

Semantics naturalized: Propositional indexing plus interactive perception

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Abstract

A concrete proposal is presented as to how semantics should be naturalized. Rather than attempting to naturalize propositions, they are treated as abstract entities that *index* concrete cognitive states. In turn the relevant concrete cognitive states are identified via perceptual classifications of worldly states, with the aid of an interactive theory of perception. The approach enables a broadly realist theory of propositions, truth and cognitive states to be preserved, with propositions functioning much as abstract mathematical constructs do in the non-semantic sciences, but with a much more specific propositional indexing scheme than previous naturalistic proposals were able to achieve.

Keywords: Naturalized semantics; propositions; interactive perception

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What would it be to naturalize semantics, and how should it be done? To answer these two related questions, one must have some definite conception of the main considerations relevant to the naturalization of semantics, along with some procedure for actually carrying out the naturalization. I shall address both issues in this paper. Addressing the first involves providing a description of a specific conception of what a semantic

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naturalization project should involve, along with its metaphysical and epistemic presuppositions. This first part of the project cannot be fully defended here, but serves rather as a preliminary motivation for the second task, which is to actually carry out a semantic naturalization project in enough detail so that its main features become apparent. If this second part of the project is potentially successful, it will also serve as some indirect motivation for the first part. To begin, here is the first part.

As a scientific realist, I am attracted to a propositional version of a substantive conception of truth as correspondence to reality. On such a view, the concept of an objective ontological fact, such as that of some particular object X actually having a property F--in metaphysical independence from our conceptions of it--cannot be disentangled from a closely linked conception of there being a true proposition which states that object X has property F. On this view, truth is a substantive property of a subset of abstract propositional entities, which consists in the fact that they correspond to, or correctly represent the fact that, object X does in fact have property F. So on this approach, truth is correct propositional representation of a fact, and falsity is incorrect propositional representation of a fact--that is, representing the fact as being some way that it is not.

The initial connection of this conception of propositional truth with naturalization is as follows. Natural science cannot proceed without some theoretical presuppositions as to what science is attempting to do. The standard realist conception is that science seeks to confirm or disconfirm a *scientific theory*, where a theory is a collection of propositions

that make claims about how the world actually is. The substantive propositional conception of truth outlined above arguably is an integral theoretical part of this metatheory, or body of theoretical presuppositions, of standard realist science.

So on this fairly common realist view, a naturalization of semantics does not, indeed *could not*, be an attempt to naturalize the relevant concepts of proposition, truth, and correct or incorrect representation themselves. They are *part of the metatheory*, and hence *off limits* to scientifically based naturalization projects. Any science whatsoever presupposes those abstract concepts, including any empirical sciences that study semantic aspects of human and animal cognition. So on this general realist conception of science, and of what it is to scientifically naturalize any claims about the world, what needs to be naturalized is not those basic semantic concepts themselves, but rather any substantive semantic theories that make empirical claims about how human or animal semantic cognition actually works. What is needed for semantic naturalization must be restricted to scientifically respectable theories showing how actual cognitive mechanisms and structures relate to the standard propositional framework.

To be sure, nothing is completely off limits to science. One can perhaps imagine at least the abstract possibility of successful attacks on the metatheory of standard realist science, which would put in doubt, or even overthrow, the substantive conception of the truth of scientific theories as consisting in the correspondence of their propositional claims with reality. But *what we actually have* within the scientific community as recognized serious criticisms of that metatheory--such as van Fraassen's constructive empiricism (1980)--

is a much milder form of attack, such as the claim that science can work well enough without scientists having to have a full commitment to such a strong metatheory for *all* theoretical terms employed in science. Such a view recognizes the centrality of the propositional model as a part of the basic structure of science, even as it counsels a less than whole-hearted epistemic commitment to it when the limits of strictly observational concepts are exceeded by scientific theorizing. But such specifically *epistemically* tempered kinds of criticism serve more to further entrench the propositional model, than to throw any doubt on its basic concepts, or their fundamental place in the metatheory.

So, perhaps ironically, it might be that only truly *drastic* failures of *semantic naturalization attempts themselves*--i.e., epistemically striking extreme failures, during repeated attempts, from many different theoretical perspectives, to successfully apply a propositional metatheory to scientific studies of human and animal semantically related cognition--could cast any significant doubt on the status of that metatheory itself. But in any case, clearly one such as myself, who claims to be able to demonstrate a potentially successful method for naturalizing semantics within the realist metatheoretic framework, has no good reason to be concerned with such a dire hypothetical possibility. So I shall not be so concerned.

1. Epistemic Support for a Propositional Metatheory

Beyond the general fortunes of broadly realist views of science, I shall argue that there are other, more specifically *epistemic* reasons as to why the study of animal and human semantic cognition is most naturally and plausibly viewed in the framework of a propositional metatheory. As a brief overview, these reasons are as follows. First, our epistemic conception of what it is for us to *discover* that the world is a certain way--or that certain facts are the case--itself relies heavily on the propositional model. So our conception of a natural semantic science of how things actually work when cognizers acquire some knowledge about the world is itself most naturally viewed as a propositionally informed view of how natural processes bring it about that cognitive activities become linked to known propositions.

And second, our allied, more specifically empirical epistemic conception of the most basic *epistemic way* in which cognizers gain such knowledge of the world--namely, through broadly *perceptual* processes--is also basically propositional in two respects. The first respect is that our basic conception of what it is to *be* a perceptual process--namely, one that is about some worldly fact, which involves the acquisition of some information about that fact, and which is also correct or incorrect with respect to that information gathered--is also a fundamentally propositional conception. The second respect also integrally involves a second-order epistemic issue, namely that of the conditions under which, or the evidence on the basis of which, people would normally accept that a person *had* correctly or incorrectly perceived some worldly fact to be some

specific way. This issue of the kinds of evidence that would normally justify a claim that a person had correctly or incorrectly perceived some fact is itself part of various social and psychological sciences involving semantic concepts, the relevant parts of which sciences must themselves be naturalized in any adequate naturalization of semantic phenomena. As might be expected, my claim will be that these second-order epistemic issues are also themselves best understood in a propositional framework.

In a nutshell, the argument for the latter claim is as follows. Our epistemic understanding of what it is for a worldly fact to be the case--and hence for a specific proposition to be true of it--cannot be divorced from our practical understanding of the conditions under which we would have *adequate evidence* that someone had correctly perceived that fact to be so. This is because a broadly realist metaphysics must be closely linked with a perceptually based epistemology of how we could find out about the relevant, propositionally described ontological facts--first-order epistemology. But an unavoidable part of that epistemic story must be an epistemology of standards of evidence for when such perceptual investigations have either been successful, or have failed--i.e., second-order epistemology, also requiring propositionally based standards of evidence. Or more simply still, our fundamental understanding of what it is to discover the facts, and to have evidence of when people in general actually have perceptually discovered the facts, cannot be divorced from a propositional conception of those facts, plus a naturalistic account of how cognition relates us to the relevant propositions.

These basic connections between a propositionally described world and our understanding of our epistemic access to that world can also be related to the standard view that the purpose of scientific theories is to explain and predict the phenomena studied by a given science. My claim would be, as already mentioned in the introduction, that the propositional metatheory provides a primary explanatory tool for use in the semantic sciences, namely those sciences studying broadly cognitive phenomena in humans and animals. Hence, again, the propositional metatheory itself cannot be part of what has to be investigated in order to explain and predict semantically related cognitive phenomena.

2. Introduction to Propositional Indexing

So far, it might sound as if I am about to propose some kind of industrial-strength intentional realist view about cognition, perhaps of a Fodorian kind (e.g., 1987), such as one in which mental states are viewed as having truth-evaluable, propositionally structured contents. But not so. Instead I shall argue that a consistent application of my earlier realist claim--namely, that propositional structures belong in the metatheoretic structure of scientific theories generally, rather than in the theories themselves--means that semantic theories also must not attempt to apply propositional concepts, including those of intentionality, aboutness, reference, representation, proposition and truth, directly to worldly phenomena. Instead, on my view, all such propositional concepts and theories are just as much part of the abstract metatheoretical structure of scientific

theories in general as are logical and mathematical concepts and theories. So in one sense, there cannot be a natural science of semantic phenomena--just as Brentano (1874) claimed, but not for his reasons--because on the current view there are no first-order, concrete semantic properties of physical entities and states at all. On this view, legitimate semantic theories are those that use the abstract structures of propositional theories to further our understanding of how concrete cognitive processes work, just as mathematically structured theories can further our understanding of natural phenomena in general without anyone supposing that concrete items actually possess or instantiate mathematical properties. But how exactly does this purely abstract and metatheoretical conception of propositional structure relate to more standard semantical conceptions? This issue will now be investigated.

