1 - Introduction

One challenge for the representationalist is to offer an approach to representation that can legitimatize explanatory appeals that cognitive science makes to mental content. On a standard way of thinking about how this challenge can be met, a theory must show how representational content can play a causal role in producing behavior. Recently, some philosophers have promoted structural representations, representations whose content is grounded in the structural features of their representing vehicles (Opie & O'Brien, 2004; O'Brien, 2016; Gladziejewski & Milkowski, 2017; Lee, Forthcoming), as an approach to representation that can endow semantic content with a causal role unavailable to other theories. Structural representationalists argue that all alternative approaches to representation must appeal to how a representation is used to ground content, and that, in failing to ground content in the structural (or, intrinsic,) properties of representing vehicles, these “use” theories of representation cannot account for how representational content can be causally efficacious.

In this paper, I will argue that structural representations are susceptible to this very same critique. This, I claim, isn’t surprising given that a theory of structural representations turns out to be just as much a use theory as alternative approaches. I will begin by briefly laying out the purported differences between structural representations, henceforth s-reps, and those posited by use theories, henceforth u-reps. Then, in Section 3, I will explain the causal efficacy critique against use theories. I will not defend u-reps against this critique. Rather, in Section 4, I will argue that structural representationalists, because they too appeal to use in fixing representational content, are, by their own lights, unable to explain how content can be causally efficacious. I will not attempt to resolve the question of what conclusions we ought to reach about the relative explanatory strengths of u-reps and s-reps. My goal is more modest. I aim only to establish
that, insofar as they each invoke use, u-reps and s-reps are equivalent with respect to their explanatory power.

2 - Structural Representations and Use Representations

Structural representationalists claim that A represents B only if A resembles B. A paradigm instance of a structural representation, henceforth an s-rep, is a map. Intuitively, a map of Madison, WI represents Madison, WI in virtue of the fact that the map resembles Madison. More specifically, the relationship between points on the map preserve the spatial relationship of locations within the city, e.g., greater distances in the former correspond to greater distances in the latter, and vice versa. Accounts differ on the nature of the resemblance relation A must bear to B, some requiring a strict isomorphism, and others allowing for a more liberal first- or second-order structural resemblance.1,2 In a familiar example, the curvature that a thermostat’s bi-metallic strip displays corresponds to ambient temperature: as ambient temperature increases, the curvature of the strip changes. The changing curvature of the strip resembles changes in temperature in virtue of a second-order resemblance – a correspondence between different kinds of relations. For my purposes, not much will hang on these distinctions, and so from here on out I will simply refer to the relation of structural resemblance.

For structural representationalists, the most salient feature of s-reps is that there is a non-arbitrary relationship between the semantic content of the representational state and the intrinsic properties of the representing vehicles underlying that state (Opie & O'Brien, 2004). While the resemblance relation is, of course, extrinsic, it is in virtue of the intrinsic properties of the representing vehicles that the relation obtains. In contrast, structural representationalists claim that all other theories

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1 While an isomorphic relation preserves a one-to-one mapping between all of the objects in a set, A, with all of the objects in a set, B (and vice versa), structural resemblance requires only a mapping of some members of A to some members of B.
2 In a first-order structural resemblance, the representing vehicles must share physical properties in common with their represented objects. However, in a second-order structural resemblance, it is only required that the relations among a system of representing vehicles mirror the relations among their objects.
of representation posit an essentially arbitrary relationship between the content of representational states and the intrinsic properties of the representing vehicles. Oversimplifying, on alternative approaches, the content of a representational state depends on, for example, how that state was caused or what it carries information about (Fodor J., 1990), whether some system has the function of producing (Dretske, 1988) or consuming (Millikan, 1984) that state, etc. Consider the (in)famous example of the state of the frog’s visual system that leads to tongue flicking. What makes it the case that this state has the content FLY is that its tokening is caused by flies, or because its tokening carries information about flies, or because the state was selected for tracking flies, etc. Notice that on all of the above content fixing relations, it makes little difference what the intrinsic properties of the representing vehicles are, except insofar as those properties are not incompatible with the vehicle meeting the relevant job description. These differences between the content endowing relations of s-reps and u-reps are what structural representationalists argue leave proponents of use theories without the resources to explain appeals to mental content in the cognitive sciences. In the next section I will explain this critique.

