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Knowledge, Credit, and the Extended Mind, or what Calvisius Sabinus got Right

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Abstract

According to one prominent view in contemporary epistemology, the correct application of one's cognitive abilities in believing truly is necessary and sufficient for a kind of credit that is, in turn, necessary for knowledge. Epistemologists who hold this view typically take the cognitive abilities concerned to be based in states and processes that are spatially located inside the head of the knowing subject. Enter the hypothesis of extended cognition (henceforth ExC). According to ExC, the physical machinery of mind sometimes extends beyond the skull and skin. The present chapter will explore what happens when the credit condition on knowledge is brought into contact with ExC. Via discussions of (a) empirical psychological work on the adaptive character of technologically augmented memory and (b) thought experiments from the extended cognition and extended knowledge literatures, conclusions will be drawn for our understanding of 'knowledge in the wild'.

1. An Unlikely Hero

As described by Seneca the Younger in letter 27 of his *Epistulae morales ad Lucilium* (Moral Letters to Lucilius), Calvisius Sabinus was a fabulously wealthy Roman with a biological memory so poor that he would sometimes even forget the name of Ulysses, Achilles, or Priam. In response to this cognitive shortcoming, Sabinus bought several expensive slaves and had each of them trained to memorize epic or lyric poetry. They were then positioned at the end of his couch during dinner parties. Now and then, he would ask them for verses that he would endeavor to repeat, although Seneca the Younger, with barely concealed derision,

reports that he would often fail. Calvisius Sabinus, this rich and empty-headed Roman, is the hero of our story. But that comes later.¹

2. Beyond Cognitive Internalism

Our increasingly wired, wireless and technologically enhanced world presents us with many philosophical challenges. Here we shall be concerned with issues that arise regarding the notion of knowledge, or perhaps more accurately the state of knowing. Much of the discussion that follows focuses on propositional knowledge (knowing that *p*), although the issues that will exercise us are not unique to that form of knowledge. Our point of departure is that the structures with which we know things, and the processes by which we come to know things, are changing: we swipe and zoom on tablets to search up and display remotely accessed information; our ways of storing and retrieving personal information are augmented by mobile computing devices, such as contact-storing cell phones whose smart interfaces are able to protect us from the tedious business of recognizing or typing in the relevant numbers; new sensory substitution technologies are under development to enable, for example, deaf individuals to receive testimonial knowledge by “feeling” the words spoken by other individuals,² and there is already commercially available wearable technology that monitors

¹ For critical discussion of the ideas presented here, many thanks to audiences in Edinburgh, Glasgow, Nice, San Antonio, Stirling, and Warwick. Many thanks also to Adam Carter for his helpful comments on an earlier version of the chapter, and to Bill Short for introducing me to Calvisius Sabinus. For Short’s own discussion of memory slaves and the extended mind, see Short (Forthcoming).

² The deaf person wears a vest that vibrates to the degree that a particular frequency is present in ambient sound, the strategy being for her to associate specific vibration patterns with specific

our electrical, chemical and postural well-being, and then feeds that information back to us via intuitive displays and prompts, enabling us to know our own brains and bodies better. You can add your own favorite example. Given that epistemology is the theory of knowledge, presumably part of its job is to tell us precisely what knowing amounts to, in our technologically saturated world. So, how should one conceptualize the epistemic contribution of the kinds of technology-involving loops just described? Let's start our investigation by taking a position off the philosophical shelf.

One popular approach in contemporary virtue epistemology is to think of knowledge as the product of cognitive abilities. I am going to assume this approach here. And I shall follow Greco (e.g., 2002) in holding that the intellectual virtues generally may be conceived as cognitive abilities that help us get to the truth and avoid error. One way of making the cognitive abilities approach concrete is found in what we might call the *credit condition on knowledge*. Here's Greco (2007, 57): "knowledge attributions can be understood as credit attributions: when we say that someone knows something, we credit them for getting it right" (see also Riggs 2007; Sosa 2007). Put generically, and in terms of true belief, then, the credit condition may be stated as follows: knowing that p implies deserving credit for truly believing that p . In other words, knowledge results only when one deserves credit for believing the truth. So, when does one deserve such credit? A standard answer is that credit accrues when and only when one exercises one's cognitive abilities in the right sort of way. Put all this together and we arrive at the following picture: the correct application of one's cognitive abilities in believing truly, or in the process of coming to believe truly, is necessary and sufficient for a kind of credit that is, in turn, necessary for knowledge.

spoken words. See <http://www.eagleman.com/research/sensory-substitution> (last accessed July 7, 2016). For the detailed science, see Novich and Eagleman (2015).

