

Representation: Problems and Solutions

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Abstract

The current orthodoxy in cognitive science, what I describe as a commitment to deep representationalism, faces intractable problems. If we take these objections seriously, and I will argue that we should, there are two possible responses: 1. We are mistaken that representation is the locus of our cognitive capacities — we manage to be the successful cognitive agents in some other, non-representational, way; or, 2. Our representational capacities *do* give us critical cognitive advantages, but they are not fundamental to us *qua* human beings. As Andy Clark has convincingly argued, anti-representationalism, option one, is explanatorily weak. Consequently, I will argue, we need to take the second option seriously. In the first half of the paper I rehearse the problems with the current representational view and in the second half of the paper I defend and give a positive sketch of a two-systems view of cognition – a non-representational perceptual system coupled with a representational language-dependent one – and look at some consequences of the view.

Keywords: representation; representation-hungry problem; consciousness; animal cognition; perception; two-systems

Introduction

The current orthodoxy in cognitive science is that human beings are fundamentally intentional beings, that what makes us uniquely cognitive agents is our ability to think (and talk) about our world. It is precisely this capacity, we generally think, that is at the root of our cognitive superiority to even our closest genetic cousins. But there are deep problems with this view. If we take these objections seriously, and I will argue that we should, there are two possible responses: 1. We are mistaken that representation is the locus of our cognitive capacities — we manage to be the successful cognitive agents in some other, non-representational, way; or, 2. Our representational capacities *do* give us critical cognitive advantages, but they are not fundamental to us *qua* human beings.

The first response should be fairly familiar by now to anyone in cognitive science who has engaged with the arguments from the embodied/embedded camp influenced by the phenomenological work of people like Martin Heidegger and Maurice Merleau Ponty. There is, surely, something deeply right about these views. As Andy Clark has convincingly argued, however, anti-representational positions are explanatorily weak. Consequently, I will argue, we need to take the second option seriously.

Once all the dust has settled, we will see that both camps are partly right and partly wrong: our most fundamental relation with the world *is* an experiential, not a representational one; but, our paradigmatically cognitive

capacities, the abilities that really set us apart from other animals, are our representational ones.

In the course of defending this view, I will argue that we cannot draw inferences about our cognitive hardware from the seemingly representational capacities of our minds, that there are more important lessons to be gleaned from extended mind debates besides metaphysical or conceptual ones about the boundaries of minds, and that clarifying matters and, consequently, carving a path for new, fruitful research, will require a narrowing of our understanding of *representation*, a narrowing that runs counter to recent suggestions from the embodied/embedded approach, with which I have deep sympathies.

In the first half of the paper, I rehearse the problems with the current representational view; in the second, I defend and give a positive sketch of a two-systems view of cognition – a non-representational perceptual system coupled with a representational language-dependent one – and look at some consequences of the view.

Deep Representationalism

The Representational Theory of the Mind (RTM) is the view that a large range of human behaviour is best explained by appeal to reasons rather than, for example, by descriptions of neural activity. Reasons, on this view, come in the form of propositional attitudes, beliefs, desires, fears, and the like, to mental representations. Why did the chicken cross the road? Because it wanted to get to the other side.

RTMs typically take it that *all* mental states are representational: abstract ideas such as *justice*, occurrent thoughts such as *the cat is on the mat*, and perceptions such as *my seeing this flower now*, all count as mental representations. Views might differ about how much conceptual content a given mental representation has, about the way in which perceptions get their representational content, but, the sphere of the mental is taken to be representational through and through. I will call this class of views, Deep Representationalism, DR. Despite much criticism, DR is still the prevailing view in cognitive science today.

One of the challenges facing DR is to produce a naturalistic account of the representation relation, of grounding it in some relation that can be specified in non-intentional terms. This has proved a difficult nut to crack. As C.S. Peirce pointed out in his comprehensive analysis of representation (Peirce, 1998), for something to be a representation it must stand in one sort of relation to the thing it represents and another sort of relation to the interpretation of the signifying relation. Smoke does not mean fire if there is no one around to recognise the relationship between smoke and fire. Giving a

naturalistic account would involve explaining this interpretant relation without appeal to intentionality at all.

Fred Dretske's information theoretic account (1988) is arguably the most comprehensive such attempt we have. On his account, Peirce's triadic relation is compressed into a dyadic one: a state R of a system S is a representation of kind O just in case R nomically covaries with the presence of O's and this co-variance relation explains R's functional role within S. On this view, the bi-metallic strip inside a thermostat *represents* the ambient temperature of the surrounding air because it is by virtue of the strip's physical properties, which nomically covary with the rise or fall in temperature, that it has its functional role, namely, to turn the furnace on when the temperature drops below a certain level and off when it rises above it. In other words, it is in virtue of its *information carrying properties* that it has its functional role. At least this is what Dretske wants to conclude.

