# Semantic Naturalization Via Interactive Perceptual Causality

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A novel semantic naturalization program is proposed.  Its three main differences from informational semantics approaches are as follows.  First, it makes use of a perceptually based, four-factor interactive causal relation in place of a simple nomic covariance relation.  Second, it does not attempt to globally naturalize all semantic concepts, but instead it appeals to a broadly realist interpretation of natural science, in which the concept of propositional truth is off-limits to naturalization attempts.  And third, it treats all semantic concepts as being purely abstract, so that concrete cognitive states are only indexed by them rather than instantiating them.

A semantic naturalization project is one that attempts to explain how semantic or

intentional concepts, such as those of reference or aboutness, representation, meaning and

truth, along with associated propositional attitude concepts such as those of intention,

belief and desire, can be naturalistically explained in a broadly causal, physicalist

framework.  The informational semantics of Dretske and Fodor is one well-known

example of such a project (Dretske 1981, Fodor 1990).

The naturalistic basis of any such project must be the selection of some basic kind of

causal relation, or causal structure, in terms of which all of these concepts can be

naturalistically grounded.  Informational semantics used a relation of *nomic covariance*

as its basic causal relation. One intuition behind such a view is as follows. If the color C

of an object X changes, because of the laws of optics the retinal stimulation S of an

observer of X would also change in a way that lawfully depends on the changes in the

color of X. So the hope was that an account of perceptual representation of the color of

X could be obtained from the causally based nomic covariation of the retinal stimulation

S with the variation in color C.

However, the informational semantics project ran into well-known problems (Godfrey-

Smith, 1992; Cummins, 1996), so it makes good philosophical sense to look for some

alternative basic causal framework to ground a naturalistic semantics. I have previously

provided a naturalistic theory of perception based on *reflexive* or *interactive* causal

relations (Dilworth 2004, 2005 a-c), which is also applicable to specifically mechanistic

kinds of perception (Dilworth 2006). Here I shall argue here that such interactive causal

relations can provide the desired alternative basic causal framework with which to ground

a naturalized semantics. This paper will also address some basic issues concerning the

status of semantic naturalization projects in general, and provide a novel method of

integrating propositional concepts into such a project.

Philosophers tend to be preoccupied with one-way causal chains and their individual

links, but it is easy to forget Newton's third law of motion, according to which action and

reaction are equal and opposite. So when an item X causes a change in another proximal

item Y, Y in turn causes an equal and opposite change in X itself. For example, the only

way to walk forward is to attempt to push the ground backward with one's foot, which

causes the ground to push one's foot forward with an equal and opposite force. So basic

or proximal causal relations are always interactive in this way.

But how could this kind of interactive causally be developed or extended so as to explain

perceptual representation? The basic development involved in my approach is that of

explaining perception as being an *extended or mediated interaction* between a perceived

object X and a perceiver Z. Specifically, the primary mediating factor is one or more

sensory organs of the perceiver. The simplest interactive, specifically perceptual chain is

one in which object X causes sense-organ $z_i$ of perceiver Z to cause Z to interact with

object X in some way. For example, Z might eat X if objects of kind X are food for Z, or

Z might attempt to fight X if X and Z are antagonistic rivals. In such cases, there is still

a closed interactive chain of causality between X and Z, even though it is mediated by Z's

sensory organ $z_i$.

Now at least initially, the conception of perception that results from such simple cases

seems to be inadequate. Intuitively, Z's perceiving of X must be distinguished from Z's

subsequent decision as to how to react to X's perceptual presence. So it may be that the

theoretical potential of causally interactive approaches to perception has been overlooked

for this reason. However, if one further mediating element is added to the causal

structure, a completely satisfactory basic theory of perception can be achieved.

The further mediating element is that of a *dispositional* factor. When Z perceives X, X

causes Z (via X causing sensory organ $z_i$ to cause Z) to acquire a *disposition* D to interact

with X in some way.  Hence Z's perception of X as such ends with Z acquiring the

relevant X-related disposition D, so any subsequent, X-related action of Z in manifesting

that disposition D is distinct from Z's perception of X.  Hence, as intuitively required,

perception and action can be kept separate as distinct causal structures, even though they

are intimately related via the concept of an X-related disposition D that only requires

manifestation to result in Z in turn causing some change in X.  So with the addition of a

dispositional element, the resulting *interactive theory of perception* has been generalized

to cover potential as well as actual causal interactions between a perceived item X and a

perceiver Z.

So, to be explicit, the interactive theory of perception claims that a cognitive system Z

perceives X just in case X causes some sense-organ $z_i$ of Z to cause Z to acquire some X-

related disposition D.  Also, the relevant concept of acquiring a disposition D covers

three possible cases: acquiring a new disposition that is either immediately manifested or

not immediately manifested, plus the activation of a previous X-related disposition D.

(For a more comprehensive summary see Dilworth 2006.)