By and large, epistemologists who think that cognitive abilities perform this kind of fundamental epistemic role succumb immediately to a certain kind of internalist temptation. That is, they take the cognitive abilities concerned to be based in various states and processes that are spatially located inside the head of the knowing subject. To avoid confusion, we need to register the fact that this kind of internalism—which I shall henceforth call *cognitive internalism*—is not, and does not entail, the widely discussed (in the epistemology literature) form of internalism according to which, for a subject to know, the justification for the belief in question must be reflectively accessible to that subject. This latter kind of internalism—sometimes called *epistemic internalism*—is rejected by most virtue epistemologists, in favor of the view that, routinely, reflection alone cannot settle whether a belief was produced by intellectual virtue. And this is a view that, expanding our taxonomy one step further, is sometimes called *epistemic externalism*. But epistemic externalism is entirely consistent with the claim that the cognitive abilities that constitute the intellectual virtues are based in various states and processes that are spatially located inside the head of the knowing subject—that is, epistemic externalism is entirely consistent with cognitive internalism.³

Why is cognitive internalism so tempting? Because (so the argument goes, and with a nod to the orthodox view in cognitive science) that's where we will find (the material realizers of) the psychological dispositions, information-processing operations, computational routines, and so on that account for those abilities. Thus Goldman (1979, 13) writes as follows: "A justified belief is, roughly speaking, one that results from cognitive operations that are, generally speaking, good or successful. But '*cognitive*' operations are most plausibly construed as operations of the cognitive faculties, i.e., 'information-processing' equipment internal to the organism." Of course, the successful exercise of a neurally based cognitive

³ For a detailed discussion of different forms of internalism and externalism in relation to extended cognition and extended knowledge, see Carter et al. (2014).

ability may depend on the presence of certain normal conditions in the organism's environment, but such conditions are, we are told, not part of the psychological story proper. They are causal-enabling factors whose contribution is akin to that made by gravity when Gareth Bayle successfully exercises his ability to score from a thirty-yard, wall-avoiding, soccer free kick.

Enter the *hypothesis of the extended cognition* (henceforth ExC).⁴ According to ExC, the physical machinery of mind sometimes extends beyond the skull and skin. More precisely, according to ExC, there are actual (in this world) cases of intelligent thought and action, in which the material vehicles that realize the thinking and thoughts concerned are spatially distributed over brain, body, and world, in such a way that certain external (beyond the skull and skin) factors are rightly accorded the same (i.e., cognitive) status as would ordinarily be accorded to a subset of your neurons. So, to be clear, "extension" here has the sense of spatial (environment-encompassing) extension, not performance enhancement, although, in some cases of extended cognition, psychological performance will indeed be enhanced. So, what sort of external physical machinery might succeed in extending the mind in this manner? Although it's true that, from the point of view of the theory, even rather pedestrian examples of technological scaffolding such as notebooks, tally sticks, and abacuses would, under the right circumstances, do perfectly well in the mind-extending stakes (see below for a canonical

⁴ Throughout this chapter, I will use the terms "mind" and "cognition" interchangeably. This strikes me as standard practice in cognitive science. From this perspective, "extended cognition" and "the extended mind" are alternative names for the same view. The case for extended cognition was first made by Clark and Chalmers (1998; see also Clark 2008). For a more recent collection, that places the original Clark and Chalmers paper alongside a range of developments, criticisms, and defenses of the view, see Menary 2010.

example of this pedestrian sort), there's little doubt that ExC animates the contemporary study of mind partly because of the way it engages our hopes and fears regarding modern technology. Thus, the most eye-catching examples of external elements that advocates of ExC take to enjoy cognitive status are the kinds of technological props for thought that we canvassed earlier, artifacts such as smartphones, tablets, and certain items of wearable computing.

For present purposes, I am not really concerned to defend ExC (for my own thoughts in that area, see e.g., Wheeler 2010a; 2010b; 2011a; 2014). Rather, I want to explore some of ExC's epistemological implications. The most obvious consequence of ExC is that it provides a way of resisting the cognitive internalist temptation highlighted earlier. Put another way, if ExC is true, then knowing is sometimes the product of cognitive abilities that are based in extended cognitive states and processes (e.g., Pritchard 2010; 2013). In yet other words, and completing the taxonomy that we began earlier, if ExC is true, then we should be *cognitive externalists*. That's certainly a consequence of ExC, but one might seriously wonder whether it's one that should keep the epistemologist *qua* epistemologist awake at night. After all, the transition from the mainstream internalism about the machinery of mind that is assumed by most epistemologists who pursue the cognitive abilities line to the machinery externalism recommended by advocates of ExC might leave everything else about the theory of knowledge entirely intact. For example, the correct application of one's cognitive abilities in the process of coming to believe truly might still be necessary and sufficient for a kind of credit that is, in turn, necessary for knowledge. In what follows, I shall target this specific issue, by asking: what happens when ExC is brought into contact with the credit condition on knowledge? I am certainly not the first person to explore, in some way, this particular meeting of views (see e.g., Preston 2010; Vaesen 2011; 2013; Adams 2012; Aizawa, 2012; Menary 2012; Kelp 2013, 2014; Palermos 2016), but, as I shall argue, certain prominent

previous treatments of the issue have failed to draw the right conclusions, so further analysis is warranted. Moreover, my ultimate goal in reflecting on this issue is not to assess the credit condition on knowledge as such, but rather to nudge us into a better place from which to understand what we might, half-echoing Hutchins (1995), call knowledge in the wild. Before all that, however, we need to get some conceptual bearings.

3. Knowing the Facts

Consider the following experiments performed by Sparrow et al. (2011). In the first experiment, participants were instructed to type, into a computer, forty trivia statements that might ordinarily be found online (e.g., “An ostrich’s eye is bigger than its brain”). Half the participants were told that their typed statements would be saved on the computer and half were told that their typed statements would be deleted. Within each of these groups, half of the individuals concerned were asked explicitly to try to remember the statements, where – and this is crucial—“remember” signals “store in your brains.” All the participants were then asked to write down as many of the statements as they could remember. Interestingly, the fact of whether or not a participant was asked to remember the target statements had no significant effect on later recall, but the steer about whether or not the statements would be saved on the computer did, with superior recall demonstrated by those participants who believed that their typed statements had been deleted. In other words, where the expectation is that information will be readily available via technology, people tend not to store that information internally. A further study provided participants in the saved condition with additional information indicating where on the computer the saved statements were being stored (e.g., folder names). This scenario uncovered a more complex profile of organic memory allocation, suggesting that people don’t internally store where to find externally stored items of information when they have internally stored the items themselves, but that

they do internally store where to find externally stored items of information when they have not internally stored the items themselves.

