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Closing the Representational Gap: An Embodied-Enactive View of Narcissistic Representational Systems

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Closing the Representational Gap

An embodied-enactive view of narcissistic representational systems.

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Abstract

According to tracking theories of mental content, the world we conceive is determined by the world we perceive, and the world we perceive is determined by the mind-independent world *as it is*. This view is challenged by Kathleen Akins on the grounds that our sensory systems are narcissistic, i.e., they have narrow operational interests and are largely unconcerned with representing objective reality. Yet, if what we conceive is not a veridical representation of the world, how is object-guided action in the world possible? This disconnect is the "representational gap". This paper will close this gap by arguing that Akins' concept of narcissism can be extended to describe all non-sensory mental objects: what we conceive is a product of what we perceive, but what we perceive is constrained and determined by what we are (i.e., our morphology) and what we can do (i.e., our potential for action in the world).

1 Introduction

Consider a busy marketplace. A direct realist account of mental content claims that sights, sounds, smells, tastes and tactile sensations are available to awareness unmediated; we see, hear, smell, taste and feel the marketplace *as it is*. While this is intuitive, an increasing amount of contrary empirical evidence has resulted in this no longer serving as the received view of the natural sciences. An alternative explanation is the representational theory of mind: our sensory systems are like finely-tuned recording/measuring devices that track external objects and transform this sensory data into internal stand-ins, conceptual representations, which serve as the basic constituents of thought, i.e., beliefs and propositional attitudes.[1] This places our awareness one step away from the world as it is, while still granting us indirect access to it. "Tracking theories" of mental content characterize concepts both in terms of their direction of fit and their direction of causation; concepts are mind-to-world insofar as they fit the properties of the external objects they represent, and concepts are causally world-to-mind insofar as they are produced by objects and events in the world [1]. By tracking objects and events, our percepts grant us reliable, structure-preserving, and unbiased access to the world as it is, which in turn facilitates the formation of stable, ordered, uniform concepts. Following Kathleen Akins, we shall hereafter refer to this description of our representational disposition as the "traditional view".

In her paper "Of Sensory Systems and the 'Aboutness' of Mental States" [2], Akins challenges the "traditional view" on the basis that our sensory systems do not furnish the sort of information the view assumes and requires. Rather than being recording and measuring devices, at least some sensory systems are narcissistic, which is to say they have narrow operational interests that do not include representing the external world veridically. Any philosopher with naturalist inclinations may be tempted to defend the "traditional view" by presenting examples of the property-tracking relations produced by our visual system;

[1] Some accounts view both sensory data and the mental content they produce as types of representations, differing only in form and function, and to distinguish them, the former are referred to as "percepts", and the latter, "concepts". This is the convention that shall be employed in this paper.

our visual system is like a little camera, they might say, and our mental representations are the photographs it produces. Yet, if Akins' analysis of narcissistic thermoreceptors can be extended to vision (subsection 2.4, subsection 2.5, subsection 2.6) this would demonstrate that both the "little camera" view of vision, and the "traditional view" of representation more generally, are untenable.

This pushes awareness back another step, since we are no longer in direct contact with the world and even our indirect representations of it are not necessarily trustworthy. How can we form seemingly reliable concepts about an external world we are unreliably connected to through narcissistically-generated percepts? Our behaviour in the external world — to say nothing of the success of the empirical sciences — appears to confirm the "traditional view" of mental content, but if our sensory systems are narcissistic, a new account must be deployed to explain how meaningfully reliable action is possible. The disconnect between the external world and our internal representations of that external world is what we shall refer to as the "representational gap".

One solution is to generalize Akins' views on sensory systems such that it applies to conceptual systems as well. This paper will argue that our conceptual representations seem stable, ordered, and uniform as if they represent the world *as it is* because of what we are (we are embodied) and what we do (we are enactive). This move seeks to close the "representational gap" by explaining how we can reliably interact with the external world relying solely on narcissistic sensory systems. After laying some groundwork regarding Akins' theory (section 2), and fleshing out the exact nature of the "representational gap" (section 3), two arguments will be presented to support the notion that our conceptual systems are narcissistic: a) they are dependent on percepts that are narcissistic (section 4), and b) they are narcissistic in and of themselves (section 5).

