive causal processes that take place intracranially. For example, the human visual system appears to have information-processing channels for such things as color, motion, and form, where digital camcorders do not. Further, human memory appears to show primacy and recency effects unlike those that occur in computer hard drives or pen and paper. We think that greater attention to cognitive psychology textbooks helps to highlight these differences, where greater attention to ordinary language tends to efface these differences. We also think that the existence of these processes, rather than mere prejudice or tradition, explains why the orthodox position in cognitive science is intracranial.[31] Finally, we think that these differences explain why even transcranialists maintain that cognition extends from brains into the extraorganismal world rather than from the extraorganismal world into brains.

Notes

1 Ideas in this chapter are precursors to those we have developed in more detail in our recent book (Adams & Aizawa, 2008).

2 Although there is a difference between the intracranial and the intraorganismal, it is not a difference we propose to trouble about here.

3 Among philosophers we count van Gelder (1995); Dennett (1996); Clark and Chalmers (1998); Haugeland (1998); perhaps Hurley (1998); Rowlands (1999, 2003); Noë (2004); and Sutton (2005). Among psychologists we count Donald (1991); O'Regan (1992); Thelen and Smith (1994); Hutchins (1995); and Gibbs (2001). An interesting early advocate of extended cognition is the anthropologist Bateson (1972). Following this rising tide in support of extended cognition are voices of resistance. These include Adams and Aizawa (2001, in press); Wilson (2002); Susi, Lindblom, and Ziemke (2003); Rupert (2004); Sterelny (2004); Block (2005); Rupert (in press, this volume); and Aizawa (2007).

Actually, some extracranialists sometimes wish to maintain that cognitive processes are essentially extended into the external world. Insofar as we are successful in arguing that cognitive processes are typically not extended, it will follow that they are not essentially extended. We do not, however, maintain that cognitive processes are essentially internal.

4 Haugeland (1998), Clark and Chalmers (1998), and Clark (in press), for example, are fairly explicit about the kinds of couplings they have in mind.

5 Cf. Hurley (1998, pp. 2–4); Clark (2005, p. 1); and Clark (in press).

6 Cf., e.g., McClamrock (1995, pp. 3–4); Haugeland (1998, pp. 209–210); Rowlands (1999, pp. 106–113); and Gibbs (2001, pp. 117–118).

7 In fact, contemporary intracranialist cognitive science appears to do this already. The interaction between organism and environment is at the heart of the lively empiricist-nativist debates. Insofar as contemporary ethology is intracranialist, it too studies organism-environment interactions, namely, the interactions of organisms with their natural environments. And where would the study of sensation and perception be if it did not study the interaction between organism and environment?

8 In correspondence, Dan Dennett indicated that what he was concerned to point out is that our concept of cognition does not require that it be found in the brain.

9 Cf., e.g., Clark and Chalmers (1998, p. 10) and Rowlands (1999, pp. 115–116). Rowlands (1999, pp. 115–116) tries to put the burden of avoiding a terminological dispute on the intracranialist. Susi, Lindblom, and Ziemke (2003) also raise this concern.

10 Clark (in press) sometimes appears not to appreciate this.

11 One might make the case that psychology should be understood in terms of mechanisms, rather than ceteris paribus laws, something along the lines suggested by Machamer, Darden, and Craver (2000). Perhaps this is so, but we do not see that debate between intracranialists and transcranialists depends on this. In addition, one might make the case that psychological explanations should be understood in terms of functional analysis (cf. Cummins, 1983). Perhaps so, in which case we might reformulate our approach within this framework. For the sake of simplicity of exposition, however, we forbear here.

12 Here we find ourselves at odds with Haugeland (1998); Rowlands (1999, 2003); Clark and Chalmers (1998); and Clark (2005), who suggest that it is mere prejudice that sustains the orthodox intracranialist position in cognitive science.

13 This is a line of criticism we broached in Adams and Aizawa (2001). The same kind of argument has recently been applied by Block (2005) in a critique of Noë's (2004) theory of enactive perception. See also Rupert (in press).