# 1.  How the Interactive Theory Satisfies the Three Adequacy Criteria for Object Perception

Any adequate theory of perception, whether naturalized or not, must be able to explain at

least three basic factors, or satisfy three constraints or criteria, concerning perception of a

particular object X.  First, a *particularity* constraint--the theory must be able to explain

how the perception can be of, or about, that particular object X, rather than just about

some object or other that is similar to X.  Second, a *property* constraint--the theory must

be able to explain how some particular property F of X is perceived, such as its red color.

And third, a *correctness* constraint must also be satisfied--the theory must be able to

explain how the relevant perception could be correct or incorrect.  For example, if object

X is red, some explanation must be available as to how a person Z could correctly

perceive it as being red in some cases, and also how Z might instead misperceive object

X as being some other color, such as green.   These three constraints, of particularity,

propertyhood and correctness, are minimum conditions on any adequate account of

perceptual representation of the properties of particular objects that are perceived.

The interactive theory of perception is able to satisfy these three conditions in the

following manner.  First, the particularity constraint is satisfied automatically for any

genuine case of interactive perception, because perception occurs if and only if a

particular perceptual object X is actually or potentially related to a specifically X-related

perceptual disposition--which X causes Z to acquire via one of Z's sense-organs $z_i$.  Thus

Z interactively perceives X only if the relevant disposition D is genuinely X-related.

As for the other two conditions, it is a significant advantage of the interactive theory that

it can make use of some standard, scientifically based *epistemic* constraints on correct

versus incorrect perception of properties.  The issue of what properties of an object a

certain person Z has perceived, and whether he has done so correctly or otherwise, is one

that can be studied using precise and carefully controlled scientific experiments. For example, one standard test for colorblindness with respect to redness involves showing a subject Z a complicated grouping of dots of many different colors, with the red dots forming a numeric or alphabetic symbol S. If the subject Z is able to correctly report the presence of symbol S, then that provides strong evidence that the person correctly perceived the redness of the relevant dots. If, on the other hand, subject Z fails to identify the relevant symbol S, this is strong evidence that Z incorrectly perceived the red dots as having some other color or shade--which, because of the presence of the great variety of other colored dots, would not be adequately discriminated from the other dots, hence causing Z's failure to see symbol S.

Or, as a simpler kind of color identification test, if person Z is able to sort the red, and only the red, objects from a miscellaneous assortment of colored objects into a bin labelled 'red'--as one of an array of bins labeled with different color names--this also would provide good evidence that Z had correctly perceived the relevant objects to be red. On the other hand, if any of the red objects were mis-sorted by Z into bins for other colors, that would provide good evidence that the color of those particular objects had been incorrectly perceived by Z as being some other, non-red color.

The basic epistemic structure of such scientific tests is a simple one. The actual behavior of the subject Z during the experiments provides strong evidence of Z's *perceptually acquired dispositions* during each test, which dispositions are immediately manifested in the relevant behavioral ways. The tests are designed to screen off other irrelevant factors,

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so that the only relevant, perceptually acquired dispositions are those concerning color classification. Z will be successful during the tests just in case he is, on the basis of his perception of each object or configuration of dots, disposed to classify the relevant red objects or dots as being red, rather than as being some other color or shade.

The connection of these scientifically based epistemic points with the interactive theory of perception should now be clear. The interactive theory is *itself* a theory concerning such perceptually acquired dispositions, that are both caused by the relevant red items and dispositionally directed toward those same items. So when person Z correctly sorts a red item X into the color bin labelled 'red', this provides strong evidence that object X caused Z's visual system $z_i$ to cause Z to acquire a disposition D to classify object X as red, which disposition is immediately manifested by Z's red-bin sorting behavior.

The upshot of these points is that the interactive theory does not need some novel or independent theoretical justification in order to explain how it can satisfy the property and correctness constraints on an adequate theory of perception. Instead it can simply appeal to the standard epistemic structure of well-established scientific tests for correct or incorrect perception of properties of objects. Also, the interactive theory is entitled to rely on such tests, as part of its role in the current semantic naturalization project, because any such project must ultimately appeal to the methods and standards of the natural sciences as the ultimate arbiter of its success. Arguably the *whole point* of a semantic naturalization project is to only admit to naturalistic respectability those uses of semantic concepts that are fully consistent with the best or most fundamental theories and methods

employed by the natural sciences.  So, at least prima facie, it is not question-begging in a

naturalistic project to use standard scientific methods as evidence for correct or incorrect

property perception, as part of the development and defense of a purely naturalistic

interactive theory of perception.

To be sure, this ability to directly harness standard scientific accounts of correct or

incorrect property perception does give the interactive theory a significant advantage over

competing naturalization projects, such as the nomic covariance-based informational

semantics of Dretske and Fodor discussed earlier.  But broader issues are also involved,

as will now be discussed.

