Representation and aspectual shape

Itay Shani

Department of Philosophy, University of Johannesburg, PO Box 524, Auckland Park, Johannesburg, South Africa

ARTICLE INFO

ABSTRACT

One of the most significant characteristics of intentional states is the fact that they represent their intentional objects under selective aspects (or modes of presentation); that is, that they manifest an *aspectual shape* (Searle, 1992). Surprisingly however, although this remarkable feature is widely recognized little has been done to explain what makes representation aspect-relative in the first-place. In this article I attempt to outline an answer to this question. I begin with a critique of Searle's explanation of aspectual shape as anchored in conscious experience. I argue next that, since to represent an object under an aspect is to represent it relative to a selective set of properties, the task – from the perspective of a theory of mental representation – is to explain what makes intentional states property-relative. It is then argued that while this task cannot be handled properly by standard (in particular computational-representational) theories of mental representation, a shift towards an action-based framework for theories of perception and representation promises to provide the key with which to unlock the puzzle.

> "'Seeing as…' is not part of perception"

Ludwig Wittgenstein, Philosophical Investigations, II, 197.

1. Introduction

Intentional states are characterized by what philosopher John Searle (1992) calls *aspectual shape*, namely, by the fact that they represent their intentional objects (real, or imagined) under certain

E-mail address: ishani479@hotmail.com

selective aspects. Thus, for example, one may see an ambiguous figure as a duck, but not as a rabbit, believe the winner of the 1976 Goncourt Prize to be Emile Ajar, but not Romain Gary, or think of Prometheus as the benefactor of humankind without knowing that he is, also, the brother of Epimetheus. In all these illustrative cases (and countless more like them) an entity is represented under a certain aspect to the exclusion of other, co-extensive (hence, equally valid) aspects, and while one may learn to assimilate more and more aspects with a given intentional object (e.g., one may learn that the figure can also be seen as a rabbit, or that Ajar *is* Gary) no intentional state is either devoid of any aspect at all, or includes all possible aspects under which its intentional object might be represented.

This aspect-relativity of intentional states is a fact whose significance for theories of mental representation can hardly be overemphasized. Suffice it to notice that the particular aspectual shape of a particular intentional state is constitutive of the identity conditions of that state qua intentional, content-bearing state, and that this very fact makes intentional states intensional. To use one of our stock examples, while Ajar and Gary are one-and-the-same person, the belief that Ajar (presumably, a mysterious young writer of a French-Algerian origin) won the 1976 Goncourt Prize is different in content from the belief that Gary (an established aging French writer of a Russian origin) did; co-extensiveness notwithstanding, the beliefs are different, and this is what we mean, when we say, in a more technical language, that belief thoughts, concepts, and other intentional entities are intensional (in Section 3 the intensional character of intentional states is articulated in more detail, and its relevance to the present discussion emphasized).

Given the centrality of aspectual shape to the phenomenon of mental representation it is humbling to realize how little has been done to explain it. If representation is thoroughly aspectual we must be able to understand not only what aspectual shape is but also what makes intentional states aspectual in the first place. In the present paper, I focus on this latter question. I argue that a proper understanding of the aspect-relativity of intentional states, that is, a proper understanding of why, and of how, they represent their intentional objects under selective aspects, necessitates a shift towards an action-based model of perception and representation. In particular, I argue that only an action-based model can account for the intensional character of intentional states, and since the intensional character of intentional states consists of their having aspectual shapes, explaining the aspect-relativity of intentional states requires a shift towards an action-based model of perception and representation.[1] I begin, however, by considering, and rejecting, Searle's alternative view regarding the origins of the aspectuality of representation.

2. On the shortcomings of Searle's consciousness-based approach

According to Searle (1992, chap. 7), aspectual shape is exclusively intrinsic to *conscious* intentional states, whereas unconscious intentional states are only aspectual in a derivative sense. Two assumptions drive Searle's argument: first, that the reality of aspectual shape presupposes a first-person ontology; and second, that a first-person ontology presupposes consciousness.[2] While I disagree with the second assumption, hence with Searle's consciousness-chauvinistic conclusion regarding the ontological status of aspectual shape, the aim of this section is to show that, however strong or loose the connection between aspectual shape and consciousness may be, Searle's approach to the problem is, at best, incomplete since it offers no explanation whatsoever to the basic question what it is which makes intentional states possessors of aspectual shape in the first place. I begin, however, by considering the assumptions behind Searle's consciousness-based approach to the riddle of aspectual representation.

---

[1] It may be noticed that by referring to the intensional 'character' of intentional states I do not have in mind Kaplan's (1978) distinction between 'content' and 'character'. Rather, the idea is simply that intentional states have an intensional (i.e., non-extensional) meaning factor, whether we call that meaning factor 'intension', 'aspectual shape', 'mode of presentation', or what have you.

[2] Indeed, the notion of aspectual shape, and Searle's conviction that it implies consciousness, are key in Searle's argument for his controversial *connection principle*, according to which unconscious intentional states are asymmetrically ontologically dependent on conscious intentional states. For critical evaluations of the connection principle see Fodor and Lepore (1994), Kriegel (2003), Rosenthal (1990), Shani (2007b).

Consider first the assumption that the reality of aspectual shape presupposes a first-person ontology. Although Searle does not go beyond merely observing the robust correlation between perspectivalism – seeing an object from a point of view – and aspectuality – seeing the object under certain selective aspects – his observation seems to be on sure footing. Indeed, I would like to suggest that the connection between aspectual shape and the first-person perspective is essential in that the former partially depend on the latter; namely, the representational profile (viz. aspectual shape) of a given intentional state is necessarily relative to the specific point of view of the representing subject. Consider an intentional object x and a representing subject S. The perspective within which x is represented is shaped by a variety of contributing factors, e.g., the manner in which it is situated relative to S, the significance S associates to x, S's occurrent physiological and psychological conditions (e.g., attentiveness, fatigue, curiosity, etc.), S's experience, knowledge and expectations, and so on. In turn, these factors act as filters that affect the precise manner in which S represents x to itself, conditioning what aspects of the object the subject is able to discern. Hence, as Searle rightly recognizes, in invoking the notion of aspectual shape we thereby appeal to a phenomenon whose reality is conditioned on the first-person perspective.