As Ramsey (2003) convincingly argues, however, this account is not sufficient to justify our viewing such states as representations. Dretske's story would be a naturalistic account of representation only if R's functional role really were a consequence of the information it carried via the nomic co-variance relation actually used by the thermostat. But in none of the examples that Dretske gives to support his account does he successfully show this. The nomic co-variance relation *is* playing a functional role in these systems, but not *qua* information-carrying relations:

The functionality of the strip is to cause something to happen in very specific conditions. But in this respect, it is no different than many other devices that we ordinarily treat as having no representational function. The firing pin in a gun similarly bridges a causal gap between the pulling of the trigger and the discharge of the round. ... However, no one thinks the firing pin functions as some sort of representational device. (Ramsey, 2003)

More is needed to justify the judgement that one such relation is a consequence of the information it carries, while the other is merely a consequence of the causal conditions that obtain. The mistake, I think, is in supposing there is a difference between the two cases *at all*¹. A central problem for DR views, then, is that thus far there has been no success in providing a naturalistic account of the representation relation. I take this to be a serious mark against such views.

There are positive reasons for being skeptical about DR accounts as well. DR is not entailed by RTM; one can consistently acknowledge that 1. RTM is true — a large range of human behaviour *is* best explained by appeal to mental representations, that 2. Not all human behaviour is best explained by appeal to mental representations, and, that 3. RTM is not reducible to a representational theory of the brain. In other words, one could hold a version of RTM while denying DR.

Or not. Eliminativist Materialism, EM, is a view that rejects RTM altogether, although many of the arguments made from that quarter are aimed at the reality and/or usefulness of higher-level mental representations such as beliefs, desires, and the like. More relevant to the current discussion are the arguments Daniel Dennett offers to fuel his more radical, low-level, eliminativism of representational perception.

Dennett (1991) points out that mainstream accounts of perception illusions, in which perception reports are temporally incongruous with the actual presentation of objects being perceived, all assume a Cartesian theatre in which the sub-processes of the brain come together and either rewrite the past, by altering our memories, or subpersonally reconcile contradictory experiences into one final account before they appear in consciousness. He argues that, since there is no evidence to support either account over the other, we should reject the central workspace hypothesis as explanatorily defunct. Dennett concludes that the real illusion is the Cartesian theatre itself; there are multiple processes ongoing at any given moment and those that win out or 'rise to the top' result in behaviour. Though we might balk at this radical elimination of conscious experience, Dennett's powerful arguments against the necessity of a representational view of perception cannot be ignored.

Finally, many from the embodied/embedded camp in cognitive science have been developing accounts of cognition that bottom out in completely non-representational relations with the world. Antony Chemero (2009), for example, argues that looking for and modelling the ways in which the environment constrains and directs cognitive behaviour is the best approach to developing a comprehensive account of cognition. Detailed dynamical systems analyses are on the rise, showing us that, contra RTM, many factors besides mental representations have behavioural explanatory force. (Noë, 2010; Clark & Toribio, 1994; Beer, 2003; Haken, Kelso, Bunz, 1985)

These anti-representational approaches to cognition find philosophical support in the work of Merleau-Ponty (1945) and Heidegger (1927) both of whom argued that our most fundamental relation with the world is experiential, not representational. More recently, picking up these threads, Hubert Dreyfus (2007) contends that the intractability of a naturalistic account of intentionality should be a clue that any view founded on DR is doomed.

Finally, neuroscientists such as Walter Freeman (2000) argue that even were we to ignore the theoretical stumbling blocks that plague DR accounts, neural activity lacks a fundamental requirement of any representational vehicle: that it serve as a constant, consistent, relation to what is represented. Neural activity is so dynamic, he argues, that there is nothing at the neural level stable enough to play this role.

¹ Practical realists such as Lynne Rudder Baker (2001) take this approach as well.

RTM is Partly Right

Clark, who takes these embodied, embedded objections seriously, and, who agrees with the anti-representational view that RTM is not as explanatorily useful as proponents suppose, nevertheless argues that doing away with representational explanations entirely won't do either. (Clark 1997, 1994). Some problem situations are "representation-hungry:" to solve them agents require information that is not directly available from their immediate environment. Remembering one's credit card pin when paying for groceries, mentally running through possible future contingencies when making plans, feeling regret about past actions, are all activities that require, ostensibly, a capacity for mentally representing a situation to oneself. The anti-representationalist can't explain our ability to successfully solve these representation-hungry problems because those accounts explain all of our behaviour in terms of our direct, experiential relation with our environments. What happens when the relevant environment is not there to be experienced?