2 Narcissistic Sensory Systems

As narcissists, sensory systems shape their reports on sensory stimuli based on self-interested parameters without a view to the objective state of the world, hence they are not reliable, structure-preserving, or unbiased (or "servile"). Akins presents thermoreceptors as an example of such a narcissistic sensory system [2, 345-352] and what follows is a synopsis of her account.

Though we might be tempted to treat our thermoreceptors as little thermometers, the system is far more complex. Our temperature sensations are registered by four receptors: two thermoreceptors that are triggered by both cool and warm middling temperatures, and two nociceptors that report indistinguishable pain responses at very high or very low temperatures. As we shall see, the operation of the thermal sensory system is such that it does not appear to conform to the criteria defined by the "traditional view".

2.1 Thermoreception: Reliability

Our sensations of cold or warmth do not reliably covary with absolute or changing temperatures, and different sorts of thermal sensations can be produced by identical absolute skin temperatures. This is due to the fact that the number of receptors varies across the body — the nose has a 8:1 ratio of cold to warm receptors compared to the lips, which bear almost exclusively cold receptors — and therefore some parts of the body are more sensitive to both static and dynamic temperature. Moreover, individual receptors report as a group, such that in locations featuring more cold receptors, cold is more acutely felt, and conversely, in areas with few cold receptors, cold is barely felt at all.

Imagine immersing one hand in hot water and one in cold water, in Lockean fashion, and then after a period of time, placing both in lukewarm water. Were thermoreceptors reliable, they would report the same temperature in both hands, and yet the hand previously immersed in cold water feels warmer when it is immersed in lukewarm water. Our "little thermometers" have failed to reliably track temperature changes in the world, but for good reason: rapid temperature changes are dangerous to biological organisms, regardless of the absolute temperature involved, and so it makes adaptive sense for our sensory system to register potentially dangerous thermal changes rather than simply registering the absolute temperature.

2.2 Thermoreception: Structure-preserving

"Structure-preserving" may be thought of as a relation whereby some configuration in the world (e.g., change along a continuum) is mirrored by some representation of that configuration. If thermal sensations were structure-preserving and you were to slowly lower yourself into a tank filled with cold water, you would feel a uniform decrease in temperature. Given that the absolute temperature decrease on the soles of your feet (sensed as stimulus S_1) would be the same as the temperature decrease on your abdomen (sensed as stimulus S_2) we should expect both S_1 and S_2 to produce equal cold sensations, and yet, due to differences in the distribution and concentration of cold thermoreceptors, this would not be the case, as anyone who has ever slowly slipped into a frigid lake can attest.

Additionally, if thermoreceptors were structure-preserving, a linear increase in temperature would result in a linear increase in a thermoreceptor's firing rate. As it turns out, cold receptors feature an elliptical static response function such that very low temperatures and very high temperatures (for the range of temperatures they are capable of sensing) prompt similar firing rates. In other words, cold receptors are highly excitable at both ends of the continuum without distinguishing the structure of change along the continuum. Even though this effect is muted for warmth, it is still the case that thermoreceptors are not as structure-preserving as we should expect under the "traditional view".

2.3 Thermoreception: Servility

Lastly, our thermoreceptors should be servile and present an unbiased picture of the thermal status of the environment to higher level processors for analysis. Are our thermoreceptors like this? It seems not. Both low temperatures for cold receptors and high temperatures for warmth receptors produce wildly exaggerated responses. This is also true for different locations on the body; for example, cold temperatures are acutely felt in the head more than in the feet, as it is in the survival interest of the organism to react swiftly to threats to sensitive organs such as the brain. Due to their functional role in preserving the organism as a whole, thermoreceptors are less interested in reporting "it is *this* cold up here" and more interested in reporting "it is *too* cold up here".

We might grant that thermoreception is narcissistic without accepting that this undermines tracking theories. We might suggest that thermoreception seems like too niche a sensory system to provoke general worries about the reliability of sensory representations. If narcissism was true of vision, however, Akins' argument would have wider applicability. Is vision reliable, structure-preserving, and servile?