Searle's second assumption is offered without an argument. As is often the case with unargued premises the lack of supportive argumentation is testimony to the fact that the premise is considered too obvious to be in need of support. Indeed, the idea that a first-person reality implies consciousness is so deeply entrenched in high philosophical circles that many would consider its denial a downright absurd. Nevertheless, I have argued elsewhere (Shani, 2007b, 2008) that rather than being an evident truth, or even a well-motivated empirical hypothesis, such a strong association of subjectivity with consciousness is no more than an inertial offspring of a problematic Cartesian heritage. Moreover, I argued further that Searle's second assumption is at least partly wrong since a *minimal* form of a first-person perspective is co-emergent with the basic organic capacity for autonomous conduct, a capacity manifested in creatures that, on Searle's own terms, are far too simple to be considered conscious (Shani, 2007b, 2008). In short, while the aspectual shape of an intentional state is contingent on the first-person perspective of a cognitive agent the reality of such a perspective does not necessitates conscious experience (in any familiar sense at any rate), nor is conscious experience necessary to sustain aspectual shape.

But, be that as it may, a deeper problem with Searle's analysis is that, even if it were true to fact, it simply does not *explain* aspectual shape (cf. Kriegel, 2003; Rosenthal, 1990). Nothing in what Searle says about consciousness, or about aspectual shape, explains *why* conscious intentional states possess aspectual shape to begin with. Searle seems to be relying here on the fact that the aspectuality of intentional states is *evident* in conscious experience but this, in itself, does little to explain how what thus becomes evident in experience is possible in the first place.[3] A viable theory of mental representation has to be able to explain what makes representations aspect-relative, and this explanatory requisite remains intact even if, as Searle holds, only some representations (i.e., conscious ones) are intrinsically aspect-relative. In the words of David Rosenthal "differences in aspectual shape are differences in how something is represented; so to explain aspectual shape we must have a theory of content" (Rosenthal, 1990, 621). To conclude, the major weakness of Searle's proposal is that neither his theory of content (Searle, 1983), nor his theory of consciousness (Searle, 1992), shed much light on the question in virtue of what is aspectual shape a basic feature of representation.

---

[3] Interestingly, phenomenological existential proofs of this sort are a characteristic feature of Searle's philosophy of mind and one finds similar limitations whenever they are applied. Thus, for example, Searle's famous *Chinese Room Argument* (Searle, 1980) is meant to show that a Turing-machine-like symbol manipulation yields no intrinsic intentional content whatsoever. Yet, Searle provides no satisfactory (or even remotely satisfactory) account of *what it is* about organic mental processes that makes intrinsic intentionality possible, a lacuna which, as many critics have observed, is a major weakness of his *biological naturalism*. Ditto, Searle's refutation of Quine's indeterminacy of translation thesis (Searle, 1987) is anchored in the phenomenological observation that "we do mean by 'rabbit' something quite different from 'rabbit stage' or 'undetached rabbit part'" (Searle, 1987, 126). Yet, again, Searle does not move beyond this introspective observation to address the theoretical challenge of explaining what it is about actual representations that makes them immune to Quine's indeterminacy (see Shani, 2005, in press).

3. Aspectual shape and the intensional character of content

As mentioned before, there is an intimate connection between the fact that intentional entities – concepts, propositions, thoughts, and the like – have aspectual shapes and the fact that such entities are intensional. Indeed, intentional content is intensional precisely because it is aspect-relative, for, as illustrated in the introduction, it is the aspect-relativity of intentional states, the fact that they represent their intentional objects under selective aspects, that makes the identity conditions of such states more fine-grained than the (extensional) identity conditions of their objects. Let us observe now with some more detail precisely what is meant by the claim that intentional content is intrinsically intensional. Getting clear about this interesting feature of representation will, in turn, enable us to identify (in Section 4 below) a popular theoretical assumption whose presupposition in standard theories of representation consistently thwarts the project of successfully explaining aspectual shape.

Technically, the claim that intentional entities are intensional is tantamount to the claim that their identity conditions, qua semantic, content-bearing phenomena, contravene the so-called *extensionality principle*. According to the extensionality principle if two entities A and B are logically co-extensive (if abstract), or occupy the same spatiotemporal segment (if concrete), then A and B are identical. Entities that obey the principle are named 'extensional', while entities that contravene it are called 'intensional' (cf. Bealer, 2000; Shani, in press). Many entities, both abstract and concrete, are *extensional*. Thus, for example, two co-extensive sets (e.g., the set of equilateral triangles and the set of equiangular triangles) are, a fortiori, identical, and the same is true with regard to two individuals occupying the same spatiotemporal segment (e.g., Emile Ajar and Romain Gary). By contrast, the extensionality principle also classifies many entities as *intensional*: concepts, propositions, ideas, and thoughts are some important examples, along with properties, relations (in intension), and modalities. All of these latter entities are characterized by the fact that their identity conditions are more fine-grained than the conditions dictated by the extensionality principle, making them a contrast class of 'intensional' entities.

In the context of the present discussion, however, understanding what is meant by the claim that intentional entities are intensional is but a prerequisite to the fundamental question in virtue of what are they intensional in the first place? We already know that the answer has to do with the aspect-relativity of content, but let us look at the problem from a somewhat different angle.

Consider the concepts 'chordate' and 'renate'; though co-extensive their contents are nevertheless non-identical, making them the intensional entities that they are. In traditional parlance we would say that in addition to extension, which they share, 'chordate' and 'renate' have intensions, which they do not share. Notably, this intensional meaning factor is a reflection of the fact that intentional entities are *predicative*: they are not merely directed at certain intentional objects (recall, 'renate' and 'chordate' share the same intentional objects) but also say something about those objects, and what they "say", the attributes they assign their objects, is a defining feature of their semantic identity. Co-extensiveness notwithstanding, 'chordate' and 'renate' amount to two different predications, whence the difference in the contents they express.

Now, predication, in turn, consists of the ascriptions of *properties* to the things being predicated: when an object is predicated as being a creature with a heart, a different property is ascribed to it than when it is identified as a creature with a kidney. Could it be, then, that the intensional character of predication (i.e., of property ascription) can be anchored in certain facts about properties? A simple answer in the positive mode suggests itself. Observe first, that, as mentioned above, properties, too, are prominent examples of intensional entities since the co-instantiation of two properties ϕ and ϕ' does not imply their identity. Now, let P and P' be predicates standing for ϕ and ϕ' respectively, we can thus verify that the inference from $x = y$ to $Px = P'y$ is illicit *on account* of the intensional character of ϕ and ϕ'. To go back to our last example, the predicate 'chordate' and the predicate 'renate' are intensional on account of the fact that the properties they express – the property of being a creature with a heart and the property of being a creature with a kidney, respectively – are themselves intensional; the predicates are non-identical despite being co-extensive because the properties being predicated are non-identical despite being co-instantiated.