14 For other examples, see Adams and Aizawa (2001, in press).

15 Who since about Leibniz has doubted this?

16 Chapter 1 of Noë (2004) is much more explicit about the distinction between causation and constitution and can be viewed as a defense of the view that cognition is constituted, in part, by one's body. In his chapter 1, Noë defends the view that perceptual abilities are constituted, in part, by sensorimotor skills. Given the assumption that the exercise of perceptual abilities are cognitive processes and that sensorimotor skills are constituted in part by muscles and peripheral nerves, one has the view that cognitive processing is constituted, in part, by bodily processes. In this chapter, Noë is pretty explicit in favoring the constitutive claim over the causal claim. Aizawa (2007) provides a detailed critique of this case for extended cognition.

17 Actually, the example first appears in the work of Clark (1997), but its use to support extracranialism is less marked there.

18 This jointly responsible idea figures more prominently in the version presented in Clark (1997). Haugeland (1998) runs the same "jointly responsible" line about navigating to San Jose. By driving the interstate, one relies on the structure of the interstate and on one's cognitive abilities in dealing with roads. Thus, the road and the brain are between them responsible for successfully navigating to San Jose and they constitute a single causal process. Still, that does not make the interactions between the road and the brain a single *cognitive* process. Establishing the latter stronger claim is what the extracranialist needs.

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20 Cf. Haugeland (1998): "If . . . there is a constant close coupling between the ant and the details of the beach surface, and if this coupling is crucial in determining the actual path, then, for purposes of understanding the path, the ant and beach must be regarded more as an integrated unit than as a pair of distinct components. This is the simplest archetype of what I mean by *intimacy*" (p. 217). Substitute

bowling ball for *ant* and *alley* for *beach* and you are well on your way to committing Haugeland to something rather wild.

21 In fact, one can pick up a reference to a system in the passage from Clark (2001), cited previously. Much of Haugeland (1998) can be viewed as an elaborate case of the system version of the coupling-constitution fallacy: "The strategy will be to bring some well-known principles of systems analysis to bear on the mind-body-world 'system' in a way that refocuses questions of division and unity" (pp. 208–209).

22 Doesn't the cyborg example play into the intracranialist's hand? After all, cyborgs are hybrids of organism and artifact rather than simply organisms. So, shouldn't humans with tools be hybrids of cognizers and artifacts rather than simply cognizers?

23 Aizawa and Adams (2005) and Adams and Aizawa (in press).

24 Clark (in press); Wilson and Clark (this volume); and Rowlands (1999, pp. 26, 115, 119, 122).

25 Incidently, if one hypothesized that cognitive processing is just the evolution of a dynamical system, then it will of course turn out that cognitive processing extends into the body and environment. Of course, on such a lax theory of the mark of the cognitive, there will be cognition in Watt governors, the pendulums in grandfather clocks, and so on.

26 Haugeland (1998, p. 233) puts the matter this way: "The real question is: Which sense matters in the context of understanding human intelligence?" This way of formulating the issue risks inserting controversy over exactly what constitutes "understanding human intelligence." We wish to avoid this tangential issue here.

27 Adams and Aizawa (2001) provide reason to be skeptical of the possibility of a science of the artificial.

28 This seems to be Rowlands's "official" theory of the mark of the cognitive, where the idea that cognition is simply information processing is merely a view suggested by stylistic variations in Rowlands's writing. Cf., e.g., Rowlands (1999, pp. 102–103, 116, 137).

29 Clearly the truth value of premise 2 is a primary concern whether Rowlands wants to assert just premise 2 or run the whole modus ponens sketched previously.

30 Rowlands (1999) adds another small wrinkle to his argument:

> *If we have adopted the most efficient strategy for accomplishing tasks, then the cognitive mechanisms we have evolved should be designed to function in conjunction with environmental structures. Then, the cognitive processes realized by these mechanisms would have to be understood as straddling both internal processes and those external processes whereby the organism interacts with these environmental structures. (p. 25)*

The consequent in the second sentence motivates the present paragraph. Note as well that it is the move from the second sentence to the third in this passage that constitutes for us the non sequitur.

31 Rupert (2004) provides a nice elaboration of this kind of consideration, which we broached in Adams and Aizawa (2001).

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