## 2.  What Is to be Naturalized, and the Status of Information

A standard problem with nomic covariation approaches to perceptual representation is

that they have no easy way in which to account for perceptual *mis*representation.  This is

one main reason why Dretske added a teleological component to his theory, and Fodor an

asymmetrical dependence condition (Dretske, 1995; Fodor, 1987). But in effect the

interactive theory of perception is claiming that *we already have* fully satisfactory,

naturalistically respectable scientific standards for when perceptual states correctly or

incorrectly represent worldly properties, so that there is *no need* for any further

naturalization project with respect to issues of perceptual representation versus

misrepresentation.  All that is needed is a general naturalistic theory of perception, such

as the interactive theory, whose basic structure is sufficiently close to the epistemic

structure of standard scientific studies of perceptual competence. On this account, correct

perception by a person or creature Z of a property F of an object X is basically a matter of

Z being caused by X to acquire a disposition to classify X as an F, while incorrect

perception of the Fness of X is instead Z's X-caused acquisition of a disposition to

misclassify X as belonging to some other category G, where F and G are different species

of some generic kind such as color or shape. This is as basic and naturalistic an account

of perceptual representation and misrepresentation as anyone could wish for, and

arguably standard psychological studies of perceptual competences are already

committed to such a basic framework. So on what grounds could proponents of

alternative naturalization projects, such as that of informational semantics, object to this?

My suspicion is that there is much more at stake in this issue than simply that

informational semanticists chose *the wrong causal relation* on which to base a semantic

naturalization--namely, the nomic covariance of an effect with its cause--whereas

supporters of an interactive theory, such as myself, instead choose a more satisfactory,

four-component, specifically interactive causal structure in which X causes a sensory

organ $z_i$ of a perceiver Z to cause Z to acquire an X-related disposition. To illustrate

what more might be at stake, consider a possible thesis of *global semantic naturalization*.

It would claim, among other things, that *all* previous semantic concepts, including those

of propositional or informational content, truth and falsity, perceptual correctness or

incorrectness, and so on, stand in need of naturalization, *even if currently they are

scientifically accepted as adequate*. So from such a global point of view, the reliance of

the interactive theory of perception on currently established scientific standards of correct

or incorrect perception of properties would be fundamentally question-begging.  The

global assumption would be that *all* semantic concepts, including those associated with

scientific standards of correctness or incorrectness, need to be naturalized.

Is such an assumption of global semantic naturalization (GSN) actually an integral part of

the Dretske/Fodor informational semantics approach?  It is hard to be sure, but certainly

the preface of Dretske's pioneering  book *Knowledge and the Flow of Information* (1981)

does announce a naturalization program based on a purely naturalistic concept of

information.  His program seems to be that of reconstructing or reconstituting all

legitimate, semantically related concepts in purely information-theoretic terms.

Dretske's idea is that information is a naturally occurring commodity, as found in actual

causal relations in the world.  Cognition, insofar as it involves the acquisition of correct

information about the world, works by sensory states of a perceiver becoming caused to

nomically covary with worldly states in virtue of their causal effects on the perceiver's

sense organs, and hence serving as an information channel for the acquisition of

information-based knowledge about the world.  In addition, Dretske attempts to explain

what is legitimate about our concepts of belief and knowledge in information-theoretic

terms.  So overall, there is at least the *appearance* in this early work that Dretske did

subscribe to some sort of global semantic naturalization (GSN) program.  Also, other

writers working on independent naturalization projects, such as Field (1972), seem to

espouse such a program too.

The issue is a vitally important one for several reasons. Whether or not Dretske explicitly

subscribed to the GSN program, he does claim that semantic information is actually

instantiated in the world by causal relations of cause to effect. So on this account,

semantic information is as real, and basic, a causal property as the relevant causal

relations themselves that instantiate it. If this were true, then presumably *all* semantic

concepts, including those of representation, propositions and propositional content, truth

and falsity, intentionality and aboutness, correspondence and reference, belief and

knowledge, and so on, would be fundamentally related to, and dependent upon,

substantive, naturalistically based informational concepts. If such a naturalistic view of

information were legitimate, then presumably even scientific standards for adequate

scientific evidence, or propositional truth, or perceptual correctness, would have to be

thoroughly re-interpreted in naturalistic, information-theoretic terms. So it looks as if the

*practical implications* of an acceptance of Dretske's claim that information is actually

instantiated in worldly causal relations would amount to an acceptance of some version

of the GSN program, even if it is not explicitly argued for by previous or current

defenders of naturalistic information.

On the other hand, it might be thought that the subsequent acceptance by Dretske and

Fodor that pure nomic covariance accounts of representation are unsatisfactory shows

that they are willing to accept conventional scientific standards for e.g. perceptual

misrepresentation as being legitimate in their own right. But this point is inconclusive.

Current standards might be temporarily accepted as showing that an initial version of a

putative GSN program was inadequate, but the ambition could still be to replace *all*

current semantic standards and concepts with a more adequate naturalistic substitute, once a fully adequate version of that substitute is found.