It therefore seems appropriate to conclude that intentional entities inherit their intensional character from the intensional character of the properties they express. Being predicative, concepts,

thoughts, and their ilk represent their intentional objects as possessing some properties but not others and since properties are themselves paradigmatically intensional their intensional character is inherited by the intentional states representing them.

It will be seen later (see the discussion of affordances in section 5.1) that there is more to the intensional character of intentional entities than the fact that the properties they represent are themselves intensional but for the time being it is enough if we notice that the intensional character of properties is *sufficient* to entail the intensional character of content: insofar as intentional states represent their intentional objects relative to selected properties they are intensional.

Returning now to aspectual shape, it is not difficult to see that the aspect-relativity of intentional states is none other than the fact that, in representing their intentional objects, intentional states are always attuned to specific properties while excluding, or being indifferent to, others. To represent an intentional object O under an aspect A, i.e., to represent it *as* A, is to represent O insofar as it possesses a certain set of properties $\{\phi_1 \ldots \phi_n\}$, where the set may contain one property or more but is, in any case, a proper subset of the set of all possible properties with which O might be associated.

The contention that aspectual shape simply *is* this in-built relativity of content to selected properties provides a deeper insight to our previous claim that aspect-relativity is what makes intentional states intensional for, as we have seen, the relativity of content to selected properties is precisely what accounts for the intensional character of representation. Thus, the significance of the present section for the rest of our discussion is twofold. First, we are now in a better position to appreciate what is meant by the claim that intentional states are intrinsically intensional, a claim that, if taken seriously, suggests that the ability to accommodate the intensional character of content ought to be considered an important *adequacy criterion* for theories of content. Second, as we now know, such an explanation must address the fact that in representing their intentional objects intentional states are selectively sensitive to some properties while being indifferent to, or exclusive of, other, co-extensive properties. Yet, surprisingly, we will see in the coming section that despite the reasonableness of these requirements standard theories of representation do not, and in fact cannot, satisfy them.

4. Input extensionalism as a problem for naturalistic theories of content

The discussion so far has established that to say of intentional states that they have aspectual shapes is another way of referring to the fact that intentional content is inherently intensional. No theory could therefore hope to explain aspectual shape if it is incapable of accounting for the intensional character of content. Yet, it is precisely here that a major challenge presents itself for the task of explaining the intensional character of content has proven itself incredibly difficult.

The main reason for this difficulty, I suggest, lies in the fact that standard theories of mental representation (by which I mean the generic accounts of representation most popular amongst contemporary philosophers and cognitive scientists) are constitutionally ill equipped for the task. Contemporary research into the nature of representation is decisively biased in favor of extensionalist models of representation – a theoretical choice whose pursuit destines the intensional character of content to remain inexplicable.[4] While there are various ways in which this critical claim might be developed perhaps the most apposite one in the present context is to refer to the widespread, and often tacit, commitment to what I call the principle of *input extensionalism* (see Shani, 2005, in press). In what follows I argue that input extensionalism is a standard presupposition in contemporary theories of representation and that its acceptance has dire consequences for the project of explaining the intensional character of content.

---

[4] Some readers may object that I am ignoring the thriving industry of analyzing intensional entities in terms of possible-worlds semantics (e.g., Carnap, 1947; Lewis, 1986; Montague, 1960). Note, however, that in possible-worlds semantics intensional entities are *reduced* to functions from worlds to sets of objects existing in those worlds, and the latter (i.e., the objects and worlds) are unequivocally extensional entities. Thus, possible-worlds semantics presupposes that extensional entities are basic whereas intensional entities are derivative and, ultimately, reducible. Aside from a myriad of technical difficulties associated with such reduction, I argue elsewhere (Shani, 2007a) that the very idea that extensional entities are somehow more basic than intensional entities is fundamentally flawed.

By 'input extensionalism' I refer to the view that *the perceptual, or informational, input to the cognitive apparatus of intelligent beings differentiates only those entities whose identity conditions obey the extensionality principle* (as explained in Section 3). More precisely, if a collection of entities $C = \{A_1...A_n\}$ is such that its members are *materially* co-extensive (that is, they occupy the same spatiotemporal segments) then there is no stimulus information S such that $A_1...A_n$ are mutually distinguishable on the basis of S. From our standpoint, the significance of this theoretical commitment cannot be missed since its flip side is crystal clear: no intensional information, that is, no information regarding entities whose identity conditions contravene the extensionality principle, could possibly be obtained by way of perceptual interactions. Thus, input extensionalism implies a severe limitation on the *kind* of information that could possibly enter our cognitive apparatus: it tells us that perceptual information is too impoverished, too coarse-grained, to ever inform us regarding intensional entities, should such entities exist.

This limitation, in turn, yields notorious subsequent implications. First, if perceptual interactions cannot possibly sustain intensional stimulus information then they can play no role in explaining the intensional character of content. As we have seen, semantic identity conditions, the identity conditions of intentional states qua content-bearing entities, are intensional. Such identity conditions, then, are too fine-grained, too nuanced for them to be explained in terms of perceptual distinctions, and their explanation must, therefore, be sought elsewhere. Second, while perceptual states are typical exemplars of aspectual shape (cf. Searle, 1992, 157), aspectual shape can no longer be explained by reference to perceptual information. As noticed, to represent an intentional object under an aspect is to represent it insofar as it manifests some, but not other, co-instantiated properties; yet the differences between such co-instantiated properties are intensional, precisely the kind of differences that – on the premise of input extensionalism – perceptual processes cannot possibly track.

Clearly, from the standpoint of theories of perception and representation the principle of input extensionalism is highly significant, but is it really as widespread as I have claimed? It would have been easier to assess the claim were 'input extensionalism' a term of the art rather than a neologism, and were the principle (however called) discussed explicitly rather than presupposed implicitly as it often does. Nevertheless, it is not hard to substantiate the claim by recourse to concrete examples. Thus, one finds an unmistakable commitment to input extensionalism both among distinguished behaviorists such as Quine (1960, 1969), as well as among distinguished cognitivists such as Fodor and Pylyshyn (1981). Moreover, these notable examples are not just separate instances; rather, they are indicative of standard conceptions of meaning, perception, and representation. In an earlier paper (Shani, 2005) I argued that input extensionalism and a chronic inability to accommodate the intensional character of content are symptomatic to all the leading theories of mental content currently in vogue – causal, informational, teleosemantic, and conceptual-role theories. Nor is it difficult to find the same problem in more psychologically oriented explorations of the relations between perception and cognition (see, for example, Markman, 1989).