Sparrow et al. pitch their experiments as investigations into the adaptive character of memory, concluding that “when people expect information to remain continuously available (such as we expect with Internet access), we are more likely to remember [i.e., commit to *organic* memory] where to find it than we are to remember [commit to organic memory] the details of the item” (Sparrow et al. 2011, 3).⁵ Intuitively, there is a close connection between memory and knowledge, in at least the sense that most of what we can be said to know is plausibly stored in memory, and perhaps in stronger senses too (e.g., some theorists hold that to remember that p entails knowing that p ; for critical discussion, see Bernecker 2010). And where memory-related knowledge is the issue, the cognitive operations that matter will be those concerned with the preservation and maintenance of true beliefs, rather than with the formation of such beliefs. Any such operations must at least partly be realized in the cognitive machinery that stores information over time.

Given this pattern of connections between memory and stored knowledge, let’s see how the epistemology looks in the wake of Sparrow et al.’s experiments. Imagine that an individual who has been told how to access certain facts using some readily available technology, and who has committed this access information, but not the facts themselves, to organic memory, is in a pre-display period, that is, a period of time before the relevant information has been retrieved and displayed using the technology. The pre-display restriction quarantines any complications that might arise in characterizing the period of time during which, and presumably shortly after which, the individual in question is actually, say, looking at the facts displayed on a screen. Such displayed facts may well be temporarily

⁵ Perhaps this is such an obvious feature of our modern experience that no experimental evidence was really required to substantiate it, but it’s always comforting to get the data.

stored in the individual's brain, even though the widespread failure of human beings to store information that they believe to be readily accessible using technology means (we can assume) that these facts will not be committed to long-term organic memory. Working with this picture, as Sparrow et al.'s results suggest we should, there may well be many pre-display periods during which the facts in question are not neurally stored, with those periods stationed between multiple retrieval events in which no relevant changes to long-term organic memory are made. Now we can ask the following question: in such a pre-display period, does the individual we have been considering *know the relevant facts* or merely *how to find those facts* using the available technology?⁶ Before you all rush to vote, let's bring the issue into better view, via a distinction that is at the heart of the contemporary debate over the extended mind.

The distinction that concerns us is between *embedded* cognition and extended cognition. As we have seen already, according to ExC, the physical machinery of mind (the region of the material world where, on any particular occasion, psychological states and processes are instantiated) sometimes extends beyond the skull and skin. By contrast, according to the embedded view, although the distinctive adaptive richness and/or flexibility of intelligent thought and action is regularly, and perhaps sometimes necessarily, causally dependent on the bodily exploitation of certain environmental (e.g., technological) props and scaffolds, the actual thinking going on in such cases remains an internal, paradigmatically neural, phenomenon. In other words, the embedded theorist believes that proper justice can be done to the important, and sometimes necessary, causal contributions made by environmental elements to many cognitive outcomes without there being any pressure to attribute cognitive status to the beyond-the-skin factors involved. Adopting some terminology introduced into

⁶ A version of this question is also asked, in relation to extended cognition, by Preston (2010) and Carter and Kallestrup (2016).

the extended mind debate by Adams and Aizawa (e.g., 2008), the distinction between embedded and extended cognition might be put as follows: for the fan of embedded cognition, thought is “merely” causally dependent on external factors whereas, for the advocate of extended cognition, thought is *constitutively* dependent on those factors (leaving open the possibility that the constitutive relations that matter may well be a delineable subset of the causal relations in play).

Now let’s ask our question again: given an individual who has committed the relevant access information for certain facts, but not the facts themselves, to organic memory, and given that we are in a period of time before the relevant information has been retrieved and displayed using the available technology, does that individual *know those facts* or merely *how to find them* using the technology? First assume that what we confront here is a case of extended cognition, and that what that means is that the technology where, pre-display, the relevant information is stored is itself part of the physical machinery of mind, such that the individual’s relevant cognitive states and processes are partly realized, constitutively speaking, in the technology. In this scenario, the answer to our question must surely be that the individual knows the facts, not merely how to find them. After all, if this is a case of the extended mind as just described, the salient information is stored in machinery that is literally *part of* her cognitive machinery. In this case, memory, as a cognitive ability, would be based in cognitive operations that encompass, as constitutive parts, neural mechanisms (e.g., for triggering context-sensitive retrieval), bodily movements (opening the right apps, clicking on the right folders and files) *and* the external technology where the relevant information is stored. As one might put it, the individual knows the facts, and not merely how to find them, because the information-bearing states and processes that provide the content for the true beliefs in question are inside her cognitive system, even though they are not inside her brain.