It is generally assumed that people can have concrete perceptual states and beliefs that are *about* the world, and which *represent* it in ways that are *correct* or *incorrect* in virtue of the *meaningful content* of those perceptual or belief states. One resulting philosophical issue is that of how such intentionality phenomena might be naturalized within a broadly scientific framework. For example, how could a purely physical cognitive state possibly represent, or be about, some independent worldly item? Now it might be thought that, at this relatively late stage in the history of discussion of this perennial issue, all of the possible theoretical positions regarding this issue would already have been articulated and assessed. However, I shall argue that, perhaps surprisingly, one potentially major theoretical position seems to have been neglected. It is this position that will be defended here.

The view to be introduced could be called *propositional indexing*, or *indexicalism* for short. It could be regarded as a previously neglected intermediate position between intentional realist positions on the one hand, such as those of Dretske and Fodor, and intentional eliminativist positions such as those of the Churchlands and early Stich on the other hand (Dretske 1981, Fodor 1990; Churchland 1979, Stich 1983). Intentional realists think that cognitive states possess genuine intentional or semantic properties, whose naturalistic status then needs to be clarified. By contrast, intentional eliminativists both deny that cognitive states have any such semantic properties, and deny that the traditional folk-psychological apparatus of propositions and propositional attitudes is applicable to human cognition.

However, what has not been adequately noticed is that standard intentional eliminativist positions are *conjunctive* positions. To emphasize, they involve holding *both* that token cognitive states lack any semantic properties, *and* that concepts of propositions, and propositional attitudes, are inapplicable to human cognition. So there is theoretical room for an *intermediate* position--holding one, but not both, of the relevant conjuncts in the intentional eliminativist view. The propositional indexicalism to be defended here accepts the first conjunct--that there are no token semantic properties--while rejecting the second. So the indexicalist view is that token cognitive states do not *themselves* have any representational, semantic or intentional properties, but that nevertheless those cognitive states may be *correctly described* in propositional and propositional attitude terms.

Initially this might seem to be a paradoxical position, but a mathematical analogy can serve to clarify the issue. Numbers are abstract entities, yet natural science generally makes liberal use of numbers, and other abstract mathematical objects or properties such as statistical properties. It does so by using them to set up abstract correspondences, or structural isomorphisms, between properties or relations in the mathematical entities on the one hand, and properties or relations among the concrete worldly items on the other hand. For example, the physical relation between a ten pound weight and a twenty pound weight is structurally isomorphic to the abstract relation between the numbers 10 and 20. Hence the numbers can be used to index the corresponding physical items. So, even though concrete objects do not and could not themselves instantiate abstract numerical properties, they can nevertheless correctly be described in mathematical terms, in virtue of the structural isomorphisms that hold between the abstract properties of the numbers and the concrete properties of the physical objects.

My suggestion is that, in a related way, propositions, and the logical structural patterns of propositional attitude reasoning, can be used to index or correctly describe token cognitive states, even though those cognitive states do not--and arguably *could* not--themselves instantiate any intentional properties. So on this view, to the extent that folk psychological views amount to a kind of proto-theory or model, it turns out that the theory is a broadly formal, logical, mathematical or normatively rational theory or idealized model, rather than a theory of empirical science that could actually be instantiated by cognitive states.

To be sure, there are a few writers who have previously drawn attention to some form of propositional indexing of cognitive states. Field, Churchland, Loar, Dennett and McGinn have made some basic use of the idea, while Rowlands has recently used it to show the inadequacy of Fodor's sentential Language of Thought hypothesis regarding mental representation (Field 1978, Churchland 1979, Loar 1981, Dennett 1987, McGinn 1989, Rowlands 1994).

But all of these writers have a very weak conception of the kind of indexing involved, in two respects. First, their indexing relates only truth-functionally related structures of groups of propositions to corresponding structures in cognitive systems, with no indexing of individual cognitive states by individual propositions. Second, their view is also a weak, measurement-theoretic one, in the sense that *many different* sets of mathematical relations could mathematically index the same physical states. (Recall the arbitrary or conventional nature of particular temperature scales of measurement, for instance). So the traditional idea of there being a unique, one to one correspondence between particular belief states and particular propositions is not captured at all by such indexing views. But such weak conceptions would be totally unacceptable as part of the basic metatheory of science. Scientists must be able to test individual observations and resulting beliefs about the world, but could not do so unless one and only one determinate proposition is associated with a given precise observation or belief.

By contrast with weak views, the view I shall defend is precisely this traditional scientific conception of each distinct perceptual, observational or belief state being propositionally

individuated or indexed by exactly one proposition. So I can defend the traditional view that, in a certain sense, a belief involves a relation between a particular cognitive state and a single proposition--because of the one to one indexing correspondence that holds--while yet denying that a belief state involves a substantive *empirical* relation between a concrete cognitive state and a proposition.

This strong propositional indexing view arguably is the *only* way in which to theoretically implement the scientific realism defended in the introduction, which arguably requires that all propositional concepts be treated as abstract metatheoretical concepts that could not be instantiated by concrete worldly items. As required, it is both eliminativist about first-order, concrete intentional properties, and yet potentially fully supportive of standard scientific and folk-psychological conceptions of propositional attitudes, which conceptions require that individual perceptual states, beliefs and desires can all be propositionally individuated by one to one indexing correspondences.

3. The Relevance of Indexing to the Philosophy of Mind

Before investigating further the details of the propositional indexing approach, its relevance to some of the main problems in the philosophy of mind will briefly be pointed out. The basic relevance of the propositional indexicalist theory to the philosophy of mind comes from the fact that according to the theory, cognitive states, such as concrete

states of belief or desire, count as *mental* states in virtue of their being *indexable by propositions and propositional attitude structures*.

However, at the same time, such mental states are themselves purely physical states, having no intentional contents of any kind. So immediately all of the standard problems about mental causation, supervenience of mental states on physical states, worries about epiphenomenalism, the normativity of intentionality, and so on, are trivially avoided, since mental states themselves *just are* physical states. Also, the whole complex debate about whether physicalism and physical states can be defined independently of correlative definitions of mental states can also be avoided, because all mental states are physical states on the current view.

As for what identifies some physical characteristics as those in virtue of which some cognitive states become propositionally indexable (hereafter just: indexable), and hence genuine mental states, typically it is certain specific kinds of *perceptually based causal roles* of those states that provide appropriate, functionally based causal structures, in virtue of which various isomorphisms hold between the structures and relevant propositional structures (see the more detailed account to follow). However, to emphasize, on the current indexing view, token cognitive states such as perceptual or belief states *do not themselves* acquire any intentional content in virtue of realizing the causal roles that make them indexable. The secret to avoiding all of the usual intractable dilemmas in the philosophy of mind is to expel *all* semantic and intentional concepts

from the physical world into the purely abstract realm of propositions and rational intentional structures.

So, in spite of the concerns of Fodor (e.g., 1987) and other intentional realists, who predict disaster should it turn out that no concrete intentional or representational states exist, on the present view their elimination is perfectly compatible with the continuing relevance of propositions and propositional attitudes to cognitive functioning.

4. The Unavoidably Broad Scope and Metaphysical Necessity of Propositional Indexing

As will shortly become apparent, indexicalism of the current variety is not for the faint of heart. Arguably it can only consistently be maintained if *all* putative kinds of content, including pictorial content, low-level perceptual content of various kinds, connectionist tensor product content, or any other kinds of broadly *informational* content--in addition to the conventionally recognized propositional contents of linguistic expressions--are given the same uniform indexical treatment. Indeed, it may be that the lack of recognition of indexicalism as potentially delimiting a major theoretical position in the philosophy of mind is due to its unavoidably broad scope if consistently applied.

This is so for several reasons, including the following. Broadly computational and informational approaches to cognition are ubiquitous in cognitive science and the

philosophy of mind. Specifically propositional cognition, of a kind involving all three propositional elements of reference or aboutness, property-predication and truth-evaluability, is only one extreme, specialized kind of information processing in a spectrum of more generic informational processes. So if it were allowed that there could be *some* token cases of more generic, non-propositional kinds of information processing by cognitive systems that possessed *their own* integral kinds of intentionality--involving aboutness and some generic kinds of informational content--then it would be hard to theoretically motivate a claim that the more specialized or explicit propositional cases *could not*, in turn, have their own integral kinds of intentionality. So if intentionality is to be denied for token physical cases of propositional cognition, arguably it must also be uniformly denied for *all* token informational cases of cognition. (In section 4 it will be argued that all information is propositional in a broader sense, even though not all information is expressible in sentential propositional forms).