Indeed, as some readers may have sensed already, input extensionalism echoes the popular presumption that perceptual information is too impoverished to yield the rich conceptual distinctions manifested in fully-fledged cognitive processes (whether in children or in adults). Viewed from this perspective, the claim that the input to our cognitive apparatus is strictly extensional is but another expression of more familiar claims such as the claim that categorization and concept acquisition cannot be grounded in perception (Fodor, 1975; Keil, 1981; Spelke, Breinlinger, Macomber, & Jacobson, 1992), or that inference is required to render perceptual input intelligible (Helmholtz, 1925). The connection between input extensionalism and these more familiar theses is obvious enough: for, first, they all share the assumption that there is an unbridgeable informational gap separating perception and cognition (Ben Ze'ev, 1993); and, second, the informational gap consists precisely of the fact that, on this received view, only higher cognitive processes are truly intentional (Shani, 2006) and, as we have just seen, intensional character is the unmistakable mark of truly intentional states and processes.

On a still more general level of analysis, I argue elsewhere (Shani, 2007a) that input extensionalism is strongly motivated by the widespread belief that a scientifically oriented ontology, and hence also a scientifically oriented semantics, must eschew intensional entities whenever possible and, in particular, must not allow them a place in the basic inventory of physical reality. On this view (which, I argue there, is ultimately traced to an outdated mechanistic conception of nature) strictly physical entities must be strictly extensional, and since perceptual stimuli are analyzed, by behaviorists and

cognitivists alike, as strictly physical they cannot be but extensional, hence they cannot sustain intensional information in any shape and form.

It transpires, then, that the commitment to input extensionalism is, indeed, widespread and deeply entrenched, and that the reasons for its firm grip on theoretical research into perception and representation can be identified across various levels of analysis.

Yet the mere fact that standard theories of perception and representation adhere to the principle of input extensionalism does not, in itself, show that they cannot account for aspectual shape and the intensional character of content since, in principle, there is still the possibility that these intriguing features of representation might be explained as originating outside of, and independent from, perception. Clearly, for this option to be even remotely plausible the theory in case, call it *T*, must contain a non-sensory semantic component. Thus, *T* cannot be something like Quine's (1960) behaviorist semantics since the latter is predicated on the reduction of meaning to stimulus meaning, a move that, as Quine knew well, leaves no logical space for semantic intensions and decrees their elimination. By contrast, if *T* is constructed in the standard cognitivist (i.e., computational-representational) mold then its advocates might hope to explain the intensional character of intentional states by recourse to non-sensory elements, for example by invoking various procedures of cognitive processing guided by innate conceptual resources. But while such an option is logically possible I believe that, in the final account, it is utterly non-viable. Since the argument has been articulated in detail elsewhere (Shani, 2005) I shall rest content with a sketchy presentation of its major points.

- Since, by assumption, content is intensional while perception is extensional the intensional character of content must emanate from somewhere inside the cognitive apparatus itself (where the latter is now understood to exclude the perceptual systems – a controversial assumption, to be sure, but one that seems to be in line with standard cognitivist models). In other words, there must be an intensional representational core (IRC) somewhere inside the system whose origins are not traced to perceptual interactions.
- At least part of what such an IRC is supposed to do is to *convert* extensionally individuated perceptual information to intensionally individuated cognitive representations. In particular, a standard assumption in cognitivist models is that such a conversion is made via inferences. This, in turn, implies that IRC must serve as a potential pool for premises in such inferences.
- But how could IRC emerge in the first place? Given input extensionalism the most promising option left seems to be nativism, i.e., the idea that IRC must be innate. In particular, if we wish to explain the *value* of having intentional states with intensional identity conditions the most attractive option is *strong nativism*, namely the view that IRC was selected *for* (i.e., in virtue of) the fact that it is intensional.
- However, a selection for IRC presupposes that individuals that were able to represent their respective environments using fine-grained intensional discriminations were, on average, more successful in adapting to these environments than individuals who did not and this, in turn, suggests that there was something in the *structure* of agent–environment interactions that bestowed on these lucky organisms an advantage.
- But if there is something in the structure of agent–environment interactions that corresponds to intensional discriminations than, in principle, it should be possible for some organisms, at some point in time, to develop sensory organs capable of detecting such structural invariants. This latter option, however, is what input extensionalism denies, from which it follows that input extensionalism is *inconsistent* with strong nativism.
- Alternatively, one my bet on *weak nativism*, namely, on the view that IRC was selected for reasons other than its representational qualities (where the explanation might involve all sorts of contingencies, from constraints on computational efficacy to random facts about the species evolutionary history). But the problem with weak nativism is that by conceding that the emergence of IRC has nothing to do with the merit of representing reality using fine-grained intensional discriminations it concedes, in effect, that the intensional character of content is devoid of any real representational significance (or, worse still, if it *is* representationally significant than representation is epiphenomenal).

- To conclude: nativism is a blind alley in that it is either inconsistent with input extensionalism or is inconsistent with the assumption that the intensional character of content is a phenomenon of real representational value.[5]

What the argument shows is that we cannot have it both ways, that is, we cannot insists on the reality and significance of the intensional character of intentional states while denying an intensional character to perceptual stimuli. Input extensionalism has the unpleasant, and perhaps unanticipated, consequence that it generates extensionalism throughout the representational space. If we wish to avoid this outcome, if we wish to respect the fact that intentional states are endowed with aspectual shape, we must renounce input extensionalism and the informational dualism it entails. Of course, to do so is to embark on the task of explaining how the intensional character of content is manifested already at the level of perceptual input. Going beyond input extensionalism is the goal of the next section.

5. An action-based approach to content intensionalism

If the ability to account for the intensional character of intentional states is, indeed, a veritable adequacy criterion for theories of mental content, and if such an account is conditioned on a rejection of input extensionalism, then the key conceptual challenge is to explain how, contrary to traditional thinking on the subject, perceptual information might be thoroughly intensional.

We already know the general formal character of such an account: it must be an account that explains how the things we perceive are perceived as exemplifying certain properties but not other, co-extensive, properties, that is, it must make aspectual shape an integral part of perception. In other words, such an account must take seeing (tasting, smelling, etc.) *as* to be an intrinsic feature of the very process of seeing (tasting, smelling, etc.). By its very nature, an intensional theory of perceptual input is committed to the idea that the information our perceptual systems are capable of detecting is rich enough to transcend the limitations dictated by input extensionalism, namely, rich enough to specify items in our environment *insofar* as they manifest certain properties but not other, co-extensive, properties.