There are at least two fundamental issues arising from this matter that must be adequately addressed by the current interactive perceptual naturalization (IPN) program. First, is the concept of naturally occurring information, as adopted by informational semanticists, a legitimate one? If it is, then the current IPN program could be criticized as being fundamentally inadequate as a naturalization program, since in its current form it makes no use of such a nomic-covariance-based concept of information. So as a result, three options are open. The current IPN program must either deny that there is any natural semantic information, or provide good arguments as to why such information is irrelevant to the naturalization of semantics, or find some way in which to integrate information into its theoretical framework. These issues will be briefly addressed in the next section.

The second, more fundamental issue, which is related and which also needs to be addressed, is that of the status of semantic concepts generally. So far the IPN program has only attempted to naturalize perception itself, by showing how perceptual states, explained purely in interactive causality terms, could satisfy standards for particular reference plus current scientific standards for correctness or incorrectness of property attribution. But without the addition of some further concept such as that of information, it is unclear how, or whether, this naturalization program could be extended to semantic concepts generally. So either some way of doing so must be provided, or adequate arguments must be provided as to why it is unnecessary, or wrongheaded, to attempt to

naturalize (or further naturalize, to the extent that they are naturalized already) all semantic concepts.

## 3.  Interactive versus Informational Constructs

As mentioned in the previous section, this section will briefly address the question of whether a Dretske-style concept of naturally occurring, nomic-covariation-based information, as adopted by informational semanticists, is one that must be accepted by any naturalization project.  Arguably the issue is closely related to that of the selection of a basic causal structure for naturalization purposes.  My own choice of a four-factor interactive structure can be given a sound evolutionary foundation, which also serves to show the inadequacy of nomic covariation approaches, whether as a fundamental relation, or as a definition of natural information.

The basic insight on which the interactive theory is built is that direct causal interactions between organisms Z and environmental items X are *sub-optimal* with respect to overall evolutionary fitness considerations.  The evolutionary development of sense-organs permitted *sensorily mediated interactions* to occur, which offer a much wider range of possibilities for interaction between environmental items X and organisms Z.  The additional mediation of dispositional factors even further extends the range of possibilities.  So the basic 4-element interactive perceptual causal framework, in which an organism Z perceives an item X just in case X causes a sense-organ $z_i$ of Z to cause Z to acquire an X-related disposition D, provides the widest possible range of ways in

which organisms can interact with environmental items. This greatly extended range of possibilities over simple direct interactions presumably would be much better for some species, and much worse for others. But overall, the extended range of possibilities provided by both sensory and dispositional mediating factors would act as a powerful multiplicative factor that would tend to increase the evolutionary fitness of those species who happened to survive the process. Also, as evolution randomly progressed, explanations of the cognitive behavior of organisms in interactive perceptual terms would tend to become increasingly relevant and accurate because of the ubiquity of these interactive processes.

Now, compare this purely evolutionary kind of explanation as to how some species, after millions of years, happened to acquire enough basic knowledge and survival skills to eventually develop advanced cognitive abilities, with the simple, nomic covariance construct relied on by informational semanticists. Consider recognitional skills, for instance. The real-world recognition of a certain kind of predator X in different kinds of environment would typically involve many different kinds of sensory stimulation $S_i$, so that typically there would be no strict nomic covariation between the presence of X and any particular sensory stimulation $S_j$. Also, it is only if organism Z could perceptually acquire appropriate dispositions D toward X that it would count as having recognized X at all. Hence in general, the occurrence of relevant kinds of nomic covariation in perception is neither necessary nor sufficient for recognition, or other basic cognitive tasks.

Such cases show that nomic covariation relations are fundamentally unsuited to be a basic building block in real-world, evolving and perceptually based cognition. It is the flexible and sensitive improvement of dispositional responses to perceptual stimuli during interactive perception that is the hallmark of advanced cognition, and it cannot be explained in terms of some simplistic process of intake of units of information.[1] The next section will relate these issues to the broader issue of the status of semantic concepts in general.

## 4. A Semantic Demarcation Strategy: One-to-One Propositional Indexing

Recall from section 2 that nomic covariance-based informational semantics naturalization attempts seem potentially to be committed to a *global semantic naturalization* (GSN) strategy, in which all semantic and intentional concepts would eventually be explained in informational terms. As argued there, the issue is unavoidable for the current interactive perceptual naturalization (IPN) program. For if the GSN strategy is correct, the initial reliance of the interactive theory of perception on currently established scientific standards of correct or incorrect perception of properties would be fundamentally question-begging. The global assumption would be that *all* semantic concepts, including those associated with scientific standards of correctness or incorrectness, need to be naturalized.

So at this stage the IPN program is at a crossroads. It could either adopt a GSN strategy itself, and attempt to explain all semantic concepts in interactive perceptual terms. Or it could instead negotiate some rationally defensible compromise with standard employments of semantic concepts, so that only those requiring further naturalization-- such as perceptual concepts themselves--would fall within its scope.