2.4 Vision: Reliability

A lack of "reliability" (in the sense we have been using it) does not mean that our sensory systems are uniformly false, only that they fail to consistently represent the world as it is objectively. Vision is often exalted as the sense we depend on most for representing the world internally, and yet there is good empirical evidence to suggest that much like thermoreception, it is capable of distortion. This section will briefly focus on illusion as the prototypical case for vision's lack of reliability.

The Argument from Illusion argues that the direct realist view of the world, "what you see is what there is", must be deeply mistaken. The canonical example is that of the bent stick: immersing a stick in a water-filled glass may appear to bend the stick, and the perceptual representation formed as a result of seeing the stick is one of a bent stick, but this is not a reliable depiction of the state of the stick [3]. Illusions such as this one, and the Müller-Lyer Illusion — the addition of arrowheads or "fins" can make equal lines appear unequal — demonstrate that vision does not always accurately reflect the external world, and under certain conditions it returns falsity rather than truth.

Even seemingly basic percepts such as colour are subject to widespread distortion, such as in the case of illuminant metameric failure. This effect can occur when two objects, say a pair of coffee cups, colour-match under a set of incandescent lights but fail to match under a set of fluorescent lights due to the latter's spectral emittance curve. Metameric failure can even occur under "normal lighting conditions" between observers with "normal vision" due to the yellowing of lens in the human eye resulting from individual physiological differences or age [4]. As a result, a single coffee cup may be perceived as slightly different in colour by two different perceivers, or a single perceiver at different ages. If we cannot reliably identify the colour of an object using some objective critieria — or if colour is not a reliably sensible property at all as some colour theorists claim — this is a problem for the "traditional view".

2.5 Vision: Structure-Preserving

If vision were strictly structure-preserving, we would expect the arrangement of objects in the external world to be mirrored by our visual representations. Numerous studies, however, show that this is not always the case. These visual distortions are similar to those presented in the previous section, but have the added quirk of being triggered in a top-down manner by a representation-bearer's pre-existing internal states. "Top-down" processing occurs when non-sensory states or representations influence perception, and is distinguished from "bottom-up" processing where stimuli passively shapes representational content. This form of illusion is a particular form of narcissism that will be revisited in later sections, but for now it is enough to note that it causes our representations of the external world to be structurally inaccurate. For example, our visuospatial representations for grade and distance can be skewed based on non-visual information in the following ways: a) patients with chronic pain perceive distances while walking to be greater than controls [5], b) perceived distance is exaggerated for an individual carrying a heavy load [6], c) the geographic slant of hills are perceived as steeper when fatigue sets in [7], d) the perceived distance to the ground when standing on a balcony is influenced by one's fear of falling [8], and e) novel contexts can cause people to misperceive their ability to reach an object by affecting internal simulations of the action [9].

2.6 Vision: Servility

Top-down mediation of visual perception is also a problem for the servility of our visual system. For example, it has been demonstrated that an individual's perception of coin size can be influenced by the coin's value to the individual [10]. The value of the coin is not, strictly speaking, a fact about the external world, and yet it is perceived by individuals as if it were. One explanation for this effect is that if vision is narcissistic, it will overrepresent valuable objects in the environment to increase the chance they will be noticed. Though two individuals may observe the same object, their phenomenological experience (the subjective "what it is like") may differ; this may be because our brain translates sensory representations into conceptual representations while adding or dropping properties based on our affect or the object's unique emotion salience for us [11].

Expertise also has an effect on perception: softball players with better batting averages perceive softballs as larger, children who are better at throwing balls at a target perceive the target as larger, and tennis players with a higher return rate see the net as lower [12]. These top-down results challenge the notion of vision as servile; if our visual system was servile, we would expect it to behave in a purely bottom-up fashion, returning exclusively unbiased information about the external world.

If our sensory systems are supposed to be reliable, structure-preserving, and servile, but this is not the case, how is it that we are able to make our way in the world? Surely these three criteria are critical for stimulus-response behaviour, without which, humans could not thrive, let alone survive.