But while the said formal character is certainly helpful in defining the task ahead of us, we need an explanation of what, in the nature of things, enables sophisticated organisms to perceive their environments in such an aspect-relative manner. In what follows I argue that the success of this endeavor is contingent on two major steps. First, an intensional theory of perception must revise our ideas regarding the *objects* of perception so that it becomes possible for intensional entities to be perceived in the first place. So long as the standard view that the objects of perception are strictly extensional entities (physical objects and physical magnitudes of various sorts as defined by mechanics, optics, and other sub-disciplines of physics) remains uncontested an intensional account cannot even get off the ground.[6] Second, once room is made for the perception of intensional entities there is still a need to explain what enables their systematic detection, i.e., what information there is to specify their existence. The discussion below carries some obvious Gibsonian overtones. However, my intention is neither to defend, nor to commit myself to, the specifics of Gibson's view but merely to use some of Gibson's ideas to illustrate the general direction needed to be sought in order to begin to do justice to the idea of intensional perception and, more generally, intensional representation. It is perfectly possible that similar ideas could be expressed to comparable success using alternative action-based approaches to perception and cognition.

5.1. An intensional basis for perception: Gibson's theory of affordances

Both sympathizers and critics are prone to agree that J.J. Gibson's theory of affordances (Gibson, 1979, chap. 8) is one of his boldest and most significant contributions to the ongoing debate about the

---

[5] Bickhard (1991), Gibson (1979, 253), and Thelen and Smith (1994, 31) advance similar arguments against nativism, though without an emphasis on the problem of the intensional character of content.

[6] By 'object of perception' I have in mind the functional trait of being one of the things to which our perceptual systems are attuned and which they detect. Thus, such "object" need not be an object in the more restricted ontological sense of physical, or even ecological, object; it could be an entity of various sorts – event, process, state of affairs, property, and so on.

nature of perception. In expressing this judgment commentators often refer to such facts as that the concept of an *affordance* makes meaning and value intrinsic to perception, that it cuts through the traditional separation of self and world, or that it ties perception to the scale of animal behavior. A much less publicized feature of the theory of affordances, though hardly less important or innovative, is the fact that it marks a radical departure from the traditional commitment to the idea that the objects of perception are strictly extensional entities and provides a conceptual basis for an intensional theory of perception. While not independent of these other, more familiar features, the thoroughgoing intensionalism of Gibson's theory of affordances is nevertheless a distinct feature deserving recognition in its own right.[7]

According to Gibson, perceiving the functional significance of the various items populating one's environment does not postdate the perception of their physical characteristics such as shape, texture, brightness, and so on; rather, the two are concomitant. We perceive the interactive potentials, the affordances, of things external as we perceive those things, i.e., as we perceive the substances and surfaces in the layout.[8] The affordances of an environment are "what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill" (Gibson, 1979, 127). Thus, a sufficiently horizontal, flat, extended, and rigid surface affords support, as it permits equilibrium and the maintaining of a posture with respect to gravity. Ditto, other items in one's environment afford grabbing, climbing, hiding, chewing, sex, danger, etc. Assume, then, that perception is affordance-oriented, namely, that animals perceive their respective environments as pregnant with possibilities for future interactions. What, in this picture, makes perceptual information intensional?

To answer this question observe, first, that to detect an affordance is to perceive an intentional object insofar as it manifests certain aspects, or properties. Thus, a lizard perceives a crevice as a hiding place to which it may crawl, a group of lionesses view a weak or inexperienced member of a herd as an easy prey, and a human perceives a knee-high surface of support (whether natural or artificial) as a potential seat. Therefore, an affordance-sensitive perception is intrinsically aspectual: in perceiving affordances we perceive things insofar as they manifest certain properties but not other, co-extensive properties, i.e., we perceive things under selective aspects.

But an affordance-oriented perception is intensional in yet another important respect. For to perceive an affordance is not merely to perceive a definite aspect of an environmental item, rather it is to perceive this aspect as *coupled* to certain complementary aspects (or properties) of the agent itself. As Gibson emphasized time and again, affordances are reciprocal entities whose existence depends on the qualities of the agent as much as it depends on the constitutive qualities of the environmental items it perceives. Thus, the surface of a pond affords support and walking-on for water bags but not for mortal humans, and a small stool affords seating for a child but not for an adult. Similarly, affordances are also context sensitive: a bottle may afford throwing it at someone on the occasion of a bar-room brawl while affording putting things into it on the occasion of needing to put out a cigarette. The important point here, to repeat, is that affordances are ontologically reciprocal entities – they are aspects of the environment pertaining to aspects of the agent. This gives a redoubled force to the assertion that an affordance-sensitive perception is thoroughly intensional. We may summarize it by saying that affordance perception is *bilaterally intensional*, connecting aspects of the agent with aspects of its environment.

On a somewhat different note, it may also be observed that the reciprocality underlying the ontology of affordances illuminates Searle's observation regarding the connection between aspectual shape and the first-person perspective (see Section 2), for it is relative to the perspective, i.e., the

---

[7] It may be noticed that although the relevance of Gibson's ideas to the question whether perceptual information is intensional or extensional went largely below the radars it was not completely ignored either. Thus, in their response to Fodor and Pylyshyn's critique of Gibson (Fodor & Pylyshyn, 1981), Turvey, Shaw, Reed, and Mace (1981) characterize Gibson's account of perception as 'intensional' and contrast it with the 'extensional' view of the "establishment". My own awareness to the significance of the question whether perceptual information is intensional or extensional was no doubt influenced by this remarkably rare treatment of the subject.

[8] In fact Gibson went even further, asserting that the affordances of objects are what infants first pay attention to and that even adults normally pay most of their attention to the affordances of the things they perceive rather than to their detailed qualities (Gibson, 1979, 134).

embodied and situated particularity, of the agent that things afford themselves as objects of interaction with specific functional significance.[9]

To conclude, Gibson's theory of affordances gives content to the idea that aspect-relativity is built into the very fabric of perception. It therefore provides an illuminating way in which to challenge input extensionalism and the undesired consequences it yields.

5.2. Perceptual invariants and the detection of form

A redefinition of the "objects" of perception in the sense described above is, however, only part of what is required in order to sustain an intensional account of perceptual input. Sure enough, if affordances are to be detected their detection must be based on available stimulus information, and the latter must be apt for the task, that is, it must effectively indicate the presence of functionally salient affordances. Here we face another significant issue raised by Gibson, for according to Gibson (1960, 1966, 1979) the traditional concept of stimulus is inherently unsuitable for this task. Reviewing Gibson's criticism will enable us to identify yet another crucial factor in the making of intensional perception.

Gibson's first critique of orthodox theories of stimulus input is that they describe perceptual stimuli as punctated and momentary disturbances of sensory receptors. On such an atomistic picture, which depicts stimuli as approximations of mathematical points and mathematical instances, perceptual stimuli are structureless, a fact that renders them all but useless for the specification of form, that is, of the characteristic structures, patterns, and organizations, of things external.