A mathematical analogy can again serve to clarify the issue. If it is to be denied that specialized uses of mathematics in science, such as in statistical descriptions of the behavior of ensembles of particles, can genuinely be *instantiated* by the physical objects or processes that they describe, then more generic or basic uses of mathematics, such as the minimal sense in which distinct objects may be numerically counted as separate items, must be uniformly treated as also *not* involving instantiation of mathematical properties, even of the simplest variety, by physical objects.

But the mathematical analogy also shows that the issue is not simply one of universal applicability, but it also involves a basic metaphysical issue of abstract versus concrete properties and relations. The most basic reason why no physical item could instantiate a mathematical property is not simply that we should be uniformly consistent in our theoretical applications of mathematics. It is that concrete physical items, as such, *could not* instantiate purely abstract mathematical properties. So the uniform non-instantiability of mathematical properties by physical items is a consequence of its being *metaphysically impossible* for any physical item to instantiate any abstract property.

Arguably in this respect too *propositional indexicalism must follow the mathematical model*. There is no fully coherent theoretical position about the metaphysical status of intentional or informational concepts or properties short of a full, categorical metaphysical thesis that their instances are all *purely abstract* semantic objects, properties, relations or structures. Hence no purely physical item, process or state *could* instantiate an informational or intentional property, any more than it could instantiate an abstract mathematical property. The realm of the intentional, though it remains a mark of the mental as argued by Brentano, must be a purely *abstract* realm, as abstract as set theory or mathematics in general. As it happens, it is an abstract discipline that, unlike set theory, can only usefully be applied to cognitive systems having at least a minimal degree of causal interaction with their environment (of a kind to be precisely characterized later). But it remains a purely abstract discipline nonetheless.

The discipline itself could appropriately be called *semantics*, since its field of study is all abstract meaningful informational structures. *Applied semantics* concerns application issues, such as how abstract semantic structures may be used to describe or index concrete cognitive processes. Then the current thesis of *propositional indexing* may be given a somewhat broader, specifically empirical role or interpretation, as the thesis that semantics, as just characterized in both its pure and applied forms, is *the only plausible available candidate* for the explanation of intentional and content-related aspects of cognitive systems. As an analogy, a thesis of *mathematical indexing* would hold that the only plausible available candidate for the explanation of certain formal structures in science is the system provided by applied mathematics.

5. Why We Should Believe the Indexicalist Thesis

Why should we believe the thesis of propositional indexing, in its new incarnation as a thesis claiming that the only plausible framework for applying intentional concepts to cognitive systems is provided by indexing-related applications of the purely abstract discipline of semantics? Well, here are a few initial arguments, to serve as some preliminary motivation for the indexing view to be developed.

To begin, there are really only two basic kinds of choice for intentional relations between a cognitive system *Z* and some worldly physical item *X*. Suppose that *Z* perceives *X*, or has a belief about *X*. In such cases, either *Z* itself *directly* represents *X*, in virtue of its

own possession of some X-related content, or Z *indirectly* does so in virtue of its being indexable by some propositional structure S that represents X. So either some aspect of physical system Z itself is directly about X, or the relevant aspect of Z is not about X, but instead it is indexable by a propositional structure S that is about X.

Arguably the implausibility of the direct representational approach has been amply shown by the dubious track record of naturalized semantics theories, such as those of Dretske (1981, 1995) and Fodor (1990), according to which cognitive states represent worldly states in virtue of their direct nomic covariation with them, plus some other factor (teleological in Dretske's case, and involving asymmetric dependence in Fodor's case). A crucial problem for such direct covariation or correlation approaches is that of explaining the possibility of *misrepresentation*. If A represents B just in case some state of A nomically covaries with some state of B, then how could A ever misrepresent B? On the other hand, misrepresentation potentially could easily be handled by indirect indexing approaches, in that a false proposition about B represents B just as surely as does some corresponding true proposition about B. Indeed, the concepts of propositional truth and falsity provide our only clear and generally agreed on concepts of correct and incorrect representation. So, other things being equal, the controversial track record of direct approaches, plus their inability to adequately explain misrepresentation, provides at least a *prima facie* case for the current indexicalist thesis.

Nevertheless, it must be emphasized that the thesis of propositional indexicality is intended to be a substantive empirical claim, namely that cognitive states can *in fact* be

indexed propositionally. Showing this will require showing that there do indeed exist structural isomorphisms or correspondences between concrete perceptual or belief states, such as a person's concrete perceptual state P when he perceives that an object X is red, and the corresponding proposition that X is red, which enables it to serve as an index for the concrete perceptual state P. If unique correspondences or isomorphisms of these kinds could not be found, then after all we might have to settle for the direct intentional approach, in spite of all its flaws.

Another potential theoretical advantage of the indirect approach is in explaining the possibility of reflexive intentional states (Kriegel 2003)--states in which one is thinking about one's own current thought. The most straightforward theoretical way in which to explain this possibility is to deny that reflexive mental states are themselves intentional. Instead they are causal structures that are indexed by propositions about those very structures. For example, my current thought about this very thought token itself--such as a belief that it is instantiated in a certain region of my brain--could be a purely causal structure S that is indexed by a proposition referring to this very same causal structure S.¹

6. Why Extend Indexicalism to Informational Content Generally?

Section 2 argued that the indexicalist thesis cannot be restricted to overtly propositional information, of kinds expressible in explicitly sentential form, since cognitive informational processing can take many forms, which nevertheless require a uniform

theoretical treatment. This section will briefly provide a preliminary defense of this view, so as to further motivate and clear the way for the indexing view to be developed.

The most basic defense is that any recognizably informational processes, of *any* kind, cannot avoid providing information *about* something, which is also *correct* or *incorrect* about it. For example, in order for a picture P to be a picture of a person X, P must provide some information about person X, and it must be possible to assess that information with respect to its correctness or incorrectness as a representation of X. Or in other words, it does not matter whether the relevant information is provided by a sententially structured physical vehicle, or a pictorially structured one, or a connectionist neural network, and so on. Insofar as those vehicles directly or indirectly provide information, they must represent or be about something, and the information they provide about it must be correct or incorrect. So information as such must be propositionally structured, in terms of the three propositional factors of reference, specific property predication, and correctness or incorrectness, whether or not the relevant physical vehicle has an explicitly sentential structure.²

Here is a basic argument to demonstrate this. Photographs do not have a sentential structure. But in order to even *understand* a claim that a photograph correctly represents some particular actual person, the photograph must be capable of providing information whose association with the photograph entails one or more propositional claims about the person, such as that she is a woman, with blond hair, and so on. But if photographic information can *entail* propositional claims about a person, that information must *itself* be

propositional, even though it is derived from a non-sententially structured source. This is because entailment is a logical relation that can only hold between propositionally structured items. So we must not confuse how an informational vehicle is *physically* structured--whether sententially, photographically, and so on--with the issue of how *the propositional information that it expresses* is structured. So a unitary view of propositional indexing of all information is not only possible, but it is also unavoidable for those who reject direct representational views of information processing.

7. Overview: Ontology, Epistemology and Basic Perception

To summarize where we have arrived at, it has been argued that propositional indexing potentially offers an attractive, indirect way in which to naturalize intentionality, which also would avoid the well-known difficulties of direct naturalization attempts, such as those involving nomic covariance concepts. But in addition, a broader point should also be made that ties in with the outline in section 1, namely that such an account integrates well with the standard distinction between the objective nature of the world, and issues about our epistemic access to that same world. That distinction is echoed in the distinction of propositional expressions of facts concerning objective reality, as compared with our cognitively based, epistemic ways of coming to know those facts. So, as a first approximation only, a propositional indexing view might be viewed as one that seeks to relate an impersonal or abstract conception of what the facts of the world are,

independently of cognition, with particular, cognitively based epistemic methods for discovering what those facts are.

However, the situation is more complicated than that initial conception--of ontologically based propositions, versus epistemic methods of discovery--would suggest. Abstract objects such as numbers or propositions are themselves conceptual tools having *epistemic* functions. As for propositions, on the current indexing view propositions are *representations* of the world--indeed, the *only* representations that there are. So a more appropriate or nuanced account of the role of propositions in an indexing theory is that they constitute an abstract, broadly epistemically based *regimentation of all of the world-related representational functions of cognitive processes*. So, propositions provide, in a conceptually clarified and regimented form, the sum total of what we are able to learn about the world, in an abstract format that is divorced from the particular, concrete cognitive epistemic routes by which we achieved those results.