3 The Representational Gap

It certainly seems like our internal representations reliably coincide with the external world, but if our sensory systems are narcissistic, that relation cannot be direct. If visual perception is not like a little camera, how can we account for the ostensibly high-definition concepts we have in our head? Imagine a cup on the table in front of you; the cup may be quite ordinary, but the fact that the conceptual representation <CUP> exists at all is undeniably remarkable. <CUP> has an associated colour that appears stable even if its surface reflectance varies wildly depending on ambient lighting or subtle lens colouring (i.e., colour constancy). <CUP> relies on the fact that although it radically transforms as you alter your perspective, it has a stable shape (i.e., shape constancy). <CUP> relies on your understanding that this particular cup shares some type-token relation with other similar cups in your cupboard, and it relies on the fact that you believe those other cups to be in the cupboard even though you cannot see them at the moment (i.e., object permanence). This "ability to impose stability, order, and uniformity upon a conception of the world" [2] is what Akins refers to as the "ontological project". In contrast, our sensory systems have very specific tasks (the "sensory-motor project"), none of which seem to account for the vast and complex ontology stored as conceptual representations [2]. In other words, we cannot explain our concepts using our percepts. We might call this the "representational gap" and it seems, at first glance, intractable.

If pushed to explain why our sensory systems seem like poor cameras but our concepts seem like the equivalent of high-definition photographs, we may simply deny that the latter is true. Rather, we might claim that conceptual systems are narcissistic as well and the high definition is illusory; our concepts are satisficing (Herbert Simon's "good enough" [13]) but because they serve us well, we assume they are perfectly veridical. Collectively, our sensory systems have a specific task, which is delivering information to our motor system to facilitate approach-avoidance behaviour [14]. Thermoreception and vision are not little thermometers or little cameras and are not interested in reporting the outside world per se, instead they are exclusively tasked with reporting certain objects and events that correspond to their organism's biological requirements. This sort of narcissism may be defined as both: a) embodied, in that our sensory systems are primarily egocentric and morphological, and b) enactive, in that our sensory systems are primarily concerned with facilitating interactions with the external world. Percepts, the representations generated by our sensory systems, may be narcissistic, but how might we argue that our concepts are also narcissistic? There are two arguments for this position: we might argue that our conceptual systems are narcissistic because of their dependence on narcissistic sensory content (the Extrinsic Argument) and/or because they are embodied and enactive like our narcissistic sensory systems (the Intrinsic Argument).

The Extrinsic Argument (section 4) states that if concepts are grounded in percepts which are narcissistic, we should expect the former to be narcissistic as well. The unstated (but hardly controversial) premise in this argument is that a system is narcissistic if its content is narcissistic, and vice versa.

P1. Sensory systems are narcissistic.

P2. Conceptual systems are grounded in sensory content.

C1. Therefore, conceptual systems are narcissistic (from P1,P2).

The Intrinsic Argument (section 5) states that a narcissistic conceptual system does not need to be reliable, structure-preserving, or servile, only tuned for action some representation-bearer may take in the world (i.e., enactive) and based on both the nature and environment of that representation-bearer (i.e., embodied).

P1. To be narcissistic, our conceptual systems should be:

a) embodied, and b) enactive.

P2a. Conceptual systems are embodied.

P2b. Conceptual systems are enactive.

C1. Therefore, conceptual systems are narcissistic (from P1, P2a-b).

4 The Extrinsic Argument

The claim that sensory systems are narcissistic (Premise 1) can be demonstrated by the fact that some of our sensory systems do not conform to the "traditional view" because they are neither: a) reliable, b) structure-preserving, nor c) servile (as per section 2).

Grounding our conceptual representational systems in sensory content (Premise 2), however, requires a dependence relation between the system that generates percepts and the system that generates concepts. The exact nature of this relation is beyond the scope of this paper but for the Extrinsic Argument to hold, the relation need only be such that the content of concepts be reliant on the content of percepts. This could mean that concepts are related to perceptual data (i.e., "weak dependence") or that concepts simply *are* repurposed perceptual data (i.e., "strong dependence"). Either the weak or the strong dependence relation will suffice, so it is worth examining empirical evidence supporting both versions.

4.1 Weak Dependence

For a weak dependence relation to exist between percepts and concepts, we must be able to show that our concepts are, in some way, influenced by our sensory systems. This is an intuitive position for the tracking theorist, since they have already committed to the notion that our sensors connect us to the external world. The compromise they would have to make is in the type of relation that holds between our representations and objects and events in the world, since they cannot claim it is the relation suggested by the "traditional view". If the weak dependence can be demonstrated, then concepts should import many of the narcissistic qualities of the percepts on which they depend. A concept even partially reliant on narcissistic percepts would close the "representational gap" such that the external world as we perceive it could achieve a degree of parity with the internal world as we conceive it, all through sharing some mental content.