3 – Use Representations and Explanation

Representationists generally agree that contents ought to be causally efficacious. If not – if content does not do anything – then the following explanations would be false: the frog snapped at the fly because the content of its visual state was FLY; the bi-metallic strip turned on the furnace because it registered the temperature to be 68º. Therefore, if appeals to content are to play a scientifically respectable role, representational content must be causally efficacious. Call this the causal constraint on representation (Opie & O'Brien, 2004, p. 2). To meet the causal constraint it must be the case that the specifically representational properties of a state are causally efficacious over and above its physical properties. Consider, again, the frog which snaps its tongue at a fly, and let’s focus on a cell in the frog’s visual system. Activation of this cell causes the frog to flick its tongue at passing flies. Notice that this claim differs from the following: the cell’s having the content FLY causes the frog to flick its tongue at passing
flies. Since it seems that it is the activation of the cell, not what the cell means, that is causally productive of the frog’s behavior, the burden is on a representationalist to explain how the relevant content-fixing relation can result in the representational content being causally relevant to making the frog’s behavior appropriate to its environment.  

Structural representationalists believe s-reps can meet this burden. Consider a map user, Annie, who uses a map of Madison to navigate around the city of Madison. In attempting to explain Annie’s successful behavior it would be natural to point out that the structural features of her map correspond to the structural features of the city. In fact, the resemblance relation between the map and the city is what best explains how Annie gets where she wants to go. In another familiar example, the correspondence between changes in the curvature of a bi-metallic strip and changes in ambient temperature best explains how a thermostat is able to regulate temperature successfully. Again, that the structural resemblance between the curvature of the bi-metallic strip and ambient temperature holds is causally relevant to the thermostat’s successful temperature regulating behavior.

Of course, while use theories cannot invoke the relation of structural resemblance, isn’t it the case that they can invoke something in the vicinity? Consider the state in the frog’s visual system tokened in the presence of flies. Prima facie, a use theorist can explain successful tongue flicking behavior by pointing to the fact that the tokening of the state is caused by flies, or carries information about the presence of flies, or has the function of indicating flies, etc. While structural resemblance might be

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3 Philosophers who deny that explanation requires causation, or who believe the above is working with an impoverished notion of causation, may be unmoved by the way this challenge has been presented. Since my main aim is to establish an equivalency between u-reps and s-reps with respect to the causal constraint, I’ll adopt the challenge as presented by structural representationalists.

4 As Gładziejewski & Miłkowski note, “[u]sers of cartographic maps owe their success to the similarity that holds between the spatial structure of the representation and the spatial structure of the territory it represents...” (2017, p. 340, emphasis added)

5 Consider the following interventionalist point: had we intervened on the resemblance between the map and the city, Annie would fail to navigate the city successfully.

6 And had we, for instance, intervened on tokening of the state and its being caused by, or carrying information about, an object, the frog would similarly fail to engage in successful tongue flicking behavior.
sufficient to explain successful behavior, why think that it is necessary? To understand the structural representationalist’s critique, we must again consider the importance of grounding representational content in the intrinsic properties of the representing vehicles. The difference between s-reps and u-reps, according to structural representationalists, is that s-reps possess the capacity to modify a system’s behavioral dispositions just in virtue of the grounding relations they bear to their targets. It is the relation of structural resemblance, grounded in the intrinsic properties of the representing vehicles, that is causally relevant to system’s appropriate behavior.\(^7\)

Use theories can offer no such explanation. The representational vehicle, lacking any sort of structural resemblance to its target cannot explain successful behavior. Unlike in the case of a map, you cannot just point to, say, the structural properties of a stop sign to explain how drivers successfully perform stopping behavior in response to one. Proper stop sign behavior entirely depends on how stop signs are interpreted, or used, by drivers. In fact, structural representationalists claim that because there is nothing about the structure of the representing vehicles themselves that fixes their representational content, any explanation that use theorists can offer will be circular (Opie & O’Brien, 2004, pp. 2-3). Like in the case of the stop sign, use theorists must always invoke something extrinsic to the representing vehicles to explain content fixation and, therefore, successful behavior. Once more, consider the state in the frog’s visual system tokened in the presence of flies. On a view such as Dretske’s (1988), at some point in the past this state was a candidate for representational status in virtue of indicating flies.\(^8\) Only after the relevant state is recruited to modify the behavior of the frog to produce tongue flicking because it indicates flies, does the state now have the content FLY. But, notice, that the frog now flicks its tongue at flies is constitutive of the relevant neural state bearing the content FLY. While we want to be able to say

\(^7\) Though Gladziejewski and Milkowski at times endorse this literally (“structural correspondence can quite literally cause the representation-user to be successful at whatever she (or it) is using the representation for”) (2017, p. 340), O’Brien and Opie (2004) are consistent in claiming that structural resemblance, while not a literal cause, is causally relevant.