Now let's assume that what we confront in our pre-display scenario is a case of embedded cognition, and that what that means is that although the individual concerned has not stored the relevant facts in her brain, nevertheless she has the capacity, in part because she has internally stored the access information, to subtly couple with the available technology in such a way that she is able, fluidly and reliably, to access those facts in real time. On the embedded interpretation, the only constitutively cognitive machinery present here is in the individual's brain, so the external technology where the facts are stored is beyond the limits of the individual's cognitive architecture. Under these circumstances, the right answer to our question is presumably that our individual does not know the facts, only how to find them using the available technology. After all, if this is a case of the embedded mind as just described, the salient information is stored in machinery that is *not* part of her cognitive machinery. In this case, we still observe a process in which neural mechanisms, bodily movements, and external technology combine as partners to retrieve information. But only the first partner, the brain, makes a cognitive contribution. So we cannot reasonably characterize the individual as truly believing the relevant facts. Her cognitive abilities are not a matter of maintaining true beliefs regarding those facts, but rather of sustaining her capacity to seek out those facts, and thus to endorse them, even if only temporarily, under appropriate conditions.

In the preceding analysis, I have not taken sides as to which interpretation, the embedded one or the extended one, is correct. All I have claimed is that our epistemological question demands different answers depending on which one of these interpretations we adopt. Nevertheless, one defensive comment regarding the extended interpretation is warranted. It won't do to object to that interpretation by complaining that our extended individual is not conscious of the information in question before it appears on the computer screen. At any one time, any one of us is standardly counted as knowing many facts that are not, at that moment,

present within our conscious experience. These items of knowledge will be based on dispositional beliefs, beliefs that are not (at this moment) present to consciousness, but which are poised to be brought to consciousness under appropriate conditions. On the orthodox cognitive internalist story, the information that forms the content of such beliefs is stored unconsciously in our brains, ready to be brought to consciousness. So, in the purely internal case, the unconscious status of the relevant information prior to the event of retrieval does not, on its own, undermine the claim that one knows the facts in question. But if that's right, then surely the unconscious status of the relevant information prior to the event of retrieval in the technology-involving case cannot, on its own, undermine the extended interpretation.

Despite my refusal so far to take sides between the embedded and the extended interpretations, one might be moved to complain that it would be bizarre to think of the individual in our Sparrow et al.-style scenario as the bearer of an extended mind, because the external technology is inadequately incorporated into her ongoing psychological activity. For example, to deploy something like Clark's (2008) "trust and glue" indicators of cognitive status (also operative in our next example below), although the information saved in the technological resource is, in the experimental context anyway, readily available and easily accessible, it is perhaps doubtful that it would be judged as trustworthy as information retrieved from organic memory, and so might well be subject to degrees of critical scrutiny that make the storage technology itself a poor candidate for being part of the individual's own psychological memory system. In truth, although this may be a compelling point in the case of the participants in Sparrow et al.'s actual experiments, whose access to the technology is confined to the experimental context, it may be less persuasive if one considers (as we did earlier) an "in the wild" individual engaged in multiple successful retrieval events whose reliance on, and trust in, the technology might be predicted to increase over time. Nevertheless, if we are to treat the embedded and extended interpretations as genuine

competitors, and thus if we are to take seriously the claim that, in some cases where memory is technologically scaffolded, we know the facts over time, even though the relevant information is not stored in our brains, perhaps a different candidate case of cognitive extension, one that plausibly meets reasonable incorporation conditions, is needed. Time, then, to reconnect with a pair of (for those of us who have been around this literature for a while) old friends who were first introduced to us by Clark and Chalmers (1998). It's Otto and Inga time (again).

Inga is a psychologically normal individual who has committed to her organic memory the address of the New York Museum of Modern Art (MoMA). If she forms the desire to go to MoMA, she accesses her organic memory to retrieve the information that the building is on 53rd St. Otto, on the other hand, suffers from a mild form of Alzheimer's which means that he cannot internally retain certain kinds of factual information. He compensates for this shortcoming by recording salient facts in a notebook that he carries with him constantly. If Otto forms the desire to go to MoMA, he automatically and unhesitatingly pulls out the notebook and, without a hint of any critical scrutiny of the information stored within, retrieves the relevant fact, viz. that the museum is on 53rd St. At this point in the drama, the so-called parity principle (Clark and Chalmers 1998) makes its entrance. The parity principle asks us to start by considering a distributed system like Otto and his notebook, that is, a system (a) that generates some psychologically interesting outcome and (b) whose operation involves not only neural clankings and whirrings, but also an important functional contribution from certain externally located physical elements. It then encourages us to imagine a hypothetical scenario in which the functional contribution identified in (b), to an equivalent outcome to the one identified in (a), is made not by any external elements, but by certain internally located factors. Having taken this imaginative step, if we then judge that the internal realizing elements in the latter hypothetical case count as bona fide parts of a

genuinely cognitive system, we ought to conclude that the very same status—that is, cognitive status—should be granted to the external realizing elements in the environment-involving case with which we began. To do otherwise would be to succumb to neural chauvinism, which is to beg the question against ExC. The idea is that, if we follow the steps just specified in order to implement the parity principle, we should conclude that Otto's memory is extended into the environment. Moreover, argue Clark and Chalmers, just as, prior to recalling the information in question, Inga has the dispositional belief that MoMA is on 53rd St., so too does Otto, although while Inga's dispositional belief is realized in her head, Otto's is realized in the extended, notebook-including system.