In order to resolve this issue, consider again the section 1 discussion of how the interactive theory can provide a precisely parallel causal account to a standard scientific description of the three epistemic adequacy constraints on evidence of object perception-- namely, the particularity, property and correctness constraints. One general point that can be made is that the accounts parallel each other in such a precise causal way that initially it seems likely that one of them is *explanatorily redundant*. If we adopted the GSN strategy, we could reductively explain the scientific standards in interactive causality terms. But on the other hand, we would not want to attempt to carry out a reduction in the other direction--i.e., reductively explaining the interactive causality in standard scientific terms--because that would seem to suggest that a substantive new naturalistic theory of perception is not needed after all, beyond what is already implicit in standard scientific practice. Such an attempt would at most amount to a *semantic clarification* program--of clarifying what is already implicit in our scientific practices-- and so it could not serve to provide a genuinely novel naturalistic explanation of the mysteries currently associated with intentional concepts.

Fortunately, however, a third strategy is also available.  This preserves the independent

legitimacy of both the interactive causal account, and the scientific epistemic account, via

employment of the following drastic demarcation strategy.  On the one hand, *semantic*

*concepts do not apply at all* to the purely causal structures that are the subject of the

interactive theory of perception.  On the other hand, semantic concepts are fully

applicable to the abstract epistemic scientific standards and propositional theories

employed in the scientific experiments, but all of those semantic concepts are interpreted

as being *purely abstract*, as is generally agreed to be the case with propositions and truth

conditions.  Or in other words, all genuine semantic concepts of intentionality, aboutness,

representation, correspondence, truth and falsity etc are interpreted as being *purely*

*abstract* concepts having application only to abstract entities such as propositions and

their components.


On this account, the precise correspondence between concrete interactive perceptual

activities and the epistemic standards of scientific experiments is structurally like the

correspondence between concrete physical items and the abstract mathematical structures

that may be used to describe or index them.  For example, in measurement theory

numerical values are assigned to objects having different weights, but of course everyone

knows that the concrete objects do not actually *instantiate* the relevant numbers.  Instead,

concrete correspondences between the physical weights are structurally isomorphic to the

abstract correspondences between the various numbers, so that the numbers can be used

to *mathematically index* concrete properties of the objects.  Similarly, my suggestion is

that in an analogous sense to be clarified below, semantic concepts, and the abstract

objects to which they apply, can be used to index concrete interactive perceptual states,

even though those concrete states cannot themselves *instantiate* any semantic properties.

More precisely, my suggestion is as follows. Any case of interactive perception that,

intuitively speaking, is capable of being judged to be correct or incorrect can be put into a

relation of *one-to-one* correspondence with an abstract proposition that expresses what

would normally be regarded as the propositional content of the relevant perceptual state.

(This one-to-one correspondence standard is a much stricter standard than the usual

many-one mathematical indexing employed in measurement theory (Dresner, 2006). For

example, if a person Z, in perceiving a red object X, thereby acquires a disposition to

classify it as red, that perceptual state would correspond one-to-one with the true

proposition 'X is red'. If object X is actually green rather than red, then Z's perceptual

state would instead correspond one-to-one with the *false* proposition 'x is red'. But, to

emphasize, strictly speaking, on the *propositional indexing* view being proposed, the

interactive perceptual state itself has no semantic properties of any kind--it just happens,

in virtue of its causally interactive properties, to precisely correspond one-to-one with an

appropriate proposition that does have the relevant semantic properties.

## 5. The Power of Propositional Indexing: How To Naturalize Folk Psychology

The current one-to-one propositional indexing approach potentially provides a powerful new method[2] for combining or reconciling a semantic eliminativism about concrete perceptual and cognitive states with an acceptance of folk psychology. Here is how this would work. As a preliminary, the interactive theory of perception (ITP) is fully consistent with standard accounts of cognition, according to which we form our *beliefs* about the world on the basis of our perceptions of it. Since on the present view the physical process of perceiving that an object X is red can be indexed by the proposition 'X is red', the corresponding belief that X is red can also be indexed by the same proposition. Also, since the ITP provides a completely general theory of perceptually based disposition acquisition with respect to particular worldly items X, which puts no limits at all on the possible, X-related dispositions that might be thus acquired, there is nothing to prevent some perceptual dispositions from also counting as, or being associated with, corresponding desires of the perceiver.

For example, when a predator Z perceptually acquires a disposition to eat a prey animal X, the relevant disposition could also be regarded as being, or being associated with, Z acquiring a current desire to eat X. So, once one-to-one propositional indexing of dispositionally based perceptual episodes themselves is theoretically secured, cognitive transitions to corresponding, propositionally indexed belief and desire states are theoretically unproblematic. It would also be unproblematic to generalize the account to

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apply, not just to particular items X, but to any items of the same kind as X. Hence a

generic desire to eat animals of kind X could be attributed to a predator Z, on the basis of

its similar disposition-acquisitions in each particular perceptual situation in which it

perceives a particular specimen of prey of the same kind as animal X.