Motivated by these considerations, Clark (1997) and Wheeler (2007) have developed a hybrid view in which perception is a kind of action/representation mix, what they have termed action-oriented representation (AOR): sensory-motor loops that develop in certain sorts of situations over time as a result of experience. The fact that these are idiosyncratic to an agent, to its particular sensory capacities, and to its environment is meant to address many of the challenges that traditional, objectivist, representational views face. In particular, the problem of grounding these representations in some direct experience with the environment is met, on these accounts, via these base level, action-oriented, sensory-motor loops.

But, as Dreyfus has recently pointed out (2007), so long as perception is assumed to be a representation relation, whether objective or action-oriented, the problem of intentionality does not go away.

Language and Perception

The perceptual relation, then, must be non-representational. At the very least, the objections to DR militate against an out-of-hand dismissal of this view. But thoroughgoing anti-representationalism, as we've just seen, is inadequate as a comprehensive theoretical framework, since it cannot account for our ability to think and reason and plan.

A nice middle ground view, that accommodates both of these insights, is the hypothesis that language is not a consequence of our innate, representational capacities – this would be a DR view; rather, the development of language makes those capacities possible. Many are developing such accounts.

Clark, for example, argues that language is best viewed as a cognitive niche construction, a tool that "transforms problem spaces in ways that aid thinking and reasoning." (2006). On this view, language is a cognitive resource that complements the capacities of our brains: since our brains are pattern completers, but language has logic-like structure,

language allows us to formulate inferences, make plans, think about tasks in a linear fashion, and so on, all cognitive activities our brains are not very good at doing. "Words and linguistic strings are among the most powerful and basic tools that we use to discipline and stabilize dynamic processes of reason and recall." (Clark, 2006).

More generally, usage-based theories take language to emerge over time "through the interaction of cognition and use." (Ibbotson, 2013; Bybee, 2010; Tomasello, 2003)

From a rather different approach, Christiansen and Chater (2008) argue (indirectly) against DR by rejecting evolutionary accounts of language. Instead, they argue that we should see languages as "'organisms'; i.e., highly complex systems of interconnected constraints, that have evolved in a symbiotic relationship with humans."

Finally, comprehensive accounts such as Terence Deacon (2011) set up a wider theoretical framework in the context of which we can develop the concepts we will need in order to explain the dynamic co-development of language and our representational cognitive capacities more completely.

Precisely what mechanisms underwrite our capacity to develop/use language, how language use yields mental representations, indeed, whether/how consciousness emerges as a result of language use, are some of the core research questions of this new view. As we've just seen, there is already work being done on different aspects of these questions, but the hard problem of accounting for the shift from non-representational perception to language to conscious self-reflection is still more of a chasm than a gap. A good way to begin closing it is by clarifying the nature of non-representational perception, since this is precisely the point at which DR views begin to diverge.

Ironically, one of most compelling positive arguments for a non-representational view of perception is suggested by a debate firmly entrenched in the DR framework. In that context, a distinction is drawn between non-conceptual and conceptual representations: bare perceptions such as *my seeing a flower now* are instances of the former, they do not require a network of concepts in order to be had, while judgements of perception such as *my thought that flower is lovely* are instances of the latter, these do require conceptual scaffolding in order to be had. Various arguments are offered in support of this conceptual/non-conceptual divide, but the one I will mention here, since it also motivates the non-representational position, is the following set of observations and inferences.

The perceptual hardware of many animals with whom we share an evolutionary history is very like our own. It is plausible, consequently, to suppose that our underlying perceptual *experiences* are similar as well. In perception, things in our environment appear to us in certain ways, e.g. apples look red, taste sweet, and sound crunchy. For our evolutionary cousins, though the phenomenal details will vary with the sensory capacities of the animal in question, these perceptual experiences are likely similar. It is implausible, on the other hand, that animals share our concepts — our conceptual capacity, after all, is what sets us

apart, cognitively speaking. Perception, therefore, involves a re-presentation of the sensed features of an animal's environment, but these re-presentations do not require prior concepts: an animal can see a red apple as red without having the concept *red*. (Peacocke 2001A, 2001B, Bermúdez 1998, 1994)

The problem with this reasoning is that it begins the story too high up, at personal-level perception. Not only do humans *engage* in sub-personal perception, we know this from the myriad perception illusions that continue to be uncovered; it is likely that the *majority* of our perceptions are of this sub-personal sort. From this vantage point, taking the features of the relatively small set of personal-level perceptions as the baseline for theoretical analysis seems unwarranted. A more cautious conclusion of the reasoning above would be that we share a sub-personal, non-representational, perceptual capacity with our evolutionary cousins.