As a result of these functions of propositions, one defensible naturalistic project in semantics is that of showing how propositions, as thus conceived, can *in turn be used to index*, or be isomorphically mapped onto, typical concrete cognitive processes of a kind apt for providing us with access to those very same abstract propositions. On this conception, to naturalize cognition, or to understand how it works, is a matter of *re-integrating* its propositional outcomes--in a fully perspicuous and structure-preserving manner--with the concrete cognitive processes from whence they came.

A more familiar point about scientific theories may also be invoked. The epistemic utility of scientific theories in general is that they enable us to better explain and predict the phenomena they apply to. In the case of semantically related cognitive phenomena, including the kinds of behavior associated with them, a specifically *evolutionary* argument is applicable. This is that, generally speaking, kinds of cognitive processing that are propositionally indexable *tend to correlate well with evolutionary fitness considerations*. Various aspects of the behavior of evolutionarily successful species of organisms can generally be satisfactorily explained and predicted in propositional indexing terms, because of their positive correlation with the evolutionary success of those organisms. So, rather than semantic items being real, naturally occurring phenomena that need to be explained, instead what needs to be explained are various cognitive factors that, generally speaking, have a positive influence on evolutionary success, and which we conceptualize as being semantically relevant in virtue of their presence in an organism being what makes the behavior of that organism propositionally indexable. A related role of evolutionary considerations will also be a central factor in the discussion of perception in section 10.

Another general point that should be made about naturalistic projects in semantics is that they must initially engage with our epistemic methods--for coming to learn the truth of specific propositions--at a *sufficiently basic level*. So the natural initial target for naturalization projects such as Dretske's, or the present one, is to explain the representational cognitive powers of non-linguistic animals, plus the most basic, low-end epistemic cognitive powers of humans, in specifically *perceptual* terms. Hence higher-

end issues, such as those involving concepts of belief, desire and intention, plus socially based, semantic deference factors associated with linguistically based conceptual structures, plus intensionality and referential opacity issues, and so on, must initially be bypassed (Godfrey-Smith, 1992). In the present case this low-end engagement will involve application of a very basic *interactive* causal theory of perception, which can be applied to even the most rudimentary early stages of perceptual evolution. (See section 10).

8. Some Groundwork for Propositional Indexing

Now finally we can proceed with the indexing-based task of showing how specific causal-role factors in cognitive states may be put into appropriate isomorphic correspondence with propositions. The causal-role factors could also be considered as *concrete causal mechanisms*, whose methods of functioning provide the causal structures to be indexed by particular propositions. A typical task would be to formulate the conditions under which e.g. the proposition 'X is red', about a particular object X, indexes a corresponding perceptual or cognitive state, such as that of a particular person Z who is perceiving that X is red.

In order to make further progress on the analysis of indexing, the following consideration must be brought to bear (see section 1 for an initial introduction). This is a point that there are significant *epistemic* constraints on possible naturalistic solutions satisfying the

indexing correspondence. The primary epistemic issue is that of *the epistemic conditions under which we would accept* that the isomorphism holds.

This point may be expanded on as follows. Our understanding of propositional indexing is not intended to be restricted to a specialized cognitive science procedure requiring technical expertise and detailed knowledge of such matters as the cognitive structures involved in perceptual functioning. Instead, the idea is that the everyday understanding, by people in general, of when a particular proposition, such as 'X is red' is true of a particular object X is to be correlated with a related understanding by such people of *what kinds of behavioral evidence would justify a claim* that the person *had indeed correctly perceived* the relevant fact. So the predominant epistemic issue is not the theoretical nature of propositional indexing as such, but rather the everyday conditions under which people in general would agree that it had successfully occurred. It is such conditions as these, along with aids from ancillary neurological sciences, which enable more rigorous and precise scientific formulations of these conditions to be employed in experimental studies of perceptual abilities.

To be sure, a naturalization project such as the present one, though it must to some extent rely on such everyday or folk-psychological understandings of cases of successful or unsuccessful perception, must also be able to provide a basic, fully adequate theory of the causal workings of perception and the perceptual mechanisms involved in such perceptual successes and failures. (See section 10 for such a theory). Without a detailed account being available in the background as to how perceptual mechanisms actually

work--so that, in principle at least, the actual isomorphic correspondences between propositional factors and perceptual mechanisms could be revealed--citations of everyday behavioral evidence concerning perception would lack any scientific basis.

But at the same time, a naturalistic theory of intentionality cannot avoid considering how people in general *actually do* use their propositional knowledge to index perceptual successes and failures. Both perceptual theories, and theories about abstract propositional structures, are no more than theoretical tools. A significant part of what such tools must be used to naturalize is *everyday understandings* of propositional knowledge, intentionality and perceptual success and failure. The indexing theory claims that our everyday understanding of intentionality can be explained in terms of a properly theoretically underpinned account of how we actually use our propositional knowledge to index our perceptual successes and failures. This engagement with everyday standards and understandings of knowledge, intentionality and perceptual evidence is a *necessary part* of any fully adequate semantic naturalization project, even though, of course, it is not the only part of such a project.

Next, arguably there is at least one important area of intersection or overlap between the technical and folk-psychological factors, which may be introduced as follows. As mentioned above, the basic folk-psychological idea is that the everyday understanding, by people in general, of when a particular proposition, such as 'X is red,' is true of a particular object X is to be correlated with a related understanding by such people of

what kinds of behavioral evidence would justify a claim that some person had indeed correctly perceived the relevant fact.

As a preliminary step, the behavioral evidence of correlation could be simplified and generalized as follows. When people believe some proposition, such as the proposition 'X is red' about a particular object X, they subsequently judge people's X-related perceptions with respect to the color of X as a form of *classification behavior*. For example, a paradigm kind of color-related classification behavior would be that of a person assigned a task of sorting some miscellaneous objects by their color, and then putting object X into a box containing only red objects. This classification behavior would provide evidence that the person P had perceived that object X was red.

Consequently, if the person Q observing person P is considering the proposition that X is red, then Q would take person P's classification behavior as *evidence* that P had perceived that X was red, and hence that P's relevant perceptual state S, whatever it may be, is *indexed* by the proposition 'X is red'. The classification behavior provides evidence that P perceived X to be red--and hence evidence also that P consequently thinks or believes that X is red, so that his subsequent belief may also be indexed by the proposition 'X is red'.

Next, a significant kind of intersection or overlap between technical and folk-psychological considerations can be addressed. The natural, folk-psychological use of classification behavior as evidence of what a person perceives or believes puts a significant constraint on the range of technical, causally based theories of perception that

could be consistent with the folk-psychological evidence. Arguably, all such theories must at least be *consistent with* a claim that perceivers in such cases are *disposed* to classify the object X in red-related ways in the relevant circumstances, and also thus disposed *as a result of* having perceived it. Here the concept of persons being *disposed* to behave in certain ways, *as a result of* perception, is intended to capture at least two elements in views of perception consistent with the evidence, as follows.

A succinct statement of the requirement is that the relevant classification behavior was neither purely accidental, nor unrelated to person P's having perceived object X. This requirement can be further analyzed as follows. First, the non-accidental element is captured in a claim that person P was *disposed* to engage in the relevant classification behavior, in some way that is lawfully related to the relevant circumstances, rather than its simply happening by accident that P engaged in that classification behavior. And second, that disposition must in some way be *integrally connected* with the fact of P having perceived object X. This second factor is needed to rule out the possibility that person P became disposed to carry out the relevant classification behavior in the circumstances as a result of some *other* factor, or factors, than factors integrally connected with P's having perceived X.

So, to sum up these points, folk-psychological and technical considerations overlap in a constraint on acceptable theories of perception that could be consistent with the folk-psychological conception of the relevant evidence. The constraint is that such theories *must in some way integrally connect perception of an object X as having some property F*

with a disposition to engage in F-related classification behavior in appropriate circumstances. Also, and more importantly for our overall concerns, this constraint is also a *binding constraint on folk-psychological conceptions of propositional indexing.* Our everyday conceptions of how our propositional knowledge about particular worldly facts involving an object X correlates with, or can be put into isomorphic correspondence with, our judgments about people's perceptions of object X also depend on this constraint being satisfied.