A second relevant point Gibson made was that the orthodox conception portrays the obtaining of perceptual information as a mechanistic and passive process. Stimuli impinge on the receptors of sensory organs, triggering a sequence of physiological processes down the line, but the agent itself (animal or human) is essentially passive – reacting to external events rather than taking an active part in exploring its environment and obtaining useful information about it.

The important point in the present context is Gibson's contention that a successful explanation of the capacity to detect affordances is contingent on a rejection of these traditional notions. For, first, Gibson argued that the information capable of specifying affordances must be *form-sensitive* and must, as a result, be itself complexly structured; and second, he argued that sensing the structured energy patterns which specify the things populating one's surroundings and the opportunities they afford is contingent on *dynamic* processes of exploring the environment and of sampling distributed energy configurations in the medium.

To appreciate these claims observe, first, that to perceive an affordance is to perceive something that has a structure unfolding in space-time, often a fairly complex one. To begin, affordances are embedded in the things (objects, events, places, other animals, social institutions, etc.) populating one's environment, and these things manifest distinct molar structural features and, often, complex patterns of organization and behavior. Moreover, whatever else they may be, affordances must be useful in regulating behavior and in order to do so they have to be relatively persistent environmental features, unfolding on a spatiotemporal scale long enough to effect adaptive behavior (Reed, 1996). Finally, it is often the case that affordances come in clusters (for example, when associated in one cohesive object which can be grasped, chewed, rolled, or thrown away, or in other stable configurations), and to perceive such mutually indicative clusters is to perceive something rather complex in form. To illustrate, consider the perception of impatience in another person (which may afford alertness, brevity of speech, concern for that person, and so on). Being impatient is a form of experience and behavior, a psycho-ecological pattern that unfolds in time and involves a coordinated ensemble of feelings,

---

[9] It must be stressed here that there is a fundamental difference between the way Searle understands the first-person perspective, and the way I understands it. For Searle, as we have seen, such a perspective can only be realized in conscious experience. By contrast, I argue elsewhere (Shani, 2008) in favor of the reality of what I call a 'minimal first-person perspective' (or minimal FPP). Such a minimal FPP is contingent on the embodied and situated particularities that shape the knowledge, capacities, interests, and interactive attitude of the agent but it does not necessitates phenomenal consciousness.

movements, gestures, postural adjustments, attention, anticipation, and so on. To perceive impatience in another is to perceive a rather complex form of interlocking elements.

Acknowledging this point, Gibson thought it natural to conclude that the information specifying the things populating one's surroundings and the opportunities they afford must be form-sensitive, i.e., capable of detecting complex spatiotemporal patterns and structures, involving a variety of interconnected elements, or stages. Yet, whereas on the standard approach the organizational complexity of the objects of perception must be inferred, or computed, from minimally structured elementary sensory stimuli, Gibson argued that the stimulus information must itself be richly organized. But in order to make sense of such information, and of the ability to get a hold on it, the traditional mechanistic, atomistic, and passively reactive model of perception must be abandoned. The construction of an alternative model, holistic and dynamic in character, hinges on the central notion of *perceptual invariants*. Rather than discussing Gibson's theory of perceptual invariants in detail, I shall touch only on the bare minimum required to make sense of the idea of form perception by way of dynamic sampling of the structure of one's environment (For a more detailed discussion see, for example, Michaels & Carello, 1980; Reed, 1996; Shani, 2006).

First, Gibson argued that the information specifying things and their affordances is global and structured rather than local and homogenous. Such information exists in ambient arrays, namely, in the energy fields surrounding animate creatures. The patterns of distributed energies in such fields are structured by the components of the environment, for example, by the reflectance properties of various surfaces, or by the diffusive nature of certain substances. Gibson's major claim in this respect was that since the energy patterns in ambient arrays are *lawfully* structured by distal sources in the environment they contain reliable information about these sources. Note that unlike traditional stimulus theories, stimulus information of this sort is, by its very nature, holistically distributed, heterogeneous, and complexly structured – it is intrinsically organized.

Second, Gibson argued that those stable patterns in ambient arrays that specify things and their affordances could only be detected in the form of stimulus configurations that remain *invariant* across certain transformations in the structure of the array. In other words, the capacity to perceive things and their affordances consists in the capacity to detect the invariants specifying them. Of importance here is the fact that invariants are detected relative to changes in stimulus flow for this implies (a) that information pickup is a holistic process extending over totalities of experiential flows; and (b) that this process is inherently dynamic, consisting of an active sampling of the structure of the array.

Point (a) is of considerable significance insofar as it denies that the relevant stimulus information is exhausted by momentary sensory excitations and asserts in contrast that the true character of an object of perception – its true gestalt, if you like – is revealed not in any specific sensory pattern but, rather, in what remains invariant amid transformations between collections of such patterns (see Breidbach & Jost, 2006; Chen, 2005). Thus, for example, invariant proportions in projective geometry are what specify a shape as a circle despite the fact that it is often projected to the eye as an ellipse. It may be noted here that part of the reason why orthodox theories of perception are of little help in discerning intensional differences between co-extensional entities is because on the standard view of stimulus input material co-extensionality, of the kind manifested by co-inhabited aspects, is considered sufficient for stimulus-equivalence (this assumption is particularly explicit in Quine's theory of stimulus meaning). But if *significant* stimulus information is obtained only in the form of invariance amid changes in actual stimuli then what seems stimulus-equivalent, hence indiscernible, on the standard view may not be so after all.[10]

Point (b) is a direct negation of the traditional reactive and passive image of perception. Since invariant relations in ambient arrays are discerned only relative to changes in stimulus properties a passive observer would be very limited in its ability to detect them. Thus, Gibson emphasized the significance of active sampling of the structure of the array, that is, of active perceptual exploration involving movement, scanning, manipulation, and so on. He also emphasized the fact that information

---

[10] I develop this idea elsewhere (Shani, in press), where I argue that this is precisely the step needed to be taken in order to explain why, contra Quine (1960, 1969), the information specifying a whole rabbit is *not* equivalent to the information specifying undetached rabbit parts.

about the environment is concurrent with information about the self, i.e., that as a moving observer perceives the persisting features of its environment it also co-perceives its own movements relative to the environment. This last point ties nicely with our previous observation regarding the bidirectional, or bilateral, character of the perception of affordances: one perceive's the environment as one perceives itself in it, and one perceives what the environment has to offer as it perceives itself in relation to it.