If Otto has an extended memory and an extended dispositional belief, then we can exploit the same considerations we used in the Sparrow et al.-style case to reach the following conclusion: in the situation essentially equivalent to the pre-display case from earlier, that is, at a time before organic Otto looks in his notebook, extended Otto (organic-Otto-plus-notebook) knows where MoMA is. Otto's memory, as a cognitive ability, is based in cognitive operations that encompass, as constitutive parts, neural mechanisms (e.g., for triggering context-sensitive retrieval), bodily movements (e.g., for finding the right location in the notebook), and of course the notebook itself where the relevant information is stored. As one might put it, Otto knows the facts, and not merely how to find them, because the information-bearing states that provide the content for his true dispositional belief that MoMA is on 53rd St. are inside his cognitive system, even though they are not inside his brain. Of course, if the combination of the “trust and glue” indicators and the parity principle fails to establish that Otto has an extended memory and an extended dispositional belief, then Otto may provide nothing more than an instance of embedded cognition, in which case, exploiting the same reasoning as earlier, he will have no memory of the fact that MoMA is on 53rd St., no dispositional belief to that effect, and so no knowledge of that fact. In this case,

and before looking in his notebook, Otto doesn't know that fact, but rather how to find it using the available technology. In other words, once again, how we categorize the cognitive system, as extended or as embedded, has consequences for the epistemic state of the target agent. This result is interesting in itself, but it will also be important as we turn our attention now back to our focal issue—the point of contact between ExC and the credit condition on knowledge.

4. Credit Checks

Let's take stock. As we have seen, according to the credit condition on knowledge, knowing that p implies deserving credit for truly believing that p . If we unpack the notion of credit in terms of cognitive abilities, then this becomes the claim that the correct application of one's cognitive abilities in believing truly, or in the process of coming to believe truly, is necessary and sufficient for a kind of credit. Such credit is, in turn, is necessary for knowledge. The cognitive abilities we care about here will be based in various psychological states and processes that will themselves be realized by some spatially locatable physical machinery. At that point, we have a choice between (i) a neuro-centric cognitive internalism—perhaps in its interactionist-embedded form—about that mental machinery or (ii) an ExC-style cognitive externalism. Which selection one makes here produces different answers to a question that we might ask about an individual who has ready access, via some available technology, to some facts of interest, but who has not stored those facts in her organic brain. That question is: does that individual (a) *know those facts* or (b) merely *how to find them* using the technology? The advocate of ExC, will, if certain criteria (e.g., those for “trust and glue” style incorporation) are met, plump for (a). The embedded cognitive internalist will plump for (b). So far, however, I have not identified any connections between this final point and the issue of credit.

So how does the credit condition play out for cases of extended cognition? First, let's focus on an example that appears in a treatment by Aizawa (this volume) of the relation between ExC and knowledge. Otis is an organic chemistry student whose lifestyle choices always lead him to miss his classes. When an exam looms, Otis copies from his textbook to make a set of little note cards. He smuggles these in to the exam and secretly consults them to answer the questions. He gets an "A," but his tutor, who knows that he has missed all his organic chemistry classes, challenges him to explain how this was possible and threatens to fail him. In response, Otis honestly explains his strategy. The tutor accuses him of cheating. But here's the thing: one class that Otis didn't cut was the philosophy class in which what was studied was the canonical Clark and Chalmers paper on the extended mind mentioned earlier. Otis draws on this paper in his defense. His chief argument is that the set of cards forms a resource that is readily accessible as and when required, reliably and typically consulted, and that the information contained therein is automatically endorsed and not subject to critical scrutiny. In other words, the arrangement meets plausible "trust and glue" criteria. So, claims Otis, he (extended Otis) dispositionally believed all those true facts prior to taking the test. Indeed, he concludes triumphantly, he knew all that material, and he really should keep his "A." Otis's tutor is not moved. After a further exchange during which Otis implores her to focus on the larger Otis-plus-notebook system, Aizawa puts the following words into her mouth: "Yes, your overall performance using your notebook got an 'A', but your overall performance did not involve the cognitive capacities that were the whole point of the test. That's why you fail. End of story" (Aizawa, this volume).⁷

⁷ In Aizawa's own description of the case, Otis also appeals to what, at first sight, looks like the parity principle, only to have that appeal rejected by his tutor. I have ignored this exchange in the debate, because, in truth, the argument that Aizawa has Otis produce deploys not the actual parity principle, as formulated by Clark and Chalmers, but rather a common misinterpretation of it. In particular, Otis

Aizawa clearly agrees with the tutor's assessment. Otis does not know the relevant facts: he knows only how to access them in a fluid and adaptive manner, using the available technology. More specifically, according to Aizawa, Otis meets the trust and glue criteria, but does not possess the relevant knowledge, meaning that the combination of trust and glue is not sufficient for knowledge. Now notice that Aizawa's grounds for his conclusions are that Otis's "overall performance did not involve the cognitive capacities that were the whole point of the test." What Aizawa refers to as "cognitive capacities" here are equivalent to "cognitive abilities that are based in various cognitive operations." In other words, in using the cognitive abilities that he possesses for creating and surreptitiously accessing a canny piece of external information storage, Otis has failed to use the correct cognitive abilities, the ones that were the subject of the test. The correct cognitive abilities were those that would have supported the committing of the relevant material to organic memory and the retrieval and the deployment of that material in such a way that evidence was provided of understanding. Thus, although Aizawa doesn't put it this way, whatever credit Otis deserves, it is the *wrong sort of credit* for him to be attributed with knowledge of organic chemistry. That's why he fails the test, because he fails to meet the credit condition on knowledge.

appeals to a functional equivalence between Otis's notebook and the neural resources of Opie, a fellow student who stored the organic chemistry information in his brain. That claim of functional equivalence is challenged by the tutor. Whoever is right here, the fact remains that, as illustrated earlier, the parity that matters for the actual parity principle obtains not between the Otis-notebook architecture and some extant wholly inner system such as, by hypothesis, Opie's brain, but between the Otis-notebook architecture and a hypothetical wholly inner system constructed *so as to be functionally equivalent to that architecture*. For my own discussion of this sort of issue in a more general ExC context, see, e.g., Wheeler 2011a. One might wonder how Otis would have fared if he had appealed to the actual parity principle. Given his tutor's staunchly internalist proclivities, it is highly unlikely that he would have come out on top.