Also, this constraint is a substantive rather than a trivial one, in that, among other things, it can be used to exclude pure input-based theories of perception from naturalistic consideration. Perhaps surprisingly, those involved in previous semantic naturalization projects, such as the Dretske/Fodor nomic covariance approach, seem not to have appreciated the relevance and significance of this basic folk-psychological constraint on acceptable naturalistic theories. It is not sufficient to have a naturalistic causal account of how worldly facts cause representational perceptual contents to occur, as with a pure nomic covariance account, because such an account by itself does nothing to explain the *relevant behavioral classification dispositions* that are necessary to satisfy everyday standards of evidence for the relevant kinds of perceptually related behavioral activity to properly correlate with appropriate propositions. For whether or not the indexing account is the right fundamental approach to intentionality, *people do in fact* index perceptual evidence propositionally, so that accounting for such social semantic facts is *part of what has to be naturalized by any adequate semantic theory.* Thus a 'surface' kind of propositional indexing is an unavoidable kind of folk-psychological evidence that

requires explanation, whether or not the current 'deep' kind--that explains all intentionality in terms of indexing by abstract propositional structures, and denies that concrete cognitive states as such have intentional properties--is true.

9. Constraints on an Adequate Naturalized Perceptual Theory

Three previous considerations can now be brought together. The first consideration is from the previous section, which showed that any adequate, semantically naturalizable theory of perception must conform to the following constraint: the theory must in some way integrally connect perception of an object X as having some property F, with a disposition to engage in F-related classification behavior in appropriate circumstances. The second consideration is from section 7, to the effect that any semantic naturalization project must, at least initially, concentrate on *low-level* semantic cases applicable to non-linguistic animal cognition and low-level human perceptual abilities. The third consideration is the basic point that a naturalized theory of perception itself, whether or not it involves specifically semantic elements, must be a purely causal theory.

Taken together, these considerations strongly suggest that an appropriate basic theory of perception must involve nothing more than some simple combination of causal factors, involving both input causality and output causality factors. As for input causality, it is generally accepted that it is at least a necessary condition of perception of an object X by an organism Z that X causes Z's perceptual state S to occur. With respect to output

causality, the behavioral classification constraint from the previous section establishes that some output causality factor or factors must also be involved in any acceptable theory. As for the second consideration from section 7, regarding low-level, non-linguistic kinds of cognition, this could be expanded into a more comprehensive *evolutionary* consideration, as follows.

The evolutionary consideration has several elements. The first has already been mentioned, namely that any acceptable causal theory must be *simple* enough to be applicable to low-level, non-linguistic kinds of cognition. But that criterion by itself presumably is too inclusive, because there may be simple causal theories that have little or no *evolutionary plausibility*. Evolutionary plausibility is in turn made up of at least two related factors. First, it should be possible to justify the claim that the simple theory in question is *actually applicable* to a high proportion of biological species in any given historical period. For if the theory were not so applicable, it could not serve to help naturalize the actual cognition of the relevant species. And second, a more central evolutionary plausibility consideration is that the relevant perceptual factors should be capable of *making some positive contribution to the evolutionary fitness* of species that happen to instantiate them. The basic point here is that unless the relevant perceptual factors or competences made some positive contribution to evolutionary fitness, they would tend to die out, or at best end up as being of only marginal relevance to understanding the semantic aspects of cognition with respect to surviving species in general.

This last point could, if suitably emphasized, be thought of as the evolutionary theory equivalent of empiricist approaches to knowledge in philosophy, which would accord a central role to perception in the acquisition of knowledge. A roughly corresponding evolutionary doctrine would be that causally based perceptual mechanisms have a central role to play in the explanation of evolutionary fitness, in all but the most elementary stages of evolution prior to the existence of perceptual mechanisms. Given the central role of perceptually based intentionality considerations in the explanation of human and other higher kinds of mammalian cognition, it would at least be highly theoretically desirable if a corresponding thesis for perceptual mechanisms in general, holding for all levels of evolutionary complexity that include perceptual cases, could be defended-- hence providing a unified perceptual basis for all kinds of intentionality, including the most rudimentary. Fortunately, the interactive perceptual theory to be defended will show that such a beneficial theoretical climate for semantic naturalization is indeed available.

One more constraint on an adequate perceptual theory should be mentioned, which could be called the *particularity* constraint. The most basic intentionality factor is that of reference or aboutness with respect to some particular item. Perceptual cases seem to involve perception of some *particular* worldly object X, and to be about X, or to refer to X. Also, elementary evolutionary considerations would suggest that whatever value perception of a particular item X has to an organism Z must be closely linked with corresponding abilities by Z to respond to *that particular X itself*, whether in avoiding that X as a danger or in seeking that X as food. So it is at least highly desirable that any

chosen theory of perception should also conform to the particularity constraint. The interactive theory to be presented will satisfy this constraint as well.³

10. The Interactive Theory of Perception

An original theory of perception satisfying the constraints spelled out in the previous section--the *interactive* theory of perception--will now be presented. The basic causal concept on which the theory is built is that of *reflexive or reciprocal causal interaction* of physical items X and Z, in which one item X causes another item Z to *causally interact with X itself*. So in such cases, an item X causes X *itself* to be causally acted upon by some other item Z--a case of reflexive or interactive causality. For example, if one animal X eats another Z, then the pressure of X's jaws upon Z's flesh will cause Z's flesh in turn to exert counter-pressure on X's jaws--a simple, direct case of causal interaction. Such interactive cases are examples of Newton's third law of motion, namely that for every action, there is an equal and opposite reaction. Clearly this kind of interactive causality is ubiquitous in nature, and no evolutionary change could occur without it. For example, no land animal X could ever move forward without its feet pushing backward on the ground, which in turn reacts by pushing X forward.

But what does this have to do with perception? The key insight on which the interactive theory of perception is built is that perception, as a central evolutionary causal mechanism, is constituted by an *extended or mediated* form of causal interaction between

a perceived item X and a perceiver Z. The evolutionary development of sensory organs permits organisms Z to interact with environmental items X in an *extended and much broader range of ways* than direct interaction alone would permit. A sense-organ z_i of Z acts as a *mediating causal factor* in the closed chain of causality between X and Z. Instead of X directly interacting with Z, if Z possesses some sensory organ z_i then an extended chain of causal interaction becomes possible, in which X causes Z's sensory organ z_i to cause Z in turn to cause some reaction back upon X. For example, the development of eyes might enable Z to see a sample X of some food that is not directly in Z's path. Hence Z could be caused by X to eat X via the relevant, sensorily mediated chain of causation, even though X could not have directly caused Z to eat X because of their initial spatial separation. So the possession of a visual sense-organ provides an evolutionary benefit to an organism Z in such a case.

As for the big picture--of how the mediation of sensory mechanisms in closed interactive causal chains enables some species of organisms to improve their evolutionary fitness--it is not that sensorily mediated perceptual interactions *as such* improve evolutionary fitness. Instead, sensory mediation in closed causal chains greatly increases the *possible range of ways* in which environmental items X and organisms Z can interact. Some of these will be much more beneficial for some organisms Z_i than any direct causal interactions could be for those organisms. Some presumably might be much more harmful for some other organisms Z_j than corresponding direct interactions. But the important point is that *some* organisms would have their evolutionary fitness enhanced by sensory mediation over what they could achieve by direct interaction alone, and that is all

that is needed for sensorily mediated perceptual mechanisms to become a primary engine of evolutionary change for organisms in general (Dilworth, 2006b).

One further kind of mediation in interactive perceptual chains still needs to be introduced, which is relevant to output causality rather than input causality. With respect to input causality, we already have that a sensory organ *zi* mediates the causal effect of X on Z. But output causality also can be mediated, in a distinctively different kind of way. Rather than Z having some direct and immediate causal effect on X, instead Z could be caused to acquire a *disposition* to have some effect on X, which effect would be manifested under circumstances that currently may not be actual.

For example, suppose that a predator Z had a mechanism for acquiring specifically *dispositional* output capabilities during perception. When Z perceives a prey animal X, Z would not need to immediately attempt to eat X. Instead Z might perceptually acquire a *disposition* to eat X under appropriate favorable conditions, such as those resulting from Z's taking some time to circle around behind X prior to the attempt, so as to maximize the likelihood of a successful attack on X. Such additional, dispositional kinds of causal mediation, in addition to sensory mediation, would even further improve the potential evolutionary benefits of sensorily based causal interactions for some animals, by further increasing the range of possible interactions between organisms Z and environmental items X (Dilworth, 2005c).

All of the pieces are now in place to provide a complete definition of interactive perception, supplying both necessary and sufficient conditions for perception to occur.⁴

Here it is, in a basic form.

IP1: An organism *Z* perceives an item *X* just in case *X* causes some sense-organ *zi* of *Z* to cause *Z* to acquire an *X*-related disposition *D*.