In two experiments conducted by Intons-Peterson and Roskos-Ewoldsen [15], participants were asked to imagine carrying either a cannonball or a balloon as they mentally traversed a novel or known map. Their results argued that our concepts carry sensory information such as "size, weight, color, uses, kinesthetic properties of hefting it" [15] and are partly defined by it. It seems natural to assume that our concepts would carry sensory data in this manner, but if this is true, then our concepts carry *narcissistic* sensory data with all the embodied-enactive distortions that implies.

These percept-concept relations are thought to begin at a young age. It is theorized that infants derive concepts such a "animacy, inanimacy, agency, and containment" [16] from their earliest perceptual experiences, and that this allows them to form "image schemas" to connect percepts of the external world to concepts in language. An image schema is a dynamic (i.e., they occur across across time), multimodal (i.e., they involve various sensory modalities) conceptual construct that represents patterns of interaction such as the spatial relations reflected in our concepts of <IN> and <OUT>. For example, image schemas for momentum can affect how we form concepts across a number of modalities: the collision of heavy objects informs and is informed by visual momentum; the transport of heavy objects informs and is informed by kinesthetic momentum; the melodic expectation created by crescendo [17] informs and is informed by auditory momentum. In this way, conceptual representations of "momentum" are reducible to sensory representations [18].

4.2 Strong Dependence

In subsection 2.6 we demonstrated that concepts could affect the processing and generation of percepts through top-down mediation. This section will show that the tracking theorists' intuition about bottom-up processing — our representations are about what we sense in the world — is not mistaken, it is simply incomplete. If our representations, both perceptual and conceptual, mediate each other in top-down and bottom-up fashion, perhaps the distinction is illusory. Strong dependence of the type argued for here claims that conceptual representations are of a kind with perceptual representations, and that the difference is in use.

Lawrence Barsalou's theory of "perceptual symbol systems" suggests a way in which concepts are grounded in sensory systems while also forming a representational system that spans both the perceptual and the conceptual. On this view, concepts are based in physical, sensorimotor experiences, such that "to represent the concept CHAIR, neural systems for vision, action, touch, and emotion partially produce the experience of a particular chair" [19]. If our sensors are narcissistic, and our concepts are perceptual symbols realized in "interaction simulators" where possible actions are tested, our concepts will be narcissistic necessarily. Moreover, this model would account for many of the cognitive processes we believe underlie conceptual representation, e.g., type-token and propositional relations, categorical inference, productivity, and other abstracta [20]. Our "representational gap" is closed by virtue of being labelled a misleading dichotomy in the first place; representations arising from our sensory systems are repurposed in simulators to produce concepts but they are only distinct in source and function, not content.

Whether or not we choose to be motivated by the arguments for weak or strong dependence, there is good reason to believe our concepts are related to our percepts in such a way as to make narcissism a thoroughgoing phenomenon in our representational systems.

5 The Intrinsic Argument

Another way to argue for the narcissism of conceptual representation is to explain the system in terms of its function. The narcissism of the sensory systems we have reviewed (section 2) are embodied and enactive, so perhaps our conceptual representations will have these traits as well.

5.1 Conceptual Representations: Embodied

While the term "embodied" covers a wide variety of related schools of thought, the common thread is a view of cognition that emerges from treating the brain and the body as a cohesive unit. Put another way: "cognition is not represented in terms of propositional and sentential information but is grounded in and structured by various patterns of our perceptual interactions, bodily actions, and manipulations of objects" [18, 1192]. If our conceptual systems are embodied in this way, we should expect representational content to be both generated and constrained by the state and/or nature of the body in which the system operates. Our conceptual representation <CUP>, for example, "would be the kinds of experiences we have had, are now having, or might someday have, with that sort of thing" given the type of body we have [21, 5].