Aizawa intends this result to cast doubt on the idea that the combination of trust and glue is sufficient for extended cognition, presumably because the cognitive-ability-targeting style of argument that undermines the relevant knowledge attribution also undermines the claim that Otis has the related true dispositional beliefs. As it happens, there is, I think, scope to object that Otis does not in fact meet a plausible rendering of the trust and glue criteria, because there is no historical incorporation of the external resource into Otis's ongoing cognitive activity. In that respect, Otis is less like Otto and more like one of the participants in the saved condition in the second of Sparrow et al.'s experiments as described earlier. Indeed, if there were to be a sustained historical pattern of repeated access to the card storage system, such that the resource did become a fully incorporated part of Otis's ordinary psychological behavior, someone with philosophical inclinations in the direction of ExC might well be inspired to appear on Otis's behalf, if his case went to appeal. In other words, and building on a line of argument introduced earlier, if Otis-plus-card-storage-system really is a case of cognitive extension, as opposed to cognitive embeddedness, then, before he enters the examination hall, extended Otis has a bunch of dispositional beliefs about organic chemistry, with the information that provides the content of those beliefs stored in a resource that is part of Otis's cognitive architecture, even though it is not inside his brain. And that means that extended Otis has used the correct cognitive abilities, viz., those that support committing the relevant material to memory and retrieving and deploying that material in such a way that evidence is provided of understanding, which in turn means that extended Otis deserves credit for believing as he does. Anyone for an appeal?⁸

⁸ A cognitive internalist critic might complain that extended Otis displays only a truncated retrieval ability, one that does not display genuine understanding of the material, which means that he should still fail the test. There are, I think, murky educational waters hereabouts, but in any case I am assuming that answering the test questions correctly, that is, getting the behavior right, will

Even though Aizawa's example is, in my assessment, ultimately inconclusive, both Aizawa's conclusion as I have glossed it (that Otis doesn't accrue the right sort of credit, and so doesn't possess the relevant knowledge), and my own suggestion (that extended Otis does accrue the right sort of credit, and so does possess the relevant knowledge), assume the credit condition on knowledge. However, in the literature that has grown up at the intersection of epistemology and ExC, Vaesen (2011) has also argued, that if ExC is true, then the credit condition on knowledge is false. More specifically, Vaesen's claim is that, in cases of technologically extended cognition, one can have knowledge without deserving credit for truly believing as one does, that is, without the correct application of one's cognitive abilities.⁹

Vaesen's intuition-pumping thought experiment (which I am simplifying slightly to avoid raising issues that need not concern us here) concerns Sissi, an airport baggage inspector operating an x-ray scanner at security. One of the problems of this job is its tedious and demanding nature, which means that inspectors quickly get bored and their vigilance becomes seriously impaired. To combat this drop in attentiveness, and the accompanying risk of a disastrous failure to spot, say, a weapon, the scanners have recently been fitted with new

require some degree of understanding, and it surely wouldn't undermine the extended interpretation if the principal source of that understanding were to be traced to Otis's brain, however it managed to get in there, given his class-cutting lifestyle. ExC requires "only" that the physical machinery of mind is sometimes spread out over world, body *and brain*. For further philosophical reflection on the ways in which the adoption of an extended cognition perspective would have implications for how we educate and test, see, e.g., Pritchard 2013; Wheeler 2011b. In an educational system shaped by ExC, testing is likely to look rather different, which might well be good news for Otis.

⁹ It is worth noting that the credit condition has also come under critical pressure in the mainstream epistemology literature. See, most prominently, Lackey's visitor case (Lackey 2009).

technology that occasionally produces false positives (images on the screen that make it seem as if there's something untoward in the baggage, when there isn't). Baggage inspectors click on the scanner image to find out whether it's a false positive. This technology keeps them focused and alert. Now, Sissi is a baggage inspector whose career straddles both types of scanner, that is, those that existed both before and after the introduction of the false-positive-generation technology. She understands the general operating principles of both types of scanner. We can assume that her neurally located cognitive abilities are constant across this changeover, in the sense that although her vigilance level is modulated by the new technology, no new cognitive abilities have been installed in her brain either during or since the changeover. On a particular day, Sissi inspects a bag that really does contain a gun. Thanks to the new technology, her vigilance level is high, so she forms a true belief regarding the contents of the suitcase, and a disaster is averted.