As for folk psychology, among other things it attempts to explain human actions in terms

of the beliefs and desires of the people involved. Now usually it is assumed that such

explanations could only be legitimate if we also accept *intentional realism* about beliefs

and desires--that is, if we accept that those mental states themselves may be correctly

described as instantiating semantic properties, such as that of a belief having a certain

propositional content. However, the current one-to-one propositional indexing strategy

would allow us to maintain an *intentional eliminativism* about concrete, perceptually

grounded belief and desire states themselves--holding that those states do not themselves

instantiate any semantic properties--while yet also ensuring that each such belief or desire

state can be individuated, or uniquely tagged or indexed, by a particular proposition.

So on this account, my action of retrieving a beer from the refrigerator could indeed be

caused by a combination of my belief that there is a beer in the refrigerator plus my

desire to drink the beer--where both the belief and the desire are concrete, causally

activated dispositional states having no semantic properties of their own. And this

account could also be underwritten by a plausible underlying perceptual account of how

my prior purchase of the beer, and my placing of it in the refrigerator, caused me to

acquire beer-related dispositions involving delayed activation conditions, such as a later

state of thirst that would activate my previously acquired disposition to drink the beer.

By contrast, traditional eliminativist accounts of folk psychology, such as those of

Churchland (1979) and early Stich (1983), argued for an elimination *both* of semantic

properties *and* of any supposed concrete belief and desire states corresponding to them.

The difference of their account from the current one is that their accounts can be

explained as involving the holding of a *conjunctive* thesis, namely that a) cognitive states

have no semantic properties and b) cognitive states cannot be propositionally indexed

one-to-one.   The present account accepts a) but denies b), and hence it can maintain the

legitimacy of folk psychological explanations in spite of its holding the semantic

eliminativist thesis a).

## 6.  Scientific Realism and Interactive Indexing

From now on it will be convenient to refer to the current combined theory as the

*interactive indexing* (II) theory, in that it combines the perceptual naturalization provided

by the interactive theory of perception with the one-to-one propositional indexing

approach to semantic concepts.  Admittedly, the combined interactive indexing theory is

an unusual and perhaps unexpected one, but as it happens it integrates very well with a

standard scientific realist account of knowledge and natural science.

On one popular conception of scientific realism, its adherents accept a propositional version of a substantive conception of truth as correspondence to reality. On such a realist 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, scientifically confirmable 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 scientific 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 abstract 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, and 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 of a realistic scientific worldview, 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. Any semantic naturalization must be restricted to scientifically respectable theories showing how actual cognitive mechanisms and structures relate to the standard propositional framework.

The current, combined *interactive indexing* (II) theory is fully consistent with this realist framework. Note that the realist framework implies a fundament rejection of any global semantic naturalization (GSN) project, as discussed in sections 2 and 4, in that the basic semantic concepts are all abstract metatheoretic concepts that are off limits to semantic naturalization projects. The II theory's eliminativist strategy of treating *all* semantic concepts as being purely abstract concepts that could not be instantiated by concrete cognitive systems is, indeed, the simplest and most straightforward way in which to implement a scientific realism in the cognitive sciences dealing with animal and human cognition.

As for my claim that at least some perceptual states, and hence related belief and desire states, can be propositionally indexed by one-to-one correspondences between cognitive

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states and propositions, arguably this is at least partly a *substantive scientific hypothesis*, which must be confirmed for individual kinds of perceptual states via the usual methods of scientific inquiry. As a potential counter-argument, there are those who argue that the neurological functioning of human brains conforms to principles of neural-net processing which do not map in any simple way onto propositional conceptions of cognitive functioning (Churchland 1979). If it turned out that perceptual processing in general was like this, then the propositional indexing hypothesis might yet turn out to be false for most perceptual processing. However, I shall argue in the next section that only minimal scientific constraints on the study of perceptual processes are needed to ensure that propositional indexing is possible.

## 7. Skeptical Concerns about Meaning and Behavioral Evidence Rebutted

Under what conditions does propositional indexing of perceptual states become possible? Section 1 states the conditions in terms of satisfaction of three adequacy criteria for object perception, namely particularity, property and correctness criteria. However, the basic definition of interactive perception, as given in the introduction, does not specifically mention the property and correctness criteria as such. Recall that the basic interactive theory simply claims that a cognitive system Z perceives X just in case X causes some sense-organ $z_i$ of Z to cause Z to acquire some X-related disposition D. But the general conditions under which any given disposition D would count as a disposition

to correctly or incorrectly classify X as having some property F were not specified in abstract terms. Instead appeal was made in section 1 to standard scientific tests of F-related perceptual classification abilities under controlled conditions.

This appeal to standard scientific testing methods is a powerful one, in that it immediately forestalls some common objections to dispositional accounts of meaning or content (e.g., Miller and Wright, 2002), such as those based on the holism of belief/desire psychology, as well as circumventing objections based on how the brain processes data, such as the neural-net objections of Churchland (1979) etc. (A dispositional account does not care about how the brain causally produced the relevant disposition, as long as it is produced).