An *X*-related disposition is a disposition such that, if certain disposition-manifestation conditions were instantiated, then *Z* would directly causally affect *X*. So particular cases of perception need not always *actually* result in the completion of a closed causal chain between *X* and *Z*, since *Z*'s *X*-related disposition might not be manifested in some cases. But in terms of the broader evolutionary picture, the greatly increased range of *possible* cases and circumstances for actualized dispositions is sufficient to ensure the evolutionary efficacy of dispositionally enhanced perceptual causality. Also, the relevant concept of the acquisition of a disposition is broad enough to cover three kinds of case: the acquisition of a completely new disposition, either with or without an immediate manifestation, and the current activation of a previously acquired disposition.

Now we can begin to relate this interactive theory to our naturalization program. To begin, a more specific form of the theory is needed in order to relate perceptual states to propositions for propositional indexing purposes. An interactive perceptual account of what it is to perceive an object *X* as *having some property F*, such as that of being red, is needed. So here is a more specific definition of interactive property perception:

IP2: An organism Z perceives an item X to have the property of being F just in case X causes some sense-organ z_i of Z to cause Z to acquire an X-related disposition D, such that D is an F-classification disposition.

An F-classification disposition is a disposition, the manifestation of which is some F-classification behavior. For example, on this account, to perceive that an object X is red is to acquire a disposition to classify object X in some red-related way. Or, in typical animal behavior cases, behavior by Z of approaching versus fleeing from another animal X typically provides evidence of classification of X by Z as beneficial rather than harmful. But it should be emphasized that, since this account is intended to apply to very low-level kinds of cognition as well as higher kinds, there is no implication that perceiver Z itself is capable of understanding or applying classification-related concepts to its own behavior. So evidence of classification behavior, and understanding of what it is to classify, may be available only to sophisticated observers of animal Z rather than to animal Z itself.

Definition IP2 is non-committal about the relation of objects and their properties, at the cost of having to explicitly characterize the relevant disposition as a disposition to classify object X in a certain way. An alternate approach would assume that a property, though instantiated by a particular object X, could itself stand in relations of interactive causality with a perceiver, as in the following definition:

IP3: An organism Z perceives an item X to have the property of being F just in case object X's instantiation of property F causes some sense-organ z_i of Z to cause Z to acquire an F-related disposition D toward property F as instantiated by object X.

This version of the definition would accommodate, among other things, particularized-property or trope ontologies for properties, without requiring any mention of classification. The subtle difference between IP2 and IP3 is that IP3 would permit F-related classification behavior to provide *adequate evidence* for a perceiver Z to have acquired an F-related disposition, but without having to identify disposition D itself as being nothing more than an object-classification disposition. For present purposes this difference will be ignored, so that version IP2 of the theory will be assumed from now on.

As a quick initial overview, independent of and prior to a formulation in terms of the propositional indexing view, the overall semantic relevance of the interactive theory of perception is as follows. When an organism Z perceives an object X, so that Z is caused by X to acquire a disposition e.g. to eat X, a straightforward account of Z's apparent *perceptual intentionality*--of Z's perceptual state apparently being *about X*--can be provided in interactive causality terms. Z's perceptual state is apparently about that particular object X because the relevant interactive causality is X-caused and X-directed.

In addition, the specific *kind* of X-related disposition that Z is caused to have by X provides evidence both as to what specific property X is perceived to have, and also as to

whether X is perceived correctly or incorrectly by Z. For example, if X causes Z to acquire a disposition to eat X, then Z would correctly represent X if animals of kind X are good food and easily edible for members of Z's species. But if animals of type X normally prey upon animals of type Z, Z's disposition to (attempt to) eat X would misrepresent X, perhaps with fatal results.

11. The Structure of Propositional-Perceptual Indexing

Correspondences

Propositional indexing involves the provision of isomorphic correspondences between perceptual states and abstract propositions. This section will show how the groundwork for the current indexing theory, as provided in section 8, can be integrated with the interactive theory of perception as just outlined in section 10. As will become clear, the requirements defended in section 8 neatly dovetail with the purely causal structures provided by the interactive theory.

Recall that a typical indexing task would be to formulate the conditions under which a proposition, such as the proposition 'X is red' about a particular object X, indexes a corresponding perceptual state of a person Z who perceives that X is red. According to the interactive theory of perception (ITP), this occurs just in case X causes some sense-organ z_i of Z to cause Z to acquire an X-related disposition D, such that D is a red-classification disposition. This analysis provided by the ITP is fully consistent with the

conclusion of section 8, namely that folk-psychological and technical considerations overlap in a constraint on acceptable theories of perception that could be consistent with the folk-psychological conception of the relevant evidence. The constraint is that such theories must in some way integrally connect perception of an object X as having some property F with a disposition to engage in F-related classification behavior in appropriate circumstances--a constraint that the ITP explicitly addresses and fully satisfies.

Moreover, the resources of the ITP are such that a more detailed analysis of the propositional indexing correspondences or isomorphisms between a proposition and a perceptual state can also be provided. The indexing correspondence for a particular proposition and particular perceptual state can be further broken down into three part-correspondences for the three relevant aspects of propositions, namely their *reference-conditions*, *predication-conditions* and *truth-conditions*. So a *naturalistic indexing schema* of the following kind may be provided. The proposition 'X is red' indexes a person Z's perception that object X is red just in case *all three* of the following schemata hold (see the next section for a discussion of how perceptual states S relate to the ITP):

- 1) the object X referred to in the proposition is the same object as that identified by some *naturalistic reference-fixing mechanism R* associated with the relevant perceptual state S;
- 2) the property 'red' predicated of object X in the proposition is the same property as that identified by some *naturalistic property-fixing mechanism P* associated with state S;

3) the truth-value of the proposition 'X is red' corresponds with a correctness-value determined by some *naturalistic veridicality-determining mechanism V* associated with state S.

Schema 1) also ties in with the *particularity constraint*, as discussed at the end of section 9. Just as a singular proposition such as 'X is red' refers to a particular object X, so also a desirable theory of perception would be one capable of providing independent causal means of ensuring that perception of one particular object X can be adequately differentiated from perception of similar but numerically distinct objects Y, Z, ... The ITP is able to provide this purely causal differentiation because of its foundation in causal interactivity between particular objects. A causal interaction is a closed chain of causality between two particular entities X and Z. The ITP analyzes perception by an organism Z of an environmental item X in terms of a particular causal interaction of this kind, and hence it is able to supply the needed naturalistic reference-fixing mechanism R associated with a relevant perceptual state S of organism Z--hence ensuring the satisfaction of indexing schema 1).

As for the two remaining schemata 2) and 3), these are closely associated with the section 8 claims that part of what semantic naturalization involves is making some integral use of everyday, folk-psychological standards of evidence as to when perception of some specific property of an object X has occurred, and as to whether that perception is veridical or not. Both of these factors are integrally involved with the issue of *the status of the available evidence as to a perceiver's relevant behavioral classification*

dispositions with respect to the particular object X. If person Z provides evidence, such as by his color-sorting behavior, that he is disposed to classify the color of object X as being red-related, then schema 2) will be satisfied. For evidence of the presence of the relevant naturalistic property-fixing mechanism P for redness is provided by the behavioral evidence that the person is disposed to classify X with red objects. The presence of this disposition provides a necessary and sufficient condition, in concert with satisfaction of the other environmental conditions, such as the existence and causal relevance of object X with respect to Z's perceptual state, for a claim that person Z has been caused by X, via X causing some sense-organ z_i of Z to cause Z, to acquire the relevant red-related behavioral classification disposition, and hence, according to the ITP, that Z has perceived that X is red. Nothing more is required to ensure satisfaction of indexing schema 2).

As for indexing schema 3), its satisfaction is closely bound up with satisfaction of the other two schemata. The issue comes down to the issue of whether the relevant indexing proposition, namely that X is red, is true or not. If it is true, and if schema 1) and 2) are already satisfied for indexing of the relevant perceptual state S by that proposition, then nothing more is required to determine a correctness-value of *correct* for the relevant naturalistic veridicality-determining mechanism V. If, on the other hand, the relevant proposition is false, then perceptual state S will be indexed by a false proposition rather than a true one, and hence nothing more is needed to for the relevant veridicality-determining mechanism V to determine a correctness-value of *incorrect* for the relevant perceptual state. Hence, as should be clear, mechanism V is not a substantive

independent correctness-determining mechanism, but instead its satisfaction just a consequence of the satisfaction of schemata 1) and 2), along with the truth-value of the relevant proposition that indexes the relevant perceptual state.