Non-Representational Perception

When I perceive something, I am merely experiencing. I am not, as the DR story goes, responding to a representation of my experience. Such an idea takes hold when we take perception to be of a representation on the Cartesian theatre of the mind, rather than a direct relation to something in the world. As Dennett says, "... the brain does not bother "constructing" any representations ... That would be a waste of time and (shall we say?) paint!" (Dennett, 1991)

An example might help make the distinction clearer. Suppose I am faced by an angry, barking dog. Immediately I begin to move away. I don't move away because I've compared my mental representation of this dog with others I have in my memory, because I've concluded that this is a potentially dangerous dog, because I believe that I ought to move away, and so on. I move away from the barking dog because the barking dog is threatening me, or perhaps parts of me, because the situation is compelling me to move away. The experience of the barking dog, which includes my becoming aware of the dog through various sensory channels, the adrenaline rushing through my body, my increased heart rate, and so on, all happen while I am, *at the same time*, moving away.

Merleau Ponty develops many such examples, describing how, in moving, I am also re-orienting myself so that I can get a 'maximal grip' on my situation, that is, be in a position to more accurately perceive what is salient to me now. (Merleau-Ponty, 1945). Dreyfus sums up this non-representational alternative like this:

According to Merleau-Ponty, as an agent acquires skills, those skills are "stored," not as representations in the agent's mind, but as the solicitations of situations in the world. What the learner acquires through experience is not represented at all but is presented to the learner as more and more finely discriminated situations. ... For example, what we have learned from our experience of finding our way around in a city is

"sedimented" in how that city looks to us. (Dreyfus, 2007)

Things are complicated in the human case, of course, because we are *also* language users. Thus, while we are responding to the world in a non-representational, experiential way, *at the same time*, we are responding with the representational capacities we have developed: we can label our experiences with words, we can describe to ourselves and to others various aspects of these experiences, that is, we can analyse them rather than just see them as experiential wholes, and we can reason and plan about better or worse ways of moving away from and toward situations.

Stated in this way, we can see that this account aligns closely with two-systems views of cognition (Butterfill & Apperly, 2013; De Bruin & Newen, 2012; Apperly & Butterfill 2009). Our cognitive capacity includes an older, quick-response, system that we share with many animals — instincts, perceptual experiences, and bottom-up motor responses are governed by this mechanism — and a newer, slow-response, system, unique to humans — our higher level conceptual capacities are underwritten by this system.

On this view, contra the anti-representationalist, we *do* reflect on our own experiences, that is, represent them to ourselves. But, contra the proponent of DR, this is a much more recent cognitive capacity that we've acquired, perhaps as a result of, and with the representational help of, language development.

Of course there are objections to the two-systems view. Peter Carruthers, for example, has argued in a number of different places (Carruthers 2011, 2013) against it, but he does so within a DR framework. For all the reasons against DR I've presented here thus far, we need to explore two-systems views before rejecting them out of hand.

Representation-Hungry Problems Revisited

If our representational capacities are grounded, at least partly, in something external like language, which is the view being suggested here, aren't language-naïve animals who are nevertheless capable of solving 'representation-hungry problems,' clear counter-examples to the claim?

Some ground-breaking studies of scrub jays (Correia, Alexis, Dickinson, Clayton, 2007; Clayton & Dickinson, 1998) show that they appear to be among the hallowed group capable of responding to features of the environment that were once present, but are no longer: they are able to access the "what", "when" and "where" of past experience and thus pass Endel Tulving's litmus test for episodic memory. Not only are they able to remember what kind of food they have cached in a specific location, but they seem to be sensitive to how old the food is as well. More recent studies seem to show, in addition, a capacity for future planning, another aspect of the episodic memory system. (Clayton, Russell, Dickinson, 2009) We know that when humans access this future-directed aspect of episodic memory, they mentally rehearse past actions in possible future situations. Intuitively this seems like a paradigmatically representational activity — we are mentally presenting *to ourselves* possible situations.

If the way in which scrub jays manage this future thinking is similar to this, then they must also have a capacity for representation. Or so such reasoning goes.

But on the view of perception I am exploring here, experience is *not* a representational activity. If that's the case, then re-experiencing past experiences shouldn't be seen as a representational activity either. That is, to re-experience what happened in the past or what might happen in the future is, at base, to experience, however the experiences are caused. A scrub jay is compelled to move this way rather than that way, to dig here rather than there. Nothing in this ability requires that we adduce a representational capacity, though it does of course require some form of memory, which need not be seen as a representational capacity either. When we talk of 'body memory', for example, we mean quite explicitly the sort of memory that does not require representation.