I used Gibson's ecological theory of perception to illustrate the validity of a general theoretical claim, namely, that a viable intensional account of perceptual input is contingent on a shift towards an action-based model of perception. As mentioned before, there may well be other serious contenders, differing from Gibson's account to various degrees. For example, Kevin O'Regan's sensory-motor approach (O'Regan & Noë, 2001; Philipona, O'Regan, & Nadal, 2003) provides an alternative, though equally action-based, account of the invariants constitutive of visual perception.[11] However, if I am right, whatever theory will prove itself best in the long run will most likely share some of the general characteristics of Gibson's account, in particular: an emphasis on the active agency of perceivers, a dynamic and holistic framework of analysis, an acknowledgement of the status of interaction potentials as direct objects of perception, and an affirmation of the central role of perceptual invariants. In the polemics surrounding the nature of perception the intensional character of perceptual information is seldom invoked, yet if the analysis suggested in this paper is along the right track then proponents of action-based theories of perception can rightfully claim it an advantage of their approach that it renders the intensional character of perception intelligible.

5.3. From perception to representation: interactivism as an intensional theory of content

I argued that they key obstacle preventing us from coming to terms with the intensional character of content lies in the entrenched commitment to input extensionalism. Accordingly, the main focus of this paper has been on the nature of perception. It is clear, however, that a comprehensive solution to the problem with which we began – accounting for the fact that intentional states are endowed with aspectual shapes – requires, in addition, the ability to explain aspect-relativity as a general feature of representation. Earlier, I made the claim that accommodating the intensional character of content ought to be an adequacy criterion for theories of meaning and representation. I also mentioned the fact that the most popular naturalistic accounts of mental representation fail this adequacy test uncondi-tionally. I would like to conclude on a more positive note by indicating briefly that at least one contemporary naturalistic account of mental content – interactivism (Bickhard, 1993 and elsewhere) – *is* thoroughly intensional. There is neither time, nor space, for a detailed demonstration; instead, I shall make do with indicating some of the major relevant points at stake.

In stark contrast to other, more orthodox, theories of representation (in particular, those associated with the computational-representational theory of the mind) interactivism has no difficulty accom-modating, and does accommodates, the intensional character of perception. First, in a similar fashion to Gibson interactivism maintains that perception is action-oriented and that interaction potentials (i.e., possible outcomes of future interactions, and possibilities for further initiated action) are direct objects of perception.[12] Second, interactivism also embraces the central role played by invariants in the construction of perceptual information (although the invariants it presupposes are not limited to the ecological invariants emphasized by Gibson and often include sensory-motor invariants). Finally, on a more general level, the interactivist approach is also thoroughly dynamical and holistic, and it offers a rich account of animate agency.

While most of these features may also be shared by other action-based approaches to perception and cognition such as *enactivism* (Nöe, 2004; Varela, Thompson, & Rosch, 1991), it is often the case that action-based explanations of perception and cognition tend to shun the notion of representation

---

[11] Mossio and Taraborelli (2008) argue convincingly that the ecological and the sensory-motor accounts of perceptual information are not only theoretically distinguished but also yield different empirical predictions.

[12] In an important sense, it goes even beyond Gibson in developing the idea that all physical and spatial representation is constructed out of functional indications – interaction potentials are not merely perceived along surfaces and substances, they *constitute* the perception of the latter (Bickhard & Richie, 1983).

altogether. Indeed, this was a recurrent theme in Gibson's work throughout his career. The motive power behind this aversive approach seem to be the conviction that the notion of 'representation' cannot be salvaged from the myriad of philosophical intricacies with which it was, and often still is, associated. Representation, the idea goes, is simply irreconcilable with a thoroughgoing action-based approach.

In contrast to these eliminativist overtones interactivism offers a detailed action-based account of representation, an account that grounds a very different verdict on the status of 'representation' as a theoretical construct. Without getting into further details perhaps the most important fact worth mentioning here is that according to interactivism representations of one's external environment are ultimately constituted as internal *indications* of the interactive potentials, the interactive properties, of that environment. That is, on this model, cognitive agents represent their respective environment by way of constructing indications (often of considerable complexity) of the adaptive possibilities offered by those environments. As we have seen, such adaptive possibilities are themselves bilaterally intensional, connecting aspects of the environment to aspects of the agent. Hence, much like Gibson's theory of perception, the interactivist account of representation is deeply intensional. In sum, we not only have some robust ideas as to how to rebut the presumed extensionalism of perceptual information, in interactivism we also have a serious rival to orthodox theories of cognition and representation amongst whose many virtues is the fact that it accounts for the intensional character of content rather naturally.

6. Conclusions

John Searle deserves credit for calling attention to the significance of the fact that intentional states have aspectual shapes.[13] However, Searle's contention that only conscious intentional states are intrinsic possessors of aspectual shapes is, at best, dubious. Worse still, Searle offers no real explanation of what makes intentional states (whether conscious or unconscious) endowed with aspectual shapes in the first place. Contrary to Searle's position, the theoretical stance taken in this paper was that aspectual shape is a universal intrinsic feature of intentional states *in general* stemming from the fact that such states are inherently predicative, predicating their intentional objects with selective attributes. Intentional content, it was argued, is necessarily intensional (i.e., aspectual) because intentional states represent their intentional objects as possessing some properties but not other, co-extensive properties.

Yet, providing a viable naturalistic account of the intensional character of content is a difficult task. A major source of trouble was identified in the form of the widely (though often tacitly) held assumption that the perceptual, or informational, input to the cognitive apparatus of intelligent beings differentiates only extensional entities, i.e., those entities whose identity conditions conform to the extensionality principle. Its popularity notwithstanding, I argued that such input extensionalism precludes any hopes of respecting the intensional character of content and is therefore of dire consequences for theories of perception and representation. Gibson's ecological theory of perception, and in particular his theory of affordances and his ideas about perceptual invariants, were then presented as illustration of an alternative view about the nature of perception which transcends input extensionalism and makes the direct perception of intensional entities possible. Rather than an established dogma to be adhered to, Gibson's view was presented as an illustration of a general direction: it was suggested that whatever theory of perception capable of going beyond the strictures imposed by input extensionalism would have to share some of the essential features highlighted by Gibson, in particular an emphasis on the dynamic nature of the process of information pickup, and on the holistic and action-oriented character of the information being picked up. Finally, moving from perception to representation writ large, it was argued that among contemporary theories of representation interactivism stands out as a theory that, unlike more celebrated accounts, naturally

---

[13] It may be noted, however, that what Searle labels as 'aspectual shape' was long emphasized in the phenomenological tradition, from Husserl onwards, as a salient feature of intentionality.

accommodates the intensional character of perceptual information and incorporates it within a general action-based model of mental content.