If concepts are embodied, they should apply equally well to more abstract things such as mathematics and logic. Mathematics, according to Lakoff and Nunez [22], can be understood as a series of conceptual metaphors that are a product of human interaction with the world: arithmetic is object collection, geometry is objects in space, change is motion, sets are containers, and even numbers themselves can be represented as points or line segments. Likewise, logical principles such as transitivity can be thought of in terms of bodily interactions with containers; if an individual puts tea in the cup and puts the cup in the microwave, the tea is also in the microwave, or more formally: if object T is in container C_1, and container C_1 is in container C_2, then T is in container C_2 [21, 6].

5.2 Conceptual Representations: Enactive

If conceptual systems are enactive, we should expect them to express and be expressed as action possibilities. For example, the representation <BALL> may carry different content depending on the situation in which <BALL> and <BALL>-bearer find themselves. <BALL> in a high school gymnasium may carry content pertaining to its bounciness, whereas <BALL> in a shipwreck may carry content pertaining to its buoyancy. This is, obviously, a limited example; in real world scenarios, the representation <BALL> would include some representation of the environment and other relevant objects (e.g., ball & gym & hoop or ball & water & ship). These conjunct representations fit within a larger representation, a mental model, that allows for simulations to be run on action possibilities. Mental models are one way in which representations may be characterized as enactive, but there is significant overlap with other enactivist accounts. What follows is a brief review of three similar accounts: mental models, simulators, interactivism.

While there is no consensus in the literature as to the precise nature of mental models, but they are generally defined as: limited and composed of incomplete facts, dynamic and transient, and capable of selectively influencing perception. Each model is an individual or set of conceptual representations that simulates relevant interaction possibilities so that consequences can be evaluated and actions selected [23]. As we would expect from a narcissistic system, mental models are "reality reductive" in that they pare the external world to the core that is relevant to the representation-bearer.

Building on the notion of a mental model, simulation accounts of representation are a class of theory that describes concepts as the product of simulations, as with Barsalou's perceptual symbol systems [19]. Simulations may be actions (e.g., <CUP> may include simulations of drinking from a cup), perceptions (e.g., <CUP> may include simulations of seeing a cup), or anticipatory behaviour (e.g., <CUP> may include simulations of carefully picking up a cup filled with hot tea) [24]. These simulations are built from conceptual representations but activate the same areas in the brain as the actions, perceptions and behaviour, and so are directly related to the representation-bearer's perceptual state, physical state and physical environment.

The interactivist model of representation is an account that can be said to draw upon mental models and simulators. According to this theory, concepts emerge from action selection in biological systems; organisms conceptually represent due to the fact that environments require action, and actions necessarily involve the anticipation and evaluation of action outcomes [25]. For example, an individual seeing a cup may represent <CUP> as: i) grasping, ii) lifting, iii) drinking; an individual seeing a cat may represent <CAT> as: i) approaching, ii) reaching, iii) petting. If these interactions generate competition, they may be internally simulated, and the action set with the most desired outcome will be selected.

Thus, if our conceptual systems are embodied (Premise 2a) and enactive (Premise 2b) like our sensory systems, we may help ourselves to the conclusion that they are narcissistic like those systems. If both systems are narcissistic in the same manner, the "representational gap" is closed; our concepts can represent the external world usefully using narcissistic sensors because their goals are one and the same: move the representation-bearer towards positive stimuli and away from negative stimuli.

Conclusions

The goal of this paper has been to restore parity between what you perceive and what you conceive while accounting for the fact that neither perfectly mirrors what there is in the external world. This "representational gap" demands we reframe our understanding of conceptual representations: to close this gap we must move from concepts that are amodal symbol strings that represent objective reality to concepts that are narcissistic, embodied and enactive. If we accept that concepts are narcissistic by weak or strong dependence on narcissistic sensory systems — or narcissistic in their own right — this reframing can be supported by a healthy amount of empirical research. The solutions presented in this paper are not the only possible solutions for closing the gap, and many questions still remain, including: which embodied-enactive account best captures the narcissism of our representations? What are the neural mechanisms and substrates involved? How does an account of embodied-enactive representations fit into the wider literature of mental representations? Despite these lingering questions, there is something satisfying about the conclusion that our internal representations need not account for all the external facts, just the facts that prove adaptive. In summary: what you see is what you get, but what you get is not necessarily what there is; what you get is about what you are and what you can do.

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