\(^8\) Though it may have also indicated a range of other objects and properties.
that the frog flicks its tongue because the state has the content FLY, structural representationalists claim use theories must say that the state has the content FLY, at least in part, because the frog flicks its tongue. The more general critique here is that it’s not possible for mental representing vehicles to possess the capacity to modify a system’s behavioral dispositions towards their represented objects if the behavioral dispositions are themselves part of the grounding relations the vehicles bear towards those objects (Opie & O’Brien, 2004, p. 7). However, this is how u-reps must explicate the content of representational states. U-reps therefore fail to meet the causal constraint; they cannot explain how content can be causally efficacious, on pain of circularity.

4 – Structural Representations and Explanation

In the previous section I presented the causal efficacy critique against u-reps. However, I contend that there is actually a deep parity on this point between u-reps and s-reps. If u-reps cannot provide an explanation of how content can be causally efficacious, neither can s-reps. Consider that structural representationalists rarely suggest that structural resemblance is sufficient for representation. Often invoked under the guise of avoiding pan-representationalist commitments, structural representationalists offer up (at least) a second necessary condition for something’s being a representation. But, in order to meet the causal constraint, this further condition must continue to keep the explanatory focus on the structural properties of s-reps, or risk the fate of use theories. In this vein, we see Gladziejewski and Milkowski suggest that the structural similarity of a potential representation must be exploitable by the

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9 One might wonder whether it’s true that causal theories must posit u-reps. For instance, on an account like Fodor’s (1987; 1990), that P represents Q seemingly depends only on whether Ps are caused by Qs, and that Ps being caused by Qs do not asymmetrically depend on Ps being caused by Rs. However, structural representationalists suggest that, without invoking something upstream from the representational state, causal accounts are unable to explain the successful behavior of the system towards Qs. See Cummins (1996, p. ch. 5) for a more detailed argument for the claim that causal theories must posit u-reps.

10 Cummins (1996) being a notable exception. Cummins defends an isomorphism condition and argues it is both necessary and sufficient for representation. However, Cummins, too, invokes use in his account of misrepresentation, and though it is beyond the scope of this paper, I believe his view is susceptible to basically the same critique I develop in the rest of this section.
system in which it is embedded, and that when exploitable similarity obtains, “structural correspondence can quite literally cause the representation-user to be successful at whatever she (or it) is using the representation for.” (2017, p. 340) Likewise, Opie & O’Brien offer an interpretation condition, which amounts to the requirement that the relevant structure modify the subject’s behavioral dispositions towards the representational target, and that when it does “the intrinsic properties of the vehicles run the show.” (2004, p. 17) More recently, Lee suggests an action guidance condition, requiring that the representational structure systematically guide the actions of its containing system towards some target.\textsuperscript{11} Though there are slight differences, the common thread amongst all these conditions is that they allow structural representationalists to avoid the conclusion that a structure represents \textit{everything} it resembles. Of all the things an s-rep structurally resembles, it only modifies the behavioral of its containing system with respect to some subset of them, and so only represents what falls in the extension of that subset. Further, these conditions allow for all of this while preserving the explanatory primacy of structural resemblance.