Vaesen takes this to be a kind of technologically extended cognition, in that the true belief results from the operation of a causally coupled Sissi-technology system (more on this later). Two questions are now pertinent. The first is this: does Sissi know that there's a gun in the bag? Vaesen answers "yes," in part because we ordinarily allow knowledge, and not just true belief, to arise from technologically mediated cognition (e.g., in science). The second question is this: does Sissi deserve credit for having the true belief that there's a gun in the bag? Vaesen answers "no," arguing that the credit lies elsewhere, with the new technology itself or with whoever made the decision to install it. After all, Sissi's cognitive abilities are constant, so (one might think), if this had been a day prior to the introduction of the new technology, she most likely would not have spotted the gun. Vaesen's conclusion, then, is that Sissi has knowledge without credit, and thus that in cases of technologically extended cognition, it is possible for one to have knowledge without deserving credit for truly believing as one does.

Given our interests here, the most important element in Vaesen's Sissi-case argument is the understanding of extended cognition that he adopts. Here is what he says:

[W]hatever we decide the mark of the cognitive to be, [the extended cognition view] contains a fairly uncontroversial (but in epistemology manifestly underplayed) part: the fact that human cognition is strongly dependent on external resources (whether or not we call them cognitive). Some features of the world actively scaffold us in our cognitive endeavors and as such are causally relevant to the kinds of beliefs we happen to have. And as long as [those who endorse the credit condition on knowledge] recognize this, my argument will appear effective. The ultralight version of [the extended cognition view] I will exploit, thus, is supposed to be attractive to a wide audience and sidesteps the conceptual morass surrounding the notion "cognitive." (Vaesen 2011, 521)

Vaesen's "ultralight version" of extended cognition tends to obscure (what I have argued is) a clear and important distinction between embedded and genuinely extended cognition.¹⁰ Put another way, Vaesen rides roughshod over the causal-constitutive distinction. For Vaesen, the condition that is commonly taken to establish embedded, but not extended, cognition (namely the "mere" causal dependence, however subtle, of cognitive outcomes on external technology) is sufficient for extended cognition, in its "ultralight" form. Vaesen is clear that, if we treat the false-positive technology as a constitutive part of Sissi's cognitive architecture, such that, in the appropriate sense, it enjoys cognitive status along with her brain, then the

¹⁰ Points in this vicinity are also made by Adams (2012), Aizawa (2012), Menary (2012), and Palermos (2016), although none of these authors proceeds to draw out precisely the lessons that I do here.

credit condition on knowledge would not be undermined. He writes (Vaesen 2011, 526) that if we “consider the processes going on in the machinery as genuinely cognitive, as belonging to ‘Sissi the extended cognitive agent’,” then “Sissi’s (now extended) faculties remain the most salient feature explaining her true belief, and [the credit condition] is saved.” After all, extended Sissi (organic-Sissi-plus-false-positive-technology) has, and uses correctly, cognitive abilities that organic Sissi doesn’t have. So extended Sissi not only counts as knowing about the weapon, she does so on good credit condition grounds, because her true belief is an achievement of her extended cognitive system that includes the relevant skin-external technology, that is, it is the result of her correctly using her cognitive abilities, where those abilities are understood to be based in a suite of cognitive operations, some of which take place beyond her skin. So Vaesen’s argument actually leaves us with a choice (cf. Vaesen 2011, 526): either adopt ExC as I characterized it earlier in this chapter (that is, as a view which embraces constitutive dependence), in which case the credit condition on knowledge may be maintained, or adopt his ultralight version of extended cognition, in which case (if there are no other good objections to the Sissi example) the credit condition should be abandoned.

Once Vaesen’s conclusion is not only put in terms of a choice, but positioned correctly in relation to the distinction between embedded and extended cognition, then, even if it is true, it has no *direct* implications for the relationship between ExC and the credit condition on knowledge. If the Sissi example can be given a full-strength extended interpretation (see earlier comments on “trust and glue,” parity etc.), then we confront a case of knowledge with credit, while if the Sissi example cannot be given a full-strength extended interpretation, then we should conclude at most that, in cases of technologically *embedded* cognition, one can have knowledge without credit. So far, so good. But what about the prospect of an *indirect* threat? After all, the credit condition is proposed as a *necessary* condition on knowledge, and

if the strict necessity claim is no longer sustainable, because of the result in the embedded Sissi case, one might wonder if the advocate of ExC, along with everyone else, should look elsewhere for an account of knowledge, rather than treat all cases of embedded cognition (of which there are surely a very large number) as exceptions to the general rule.

I suspect that the “strictly necessary” aspect of the credit condition may ultimately need to be relaxed, but that we ought to be able to develop a contextually sensitive account of when credit is needed for knowledge that manages to contain the threat posed by Sissi. To glimpse how this might be done, consider a situation in which an individual forms a true belief by using her smartphone in real time to access a known-to-be-reliable source of information on the Web, and in which the information thereby retrieved is transferred into a neurally encoded form in her brain. In relation to belief-formation, this case, which I am assuming is an instance of embedded cognition, seems to satisfy the credit condition on knowledge. After all, albeit in interaction with smart technology, the individual in question deploys various cognitive abilities—both perceptual and intellectual—in an appropriate manner to form her true belief, and so accumulates credit for having that belief. Indeed, if the remotely accessed resource is socially maintained on the Web, one might think of this as a relatively straightforward form of technologically mediated testimonial knowledge. So what is the difference between this mundane example of technologically scaffolded knowledge and Sissi, such that the former, but not the latter, meets the credit condition? The answer, I propose, is in the artificial details of the Sissi thought experiment. First, there is the crucial feature that, prior to the introduction of the technology, Sissi’s correct use of her cognitive abilities would most likely have failed to produce a true belief. Second, there is the stipulation that Sissi’s neurally based cognitive abilities do not change following the introduction of that technology. There is no reason to think that the mundane kind of technologically embedded cognition that I just described must share these characteristics.