Representation-Hungry Problems Refined

Seen in this way, rather than serving as a counter-example to the two-systems view being explored here, the example of the scrub jay shows us that not all seemingly representation-hungry problems need be solved in representational ways. Consequently, we might rename the category more perspicuously to "experience or memory-hungry" problems and refine the original representation-hungry category to include only those problems whose solutions require the *explicit* use of representations, not just past learning. But if recalling past experiences does not require representation, what does we might wonder.

Arguably one of the greatest advantages of a capacity for representation is the ability it entails to reason in the absence of emotionally charged situations. Indeed, it is precisely when we seem incapable of rising above the emotional challenges of a particular situation, that we need such tools most. Representations, because they are stand-ins for the situations or things they represent, are stripped of the contextual details we experience in perception. In other words, representations, such as the thought, *the cat is on the mat*, are amodal in a way that perceptions are not: entertaining the thought, *the cat is on the mat* feels differently from actually seeing the cat on the mat. Some recent studies demonstrate that access to amodal representations allows an agent to make choices, maximising ones, that would not otherwise be possible.

Reverse Contingency Tasks are a set of problems that require agents to make a choice on behalf of some other agent; the choosing agent then receives whatever is left over. In standard tasks, a choice is offered between large and small groups of desirable objects, e.g. bananas or candies. When a very desirable selection is placed in front of an agent, it is very difficult for the agent to overcome the pull to pick the largest group. But picking the largest group is not maximising since the choosing agent ends up with whatever was *not* chosen, namely, the smallest group. Studies have shown that when the same task is repeated with tokens (that the subjects have been trained to associate with the relevant class of desirable objects) rather than the objects themselves,

both chimpanzees (Boysen et al. 1996, 1999) and capuchin monkeys (Adessi and Rossi 2011) are able to maximise their own reward more consistently.

These studies demonstrate a clear cognitive advantage to being able to reason in this aloof way: agents are able to make better long-term decisions for themselves when they have a tool for over-riding their quick-response, perception-based, primary cognitive system. There are many other contexts we could describe in which this ability confers an advantage, but due to space considerations, I will leave that for another paper.

Conclusion

As with any new theory, old questions disappear and new ones emerge: here is a brief look at some of the interesting changes that flow from this view.

The biggest payoff of this two-systems account is that it makes the problem of intentionality go away. Perception is not representation, so there is nothing to *naturalise* there. Thinking about and talking *are* representational activities, but their representational aspect derives from language itself: words and sentences are, paradigmatically, symbols.

New theoretical scaffolding will be required at the neural level: if our fundamental relation with the world is an experiential, not a representational, one, neurons can no longer be seen to 'represent,' 'detect,' or 'mean' anything at all. This is a radical shift, at the level of description and interpretation of results, for neuroscience.

At the level of language, our understanding of how and why it developed will change as well. On the DR framework, it is natural to see language development as growing out of our desire to communicate our rich, internal representational lives to one another. But when we let go of this Cartesian picture, we also let go of this communication motivation for language. Researchers are already working on developing an alternative view of why and how language developed in the first place, but there are many directions we might fruitfully explore.

One sign of a good theory is that it yields new questions that open up new lines of research. There isn't space here to discuss any of these in detail, but here are just a few of the less obvious avenues of inquiry that seem to open up once we shift from DR to this hybrid view:

- What role, if any, does language learning play in the development of 'self'?
- Does level of literacy co-relate with amount of time spent in self-reflective thought?
- If language is a tool that makes thinking *about* and talking possible, how much of our mental life is a result of an *overuse* of this tool? We know that overuse of our modern social media technologies, for example, can decrease one's capacity for mental focus. Perhaps some of the features of the contemporary human mind are side-effects of overuse of the language tool? An inability to be present to experience, which in turn can lead to many emotional and psychological problems such as depression, existential angst, feelings of loneliness, might be fruitfully explored from this angle.

— Following from the previous thought, we might investigate the effects of meditation as a cognitive enhancing technique from a new perspective: mindfulness meditation might be such an effective skill to develop, not because it yields a new state of awareness, but because it brings us back into touch with our experiential relation with our environment, an awareness we are capable of pre-language, but that is generally over-ridden by our representational system. On this view, language is the boon that makes this deeper awareness possible, but it is also the bane that makes meditation as an ongoing practise necessary. Meditation teaches us how to keep the flood of words and thoughts where they are — out there — and frees us from their bondage.

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