A primary skeptical objection is that any given behavioral act could be the result of many different internal belief/desire states, so that behavior as such cannot provide any conclusive evidence of a particular propositional content being associated with a current perceptual or belief state of the perceiver. For example, if a test subject is motivated to deceive the experimenters, he might deliberately put red objects into the bin reserved for green objects, even though he did correctly perceive the red color of the objects, and hence did correctly classify it internally. In such a case, the behavioral evidence of classification would be misleading because of the unusual desire of the test subject. However, scientific tests can be deliberately set up in such a way as to minimize, or exclude altogether, such deviant intentions. And in general, clearly it would be absurd to

suggest that we have no objective scientific evidence whatsoever as to the specific perceptual and doxastic abilities of animal and human species.

Nevertheless, there may be at least a grain of truth in the skeptical concerns, as follows. There might be some classification abilities, particularly of a low-level sort, whose scientific detection requires at least some minimal assumptions, or minimal ancillary evidence, concerning the belief/desire psychology of the test subject. For example, animals that use their perceptual abilities to enable them to flee from predators, and to eat food that is nutritious for them, are generally assumed to be perceiving correctly in those cases. But a suicidal individual--or an inevitably short-lived suicidal species--might desire to be eaten by predators, and desire to avoid nutritious food to ensure its own starvation. So the evidence that a given individual avoids predators and eats food might instead be evidence of its gross misperception--perhaps it misperceives the predators as harmless, and hence avoids them as insufficiently conducive to its suicide, and perhaps it misperceives the food as poisonous, and hence that explains why it eats the food.

However, in an evolutionary context basic evolutionary fitness considerations are sufficient to rule out, or at least to minimize, the theoretical effects of any such radically deviant individual psychologies. So, though it may be true that adequate evidence of classification behavior cannot be gathered in complete independence of concerns about belief/desire interactions, it is possible to scientifically minimize such concerns. Also, the full weight of scientific knowledge about perceptual competencies can be brought to

bear to rebut common skeptical belief/desire holism objections to dispositional accounts of meaning or content.

While we are on the subject of skeptical arguments about meaning, Kripke's well-known (1982) interpretation of Wittgensteinian skeptical arguments may also briefly be addressed. In Boghossian's (1989) reconstruction of Kripke's skeptical argument, it is the impossibility of explaining what it is for a term or concept to be *correctly* employed that is the main problem, leading to the skeptical conclusion that no one ever determinately *means* anything by a given expression. The current interactive indexing (II) approach bypasses this form of the problem completely, in that it is eliminativist about all intentional vocabulary as applied to cognitive acts of individuals, such as that of attempting to mean something by employment of an expression. So the II approach can happily agree with the skeptical conclusion that no one ever means anything by use of an expression, and yet preserve or reintroduce determinate meaningfulness via propositional indexing. Indeed, to the extent that such 'Kripkensteinian' concerns about the meaning of expressions are legitimate, they would provide some powerful independent support for the current II view.

A more specific form of the relevant skepticism is a concern that e.g. if one perceives that an object X is red, how does one know that it is *red* that one perceives it to be, rather than e.g. gred, i.e., red up to now and green thereafter? Translated into II terms, the skeptical concern might be that one has no way of knowing which particular proposition it is-- whether 'X is red', or 'X is gred', etc.--that indexes one's perceptual state. Though the

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issue deserves extended treatment in its own right, two brief points may be made. First, the II theory makes no claim that indexing by a proposition p of a cognitive state S of perceiver Z implies that Z knows that it is proposition p that indexes his cognitive state S (see the next three sections for further details). This lack of implication is obvious for perceptual states of lower animals, who may be cognitively incapable of knowing anything whatsoever. Hence the claimed fact--supposedly having skeptical implications--that Z might not know which proposition indexes his perceptual state can happily be accepted by the II theory in a form that is stripped of its skeptical implications.

Second, the reliance of the II theory on standard scientific methods for testing perceptual competences forestalls any general skeptical concerns about predicates such as 'red'. For any specific skeptical concern, eg distinguishing 'red' from 'red in 9 cases out of 10, green on the tenth occasion', specific scientific tests could be set up to distinguish the two hypotheses with respect to the perceiver's behavior. So any further, random or arbitrary skeptical objections would be nothing more than an undisciplined 'village' (shoot-from-the-hip) skepticism that has no scientific credibility whatsoever. If there really are any skeptics who are genuinely concerned that standard scientific tests of perceptual competences are fundamentally inadequate, they must get out of their skeptical armchairs and engage with real scientists and philosophers of science in the scientific literature on the methodology of perceptual testing. Until that literature is overthrown, the skeptic's stance would amount to little more than an admission of personal scientific ignorance or incompetence.