Unfortunately, the above concessions are ultimately what make s-reps susceptible to their own critique. These conditions do more than simply help limit the contents of a potential representation. They play an essential role in providing reasons to think of a given structure as genuinely representational in the first place. That one structure resembles another would not yet justify the explanatory appeals that cognitive scientists look to content to make. Resemblance comes cheap; successful behavior in response to resemblance does not. It may be true that appealing to action guidance, exploitability or behavioral modification allows structural representationalists to establish that s-reps are performing a genuinely representational function. However, what structural representationalists fail to consider is that the capacity for an s-rep to fulfill the above conditions depends as much on the design of the system an s-rep

\textsuperscript{11} “The content of an S-representation should not be identified as referring to all those objects with which the representation shares structure but as referring to…the formal structure of the representation’s action-guiding parts.” (Lee, Forthcoming, p. 14)
is embedded in as it does the structural properties of the s-rep itself. For example, the structural resemblance between a map of Madison and Madison disposes Annie to behave appropriately with respect to navigating Madison only if she antecedently knows that the map is meant to be a map of Madison. Similarly, place a bi-metallic strip into a system not designed to take advantage of the fact that the curvature of the bi-metallic strip covaries with temperature, and no such appropriate behavior with respect to temperature will result (a bi-metallic strip installed into a washing machine will not insure that a room’s temperature remains constant). A vehicle’s structural features dispose, or enable, a system to behave appropriately only insofar as the system is already set up to use the representational vehicle appropriately. Structural representationalists may claim that these further conditions are only playing a content limiting role, but it looks as if use is need determine the content of representational states here in precisely the same way as on use theories. Use is ineliminable in content determination.

At this point, structural representationalists might insist that by placing all (or most) of the emphasis on use, I am failing to acknowledge a simple, but essential, point: had the resemblance relation not held, the relevant structure would never have been recruited to cause appropriate behavior. A bi-metallic strip is clearly recruited for use in a thermostat because of the way that changes in the curvature of the strip resemble changes in ambient temperature. However, I do not deny that something which bears a relation of structural resemblance can be recruited to cause appropriate behavior in the system in which it is embedded. My claim is that once the emphasis is placed on the recruiting of the representing vehicles, structural resemblance is no longer necessary nor sufficient to cause appropriate behavior.

All natural forms of representation must depend on a resemblance, or, more neutrally, a correspondence of one form or another. Indicators, of the sort Dretske defended are structures that correspond to their targets and are recruited to modify the behavior of the systems they are in because

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\[12\] Strictly speaking, this too strong. However, it’s quite improbable that Annie successfully navigates Madison without this antecedent knowledge.
of what they correspond to. Without a correspondence relation of at least a minimal sort, no naturalistic account of mental content would get off the ground. By focusing on the usefulness of a correspondence relation grounded in structural resemblance, structural representationalists have, unintentionally, obscured the fact that without a system designed to use it properly, structural resemblance is impotent to produce any appropriate behavior. And that with a system designed to use, say, an indicator properly, a lack of structural resemblance does not rule out appropriate behavior. S-reps therefore fail to provide a better explanation of cognition than u-reps, and they fail to do so precisely because an s-rep theory is just as much a use theory as any other.

7 – Conclusion

Structural representationalists argue that a theory of representation can legitimize the explanatory appeals that cognitive science makes to mental content only if representational content is grounded in the structural features of representing vehicles. They claim that other approaches to representation, because they appeal to how a representation is used to fix content, cannot explain how content can play a causal role in behavior. However, I have argued that by acknowledging that structural resemblance is not sufficient for content determination, structural representationalists unwittingly incorporate use in the same content determining role as use theories. In fact, once we acknowledge the role of use, we see that structural resemblance is just one type of correspondence relation that natural systems can avail themselves of. When a structure has some correspondence relation to a target, X, whether that structure bears an isomorphic relation to X, a structural resemblance relation to X or simply

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13 Of course, in response a structural representationalists could bend their notion of structural resemblance to the point that any kind of correspondence would count as an instance of structural resemblance. However, two quick points with respect to this should suffice for the moment. The first is that this would seem to bend s-reps so much that they break. Far too many things would now count as an s-rep. The second point is that this wouldn’t save the structural representationalists from the critique that they, too, are a use theory. In fact, the more structures that meet the conditions of an s-rep, the less important structural resemblance is in explanation, and the more we must appeal to extrinsic facts to explain the role the s-rep plays in cognition, precisely the worry structural representationalists had about u-reps in the first place.
covaries with X matters little for the capacity of its containing system to recruit that structure for some behavior in virtue of that correspondence. Of course, my main aim here is not to establish that structural resemblance fails as a necessary condition for representation. Rather, establishing this helps to make the more immediately relevant point that appeals to structural resemblance do not eliminate the role of use, they only obscure it. This makes an s-rep theory just as much a use theory as any other.

Bibliography