Indeed, the smartphone may simply speed up information access that could conceivably have been achieved using a very similar set of cognitive abilities (such as those for opening and reading a book), and real cases of embedded cognition frequently involve neural resources adapting themselves to exploit the available environmental scaffolding. However, where the artificial features just identified are absent, the credit condition on knowledge is not obviously placed at risk, so even if Vaesen is correct that Sissi provides an example of knowledge without credit, it begins to look as if the range of cases affected will be atypical of knowledge in the wild.

5. Ownership and Credit

In effect, I have been suggesting that there is a positive connection between a cognitive resource being located within a particular cognitive system and the accumulation of epistemic credit for true beliefs that are formed or maintained through the correct use of that resource. It might seem uncontroversial that some sort of relation of this sort must obtain here, but some articulation of what does the work is warranted. Indeed, just such an articulation is, I think, the missing piece of the conceptual jigsaw, and it is with this issue that I shall finish.

As far as I can tell, the concept that we need, in order to make the transition from cognitive status to epistemic credit, is that of *ownership*. This is something that Calvisius Sabinus (remember him) appreciated. Recall that Sabinus compensated for his own poor organic memory by assembling a team of slaves who committed, to their own neurally located memory systems, poetry that they would recite on Sabinus's demand at dinner parties. But here is something that I neglected to mention previously. As reported by Seneca the Younger, Sabinus believed *that if any of his slaves knew something, then he himself also knew it*. As soon as we ask ourselves how Sabinus could possibly have believed this seemingly outrageous principle, the answer seems blindingly obvious: *because he owned the*

slaves (and thus their cognitive abilities), and because ownership is necessary and sufficient for epistemic credit.

There's undoubtedly something suspicious here, but, if I am right, the unreasonableness of Sabinus's annexing of his slaves' knowledge is not to be traced to his belief that ownership is necessary and sufficient for credit. That's what Sabinus got *right*, and in that sense heroically hands us the final missing piece of the jigsaw. Where Sabinus went wrong was that he simply didn't understand what *sort of ownership* is required. So if owning, in the appropriate sense, some correctly used cognitive resource is necessary and sufficient for epistemic credit, and if the appropriate sense of ownership isn't property ownership, what exactly is it? The account that I'm inclined to give is essentially a deflationary (one might even say reductive) one, which, it seems to me, is a particularly attractive strategy where nebulous and ill-understood notions such as "the self" (which might be advanced as "doing" the owning) are lining up to make nuisances of themselves. I propose, then, that ownership here is a matter of the right kind of functional integration—nothing more, nothing less.¹¹

¹¹ There are two senses in which the account of ownership I shall offer is essentially a deflationary account. First, in relation to the epistemology literature, it does not develop the pivotal notion of integration in terms of complex, personal-level notions such as cognitive character and cognitive agency, or even in terms of less demanding ideas such as appropriate (knowledge-conducive) sensitivity between innate faculties (see Palermos 2014 for a version of the former, and Carter and Pritchard (Forthcoming), for the latter, deployed in the vicinity of ExC). Second, in relation to (what I take to be) the most developed account of ownership in the extended mind literature, namely that of Rowlands (2010), my account does not appeal to any sort of robust or undischarged notion of the self. It is also worth mentioning that, unlike Rowlands' approach, it does not assume that ownership is necessary for a resource to be cognitive at all, only that ownership is necessary for a cognitive resource to be someone's cognitive resource.

For a suggestion in this vein, consider Rupert's (2013) claim that "the self is the cognitive architecture, and it owns a state just in case that state is a state of one of the architecture's component mechanisms." According to Rupert, our theorizing about the mind ought to track a distinction, prevalent in the empirical models produced by cognitive psychologists, between the persisting cognitive architecture, characterized by a relatively fixed set of elements with relatively stable relations among them, and a more transient set of causal factors that combine with that persistent architecture to produce intelligent behavior. In Rupert's (2009) view, it is precisely a worked out notion of functional integration that will enable us to track this distinction, via the idea that a component will count as being a component of the cognitive architecture if and only if it meets that integration condition.

To be clear, I am not endorsing Rupert's specific account of integration, which is developed in terms of a formal measure of degrees of interdependence (Rupert 2009). For one thing, Rupert himself takes that notion of integration to divide up the world in such a way that ExC is empirically false, since all the genuinely cognitive components turn out to be body-side phenomena. In my view, Rupert over-emphasizes the importance of persistence and downplays the possibility of dynamically growing and shrinking, but nevertheless, transiently integrated, architectures. With that corrective, ExC is back in the picture (cf. Clark 2011). However, that is a battle for another day. There are alternative accounts of integration to be explored (perhaps developed in terms of less formal "trust and glue" criteria) that do not obviously deliver cognitive internalist outcomes. All I want to endorse here is Rupert's general deflationary approach to ownership in which that epistemically important phenomenon is cashed out in terms of functional integration. If this is right, then we have an emerging picture: functional integration (of the right sort) is necessary and sufficient for ownership (of the right sort), which in turn is necessary and sufficient for credit (of the right sort), which in turn is necessary for knowledge (in the wild). And that is a picture that I have

argued is fully consistent with ExC. In the end, we just needed to see the world as Calvisius Sabinus (almost) did.

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