12. Weak and Multiple Indexing Without Indeterminacy

This brief section addresses what might be thought to be two potential kinds of problem with an indexing naturalization strategy, particularly as applied to lower levels of cognition. A stock troublesome case for any naturalization approach is that of a frog that attempts to eat any small black object that comes within range (e.g., Millikan 1993, p. 125). Since not everything thus ingested is food, one concern is that the frog's cognitive content might therefore be indeterminate--not 'this is food' but 'this is food, or a food-like object, or...'. Another concern is that different levels of specificity of content might be relevant. If the content is 'this is food', then often it would be incorrect; but if instead it were 'this potentially is food', it would perhaps always be correct. So either content is *indeterminate*, or there are *multiple, conflicting candidates* for the frog's perceptual content.

Fortunately for the indexing view, it can perform significantly better than rival views on such hard cases. To begin, on the indexing view the frog's perceptual state does not have any cognitive content whatsoever, so problems concerning the potential indeterminacy or conflicting nature of its perceptual contents cannot arise. Second, the indexing view

handles each particular perceptual encounter of a frog with a nearby black object as a separate case. Since the frog in each case becomes perceptually disposed to attempt to eat the object, the specific proposition that indexes its cognitive state in each case can vary, depending on whether the behavioral evidence for its perceptually acquired disposition gives evidence of correct or incorrect perception of the object. So if the object X is food, the frog's perceptual state in that case is indexed by a correct specific proposition, e.g. 'this object X is food'. On the other hand, if on another occasion another object Y is some non-food black object, then the frog's perceptual state is instead indexed by a false proposition 'this object Y is food'.

So, even though the overall success rate of the frog's perceptual strategy with respect to nearby black, food-like objects may be low, this does nothing to show that its individual perceptual states cannot be precisely indexed one-to-one with appropriate propositions. Or, to put the point in epistemic terms, the correctness of a perceptual state on a particular occasion should not be confused with the overall success rate of whatever cognitive strategy explains the frog's overall performance profile in such cases.

As for the conflicting levels of specificity problem--of 'this is food' versus 'this potentially is food', as before this could not be a problem about the nature of the frog's perceptual content, because the frog's perceptual states have no content at all. Second, there is no conflict in the indexing, because there is no reason why both levels of specificity of cognitive behavior cannot *simultaneously* be propositionally indexed. Recall that on the indexing view, the scientific rationale for indexing is to help explain

and predict the behavior of organisms in cognition-related ways. The more specific indexing helps to explain the success or failure of the frog in getting fed on a particular occasion, whereas the more generic indexing instead might help to explain what it is for the frog to be awake (and hence attempting to eat any potential source of food) rather than asleep (and hence perceptually unresponsive). Since these are different kinds of explanations at different, mutually compatible levels, there is no conflict. Because there is no semantic fact of the matter as to what the frog's perceptual content is, since there is none, we are free to use whatever level or kind of propositional indexing is conducive to our particular explanatory needs on a given occasion.

13. Indexing Perceptual States versus Indexing Perceivers

An issue still needing to be addressed is that of the status of *perceptual states*. The interactive theory of perception (ITP) outlined in section 10 provides necessary and sufficient causal conditions for a perceiver Z to perceive that some particular object X has property F. But the definition provided by the ITP does not explicitly invoke a concept of the *perceptual state* of a perceiver Z when Z perceives that X is F. On the other hand, in semantic naturalization discussions it is generally assumed that the issue is one of the naturalization of the semantic status of *particular cognitive states* of an organism Z, whether these are perceptual, belief etc. cognitive states. So the task for this section is to relate the perceptual formulation provided by the ITP to cognitive state formulations.

A simple view with respect to the ITP would be that a perceptual state is simply the relevant aspects of an organism Z in virtue of which it satisfies the causal conditions of the ITP. On this view, the relevant perceptual state of organism Z would include the causal states of all internal cognitive mechanisms of Z that realize the chain of causation in virtue of which object X causes sensory organ z_i of Z to cause Z to acquire a relevant X-related disposition. So on this simple view, nothing more needs to be done to translate an ITP formulation of perceptual conditions into a perceptual state formulation.

However, though that is a perfectly adequate perceptual state formulation method, there is some theoretical and explanatory advantage to be gained from a more specialized, purely input-based conception of a perceptual state, as follows. The concept of a perceptual or belief state as employed by previous nomic covariation theories for semantic naturalization, such as those of Dretske and Fodor, is of a cognitive state that is *purely input-based*, such as the state of a relevant sense-organ, or some more central resulting state prior to any output-related dispositional cognitive processing. In such theories, these purely input-based states are usually also identified with hypothesized *representational* states, in virtue of which, such theorists supposed, organisms could directly represent states of the world, independent of any propositional indexing.

Thus, in attempting to provide a fundamental alternative to such theories, it facilitates comparison between them and indirect propositional indexing theories if each is compared with respect to *the same*, purely input-based perceptual states. Pure nomic covariation approaches would claim that such states directly represent worldly states,

whereas indexing approaches deny that those same states directly represent anything. Instead, on the indexing approach, the claim is that such input-based states have a *causal role* in a total chain of causation, which total chain is such that the total resulting cognitive state of the organism can be propositionally indexed by a relevant proposition.

However, one caveat should be noted, regarding an inevitable theoretical mismatch. Language of thought formulations of representational theories of mind, such as that of Fodor (1975), would treat a sententially structured item in the mentalese language of thought as being a basic representational unit. On my account, such a mentalese unit corresponds to a total, propositionally indexable cognitive state rather than to a purely input-based representational state. Of course, such a mismatch is inevitable in a comparison of the indexing view with any overall theoretical view which equates propositionally related cognitive powers with a purely input-based view of representation, but the issue needs to be made explicit to avoid any misunderstandings.

Another significant theoretical connection made possible by a purely input-based conceptualization of a perceptual state is a connection with *functionalist* or *functional-role* conceptions of mental states. Standard analytical functional-role conceptions of perceptual or belief states, such as that of Loar (1981), regard such states as being second-order functional states defined by their inputs, outputs and relations to other mental functional states. By comparison, the current ITP-based theory is not an analytical or comprehensive second-order functional-role theory of intentionality, for two reasons. First, it is a functional theory only in the purely mechanistic sense in which a

particular perceptual disposition D may have different kinds of causal realizations in different animals. But this is an atomistic kind of functionalism, restricted to particular dispositions and not somehow integrally connected to all belief etc. states, as with standard analytical functionalism. And second, the current indexing theory denies that there are any concrete realizations of intentional properties or states as such. So it is not, in the conventional sense, a functional theory of perception and belief.

So, to sum up these points, the supposedly direct representational role of input-based perceptual states, as claimed by nomic covariation theories, is instead explained by the current theory as consisting in the causal role of such input states in causing organism Z to acquire the relevant X-related disposition, which causal process completes the total causal chain, in virtue of which some relevant proposition indexes the resulting total perceptual state of organism Z. In addition, the current indexing theory would invoke only a purely mechanistic, dispositionally-based and atomistic functional theory, hence avoiding the more comprehensive holistic functionalism provided by an indexing theory such as that of Loar (1981)--and hence doing so with considerably less theoretical baggage than is required by any such comprehensive functional-role theory.

Consequently, a significant advantage of the current avoidance of a comprehensive functional theory of perceptual states is that intractable issues about similarities of perceptual or belief states at all levels of evolution can also be avoided. Issues of propositional indexing, linked as they must be to issues of the behavioral evidence for the existence of appropriate dispositional states in relevant organisms, should be entirely

independent of issues of complexity of functional organization and variety of realizing states in those organisms. By avoiding that theoretical hornets nest of issues, the current low-level, ITP-based indexing theory achieves a simplicity and generality of application unavailable to any higher-level, holistic theoretical rivals. So perceptual states at every evolutionary level can be indexed by propositions in exactly the same way, and so we now have a method for direct propositional comparison of cognitive states of any organisms whatsoever that possess even minimal perceptual capabilities.

14. Perception, Belief and Representation

Recall that the current naturalizing strategy has been to first concentrate on the naturalization of low-level semantic states such as perceptual states. This section will briefly indicate how this low-level kind of semantic naturalization project might be extended to cover belief and other representational states as well.