It will be apt to conclude by returning to the quotation from Wittgenstein (1953, II, 197) mentioned at the beginning of this essay. For, if what I have argued for throughout is of any value then, pace Wittgenstein and the majority of philosophers to date, 'Seeing as…' certainly is an integral part of perception.

References

Bealer, G. (2000). Intensional entities. *Routledge encyclopedia of philosophy.* pp. 803–806.

Ben Ze'ev, A. (1993). *The perceptual system: A philosophical and psychological perspective.* New York: Peter Lang.

Bickhard, M. H. (1991). The import of Fodor's anti-constructivist argument. In L. P. Steffe (Ed.), *Epistemological foundations of mathematical experience* (pp. 14–25). NY: Springer-Verlag.

Bickhard, M. H. (1993). Representational content in humans and machines. *Journal of Experimental and Theoretical Artificial Intelligence, 5,* 285–333.

Bickhard, M. H., & Richie, D. M. (1983). *On the nature of representation: A case study of James Gibson's theory of perception.* NY: Praeger.

Breidbach, O., & Jost, J. (2006). On the gestalt concept. *Theory in Biosciences, 125,* 19–36.

Carnap, R. (1947/1956). *Meaning and necessity* (2nd ed.). Chicago: University of Chicago Press.

Chen, L. (2005). The topological approach to perceptual organization. *Visual Cognition, 12*(4), 553–637.

Fodor, J. A. (1975). *The language of thought.* Hassocks, Sussex/Scranton, PA: Harvester Press/Crowell.

Fodor, J. A., & Lepore, E. (1994). What is the connection principle? *Philosophy and Phenomenological Research, LIV*(4).

Fodor, J. A., & Pylyshyn, Z. W. (1981). How direct is visual perception? Some reflections on Gibson's "Ecological Approach". *Cognition, 9,* 139–196.

Gibson, J. J. (1960). The concept of the stimulus in psychology. *American Psychology, 15,* 694–703.

Gibson, J. J. (1966). *The senses considered as perceptual systems.* Boston: Houghton Mifflin.

Gibson, J. J. (1979). *The ecological approach to visual perception.* Hillsdale, NJ: LEA.

Helmholtz, H. (1925). Physiological optics. In J. P. C. Southall (Ed.), *Optical society of America, Vol. 3.*

Kaplan, D. (1978). Dthat. In P. Cole (Ed.), *Syntax and semantics, Vol. 9.* Pragmatics. NY: Academic Press.

Keil, F. C. (1981). Constraints on knowledge and cognitive development. *Psychological Review, 88,* 197–227.

Kriegel, U. (2003). Is intentionality dependent upon consciousness? *Philosophical Studies, 116,* 271–307.

Lewis, D. (1986). *On the plurality of worlds.* Oxford: Blackwell.

Markman, E. M. (1989). *Categorization and naming in children.* Cambridge: MIT Press.

Michaels, C. F., & Carello, C. (1980). *Direct perception.* Englewood Cliffs, NJ: Prentice-Hall.

Montague, R. (1960). Logical necessity, physical necessity, ethics, and quantifiers. *Inquiry, 3,* 259–269.

Mossio, M., & Taraborelli, D. (2008). Action-dependent perceptual invariants. From ecological to sensorimotor approaches. *Consciousness and Cognition, 17*(4), 1324–1340.

Nöe, A. (2004). The enactive approach to perception: an introduction. In A. Nöe (Ed.), *Action in perception.* Cambridge, MA: MIT Press.

O'Regan, J. K., & Noë, A. (2001). A sensorimotor account of vision and visual consciousness. *Behavioral and Brain Sciences, 24*(5), 939–1011.

Philipona, D., O'Regan, J. K., & Nadal, J. P. (2003). Is there something out there? Inferring space from sensorimotor dependencies. *Neural Computation, 15*(9), 2029–2049.

Quine, W. V. O. (1960). *Word and object.* Cambridge, MA: John Wiley & Sons/MIT Press.

Quine, W. V. O. (1969). *Ontological relativity.* (Reprinted from J. Kim, & E. Sosa (Eds.), 1999. *Metaphysics: An anthology.* Oxford: Blackwell).

Reed, E. S. (1996). *Encountering the world.* NY: Oxford University Press.

Rosenthal, D. M. (1990). On being accessible to consciousness: commentary on Searle. *Behavioral and Brain Sciences, 13*(4), 621–622.

Searle, J. R. (1980). Minds, brains, and programs. [Author's response]. *Behavioral and Brain Sciences, 3,* 451–452.

Searle, J. R. (1983). *Intentionality: An essay in the philosophy of mind.* Cambridge: Cambridge University Press.

Searle, J. R. (1987). Indeterminacy, empiricism and the first person. *Journal of Philosophy, LXXXIV*(3), 123–146.

Searle, J. R. (1992). *The rediscovery of the mind.* Cambridge, MA: MIT/Bradford.

Shani, I. (2005). Intension and representation: Quine's indeterminacy thesis revisited. *Philosophical Psychology, 18*(4), 415–440.

Shani, I. (2006). Narcissistic sensations and intentional directedness: how second-order cybernetics helps dissolve the tension between the egocentric character of sensory information and the (seemingly) world-centered character of cognitive representations. *Cybernetics and Human Knowing, 13*(3), 87–110.

Shani, I. (2007a). The myth of reductive extensionalism. *Axiomathes, 17*(2), 155–183.

Shani, I (2007b). Consciousness and the first person: a critical appraisal of Searle's connection principle. *Journal of Consciousness Studies, 14*(12), 57–91.

Shani, I. (2008). Against consciousness chauvinism. *The Monist, 91*(2), *special edition on Intentionality and Phenomenal Consciousness* (edited by T. Horgan and U. Kriegel), *9*(2), 294–323.

Shani, I. The whole rabbit: on the Perceptual Roots of Quine's Indeterminacy Puzzle. *Philosophical Psychology,* in press.

Spelke, E. S., Breinlinger, K., Macomber, J., & Jacobson, K. (1992). Origins of knowledge. *Psychological Review, 99,* 605–632.

Thelen, E., & Smith, L. (1994). *A dynamic systems approach to the development of cognition and action.* Cambridge, MA: MIT Press.

Turvey, M. T., Shaw, R. E., Reed, E. S., & Mace, W. M. (1981). Ecological laws of perceiving and acting: in reply to Fodor and Pylyshyn (1981). *Cognition, 9,* 237–304.

Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience.* Cambridge, MA: MIT.

Wittgenstein, L. (1953/1972). *Philosophical investigations.* (G.E.M. Anscombe, Trans.). Oxford: Basil Blackwell.