One basic issue that now must be addressed again is that of the status of natural languages (see sections 2 and 4 for an initial view). Beliefs and propositional attitudes are often linguistically expressed, so a basic issue is that of how those linguistic systems for expressing propositions relate to non-linguistic perceptual states. As briefly argued in section 2, in my view the only theoretically viable option for a consistent or thoroughgoing propositional indexing theory is one that gives a completely uniform treatment to *any* kinds of concrete representational vehicles, whether they are public

vehicles such as sentences or pictures, or internal cognitive states. On the present view, all of them acquire whatever meaning they seem to have in virtue of their causal role in producing perceptually based cognitive states that can be propositionally indexed. For example, on this current view there is no difference, *as far as propositional indexing alone* is considered, between any of the following:

1) Perceiving that a particular cat X is on a mat Y, and hence acquiring a perceptual dispositional state indexable by the proposition 'cat X is on a mat Y';

2) Coming to believe, in virtue of that current perceptual state of oneself plus one's knowledge of English, that cat X is on a mat Y, and thereby being in a belief state indexable by that same proposition 'cat X is on a mat Y';

3) Independently of 1) and 2) above, reading a printed sentence 'cat X is on a mat Y' on a sheet of paper, understanding it as expressing the relevant proposition 'cat X is on a mat Y', and hence thereby being in a cognitive state indexable by that same proposition 'cat X is on a mat Y'.

4) Independently of 1)..3) above, seeing a picture of cat X on a mat Y, understanding it as expressing or implying the relevant proposition 'cat X is on a mat Y', and hence thereby being in a cognitive state indexable by that same proposition 'cat X is on a mat Y'.

Or in other words, *all* so-called semantic information processing is really purely causal, non-semantic processing that results in appropriate, causally based cognitive states that can legitimately be propositionally indexed in virtue of their perceptually based dispositional status and prior causal origins as previously discussed. So the basic idea is, as far as possible, to regard all apparent cognitive extensions of basic perceptual processing, and its propositional indexing, as being no more than minor variants on those basic perceptual processes. Thus beliefs, for example, would be viewed as being only minor outgrowths of associated basic perceptual dispositions. For example, associated with a basic, perceptually derived disposition to classify an object X as a red object might be a disposition to store in one's memory a corresponding English linguistic expression 'X is red', whose activation would prompt oneself to re-acquire or re-activate the same red-related disposition toward X as had previously been directly acquired by perception of X, and which X-related dispositional state is indexed by the proposition 'X is red'.

15. Higher-Level Concerns Addressed

Given the comprehensive scope of semantic naturalization issues, this paper has only been able to outline the basic structure of the proposed propositional indexing view, as based on the interactive theory of perception. As initially announced, the concentration has been on basic, perceptually grounded forms of world-related cognition and their propositional indexing. From this low-level perspective, the well-known higher-level problems concerning propositional attitudes, such as issues of relational versus notional

concepts of belief, how externalism relates to beliefs, and so on, are only peripheral, epistemically marginal side-effects of the basic, propositionally indexed perceptual cases. Such problems do not threaten to undermine the basic indexing view itself, since they show only that basic cognitive structures, which work smoothly at lower levels, may become folk-psychologically or philosophically extended into more problematic, higher-level cognitive constructs for which strict propositional indexing with respect to propositions about particular items in the actual world might no longer hold. But from the scientific point of view this is, from an initial narrow perspective, just another kind of case in which good science, focused as it must be on epistemically central perceptual semantic cases, as judged by strict experimental standards, might become watered-down or over-extended in various kinds of informal cultural views about meaning and semantics. So the present indexing view could agree with many of Quine's suspicions about meanings in general, while yet still defending a strict, propositionally based scientific realism. Also, the low-level kinds of behavioral evidence for correct or incorrect perception that would be invoked in scientific applications of the interactive theory of perception would not themselves be meaning-involving in ways that could raise suspicions of circularity in the present semantic naturalization project.

Nevertheless, if there are legitimate propositions about various culturally instituted objects, such as theoretical possibilities, artworks, fictional characters or unrealized goals, there may be room for expansion of the indexing theory to cover propositionally indexed thoughts about such items, so that the theory is not fundamentally committed to a narrow

extensionalism about all meaning. But presumably it would be generally agreed that such issues are best left to later stages of a naturalization project.⁵

As for the provision of a convenient descriptive name for the current naturalization project, perhaps 'interactive indexing' is as good as any. So the current *interactive indexing* or *II* approach to semantic naturalization provides a fundamental alternative to previous approaches.

References

Brentano, F., 1874. *Psychologie vom Empirischen Standpunkt*. Duncke & Humblot, Leipzig. (2nd, enl. ed. by Oskar Kraus, 1924, Leipzig: Meiner). Eng. tr.: *Psychology from an Empirical Standpoint*, transl. by A.C. Rancurello, D.B. Terrell, and L. McAlister, Routledge, London, 1973. (2nd ed., intr. by Peter Simons, 1995).

Churchland, P.M., 1979. *Scientific Realism and the Plasticity of Mind*. Cambridge University Press, Cambridge.

Dennett, D., 1987. *The Intentional Stance*. MIT Press, Cambridge, MA.

Dilworth, J., 2004. Naturalized perception without information. *The Journal of Mind and Behavior* 25, 349-368.

Dilworth, J., 2005a. The reflexive theory of perception. *Behavior and Philosophy* 33, 17-40.

Dilworth, J., 2005b. A naturalistic, reflexive dispositional approach to perception. *The Southern Journal of Philosophy* 43, 583-601.

Dilworth, J., 2005c. Perceptual causality problems reflexively resolved. *Acta Analytica* 20, 11-31.

Dilworth, J., 2005d. The perception of representational content. *The British Journal of Aesthetics* 45, 388-411.

Dilworth, J., 2005e. *The Double Content of Art*. Prometheus Books, New York.

Dilworth, J., 2005f. The twofold orientational structure of perception. *Philosophical Psychology* 18, 187–203.

Dilworth, J., 2005g. The double content of perception. *Synthese* 146, 224-243.

Dilworth, J., 2006a. Perception, introspection, and functional consonance. *Theoria* 72, 299-318.

Dilworth, J., 2006b. A reflexive dispositional analysis of mechanistic perception. *Minds and Machines* 16, 479 - 493.

Dilworth, J., 2006c. Representation as epistemic identification. *Philo* 9, 12-31.

Dilworth, J., 2007a. Representationalism and indeterminate perceptual content. *Phenomenology and the Cognitive Sciences* 6, 369-387.

Dilworth, J., 2007b. In support of content theories of art. *Australasian Journal of Philosophy* 85, 19-39.

Dilworth, J., 2008. The propositional challenge to aesthetics. *British Journal of Aesthetics* 48, 115-144.

Dretske, F., 1981. *Knowledge and the Flow of Information*. MIT Press, Cambridge, MA.

Dretske, F., 1995. *Naturalizing the Mind*. MIT Press, Cambridge, MA.

Field, H., 1978. Mental representation. *Erkenntnis* 13, 9-61.

Fodor, J., 1975. *The Language of Thought*. Harvard University Press, Cambridge, MA.

Fodor, J., 1987. *Psychosemantics*. MIT Press, Cambridge, MA.

Fodor, J., 1990. *A Theory of Content and Other Essays*. MIT Press, Cambridge, MA.

Godfrey-Smith, P., 1992. Indication and adaptation. *Synthese* 92, 283-312.

Kriegel, U., 2003. Consciousness as intransitive self-consciousness: Two views and an argument. *Canadian Journal of Philosophy* 33, 103-132.

Loar, B., 1981. *Mind and Meaning*. Cambridge University Press, Cambridge.

McGinn, C., 1989. *Mental Content*. Blackwell, Oxford.

Millikan, R., 1993. *White Queen Psychology and Other Essays*. MIT Press, Cambridge, MA.

Rowlands, M., 1994. Connectionism and the language of thought. *The British Journal for the Philosophy of Science* 45, 485-503.

Stich, S., 1983. *From Folk Psychology to Cognitive Science*. MIT Press, Cambridge, MA.

van Fraassen, B., 1980. *The Scientific Image*. Oxford University Press, Oxford.

NOTES

¹ Thanks to Todd Buras for helpful discussion on this point.

² So, interestingly enough, the attempts by the Churchlands and early Stich to eliminate belief-desire folk psychology, even if they were successful, could not eliminate as well the fundamentally propositional basis of all information processing.

³ As it happens, it was investigation of purely causal ways in which to satisfy the particularity constraint which led me to develop the full interactive theory of perception, along with its evolutionary rationale, and eventually the current indexical semantic naturalization project as well.

⁴ For defenses and discussions of related issues, see my articles Dilworth (2004, 2005a-d, 2006a-b).

⁵ For investigations of such issues in ways consistent with the current naturalization project see Dilworth (2005e-g, 2006c, 2007a-b, 2008).