## 8. How to Defuse Concerns about Abstract Semantic Entities

Though I have defined a semantic naturalization strategy that avoids having to accept the global semantic naturalization (GSN) thesis introduced in section 2, there still might be concerns that the resulting overall realist view of science in the current interactive indexing (II) view is itself insufficiently naturalistic. In partitioning off all semantic factors as abstract concepts, structures or entities, this strategy does not address more generic naturalistic concerns about the status of abstract items. So, to one who worries about the naturalistic status of abstract mathematical concepts, for instance, it may be little comfort to find that, on the II approach, semantic concepts have been kicked upstairs into the same problematic abstract superstructure for science.

To be sure, the indexing strategy can, if successful, claim at least a substantial initial philosophical advance, in that apparently substantive empirical problems about content attributions to concrete cognitive states in the philosophy of mind have been completely defused, since on the indexing view there are no such attributions. Also, arguably the remaining problems about the status of abstract semantic entities are not specifically or necessarily *semantic* problems, since their abstract status is one that they share with mathematical or logical items. So a kind of functional role view of abstract semantic entities can be taken: they are those abstract entities or structures whose functional role is that of conceptually organizing and indexing, in abstract terms, specific kinds of concrete cognitive states. Mathematical entities have broader abstract functional roles, but both

semantic and mathematical cases could be viewed in this deflationary way as being

primarily defensible in terms of their instrumental functional roles in scientific theory

construction and explanation.  As for their ontological status, they could be given an

irrealist or fictionalist analysis which does not require that such entities actually exist,

hence satisfying physicalist or more general naturalistic scruples about their postulation

(Loar 1981; Balaguer, 1998).


Nevertheless, it is incumbent on those who postulate abstract entities of any kind to give

some epistemic account of specific ways in which concepts of the relevant entities come

to acquire a legitimate cognitive function in the natural sciences, and in our thinking

generally.  In the case of semantic concepts, an important basic distinction is between

basic perceptual or other cognitive states of an organism that are propositionally

indexable, independently of whether the organisms in question themselves have any

cognitive access to their indexable propositional status, versus states which sophisticated

cognitive systems, such as human beings, are capable of *explicitly representing in their

thinking* as being indexable.  Or in other words, the concept of a proposition, and of a

non-propositional but indexable cognitive state, are concepts whose instrumental

functional roles in understanding cognition only become operative roughly at the level of

reflective theory construction, involving thoughts about what is involved in constructing

scientific theories that are about the world.  So it is only when our cognitive states

become indexable by higher-order propositions that are *about* first-order propositions--

concerning the relations between theories and the world--that the concept of a proposition

becomes cognitively explicit.

However, this distinction of levels of propositional indexability is all that is needed to give a deflationary account of our knowledge of, and epistemic access to, propositions. On this account, an organism in a cognitive state, no matter how sophisticated, has no automatic or immediate epistemic access to the particular proposition that indexes her current cognitive state. But there is also nothing preventing her from entering a metacognitive state in which she thinks about the proposition that indexed her previous lower-level cognitive state. So, in answer to Wittgenstein's question as to what it is that makes a person's thought about a friend Bill specifically about *him*, rather than someone else very like him, the answer is that the proposition indexing the thought is about Bill (and no one else), and there is nothing to prevent further metacognitive activity that would investigate the truth-conditions etc. of the relevant first-order proposition about Bill. For the broader implications of these points for the philosophy of mind, see section 10.

## 9.  Why Propositions And Other Semantic Entities Must be Abstract

The present propositional indexing view could be defended in a strong form holding that propositions, and other semantic entities, properties or concepts not only are not, but also *could not* be instantiated as properties of cognitive states, and that in general no cognitive state could literally instantiate, have or possess any semantic properties. Hence

propositions etc. must be abstract, and be confined to an indexing role with respect to concrete cognitive states. Here are two basic arguments to that effect.

One basic argument relies on modal differences between physical and abstract states. It is generally accepted that physical objects, as with any empirical entities or matters of fact, have all of their relational properties only contingently. So if a cognitive system S did contingently instantiate a relational content C of a proposition-like kind, its being about a particular physical object, and its truth-conditions, would also be contingent relational properties of the cognitive system S. However, by contrast, a given singular proposition is necessarily about a particular object, and its truth-conditions are also a necessary part of its identity. Hence no proposition could be instantiated by a concrete cognitive state. Instead, the indexing view is that the relevant empirical contingency shows up in the fact that it is a contingent matter which particular, necessarily structured proposition indexes any particular cognitive state.

Another important kind of argument for the abstractness of semantic concepts relies on their role in normative semantic structures such as principles of logic or rationality. As argued by Davidson (e.g., 1980), our acceptance of normative principles of logical inference 'finds no echo in physical theory'. But, rather than assuming, with those such as MacDowell (1994), that therefore our thinking about the world, and its relations to human minds, must presuppose the existence of an autonomous realm of mental normative or rational structures, independent of the purely causal structures of the world, a much more economical hypothesis is to regard such normative structures as being

purely abstract postulations or stipulations, which are cognitively very useful for indexing desires and their outcomes, such as a desire to preserve truth during inferences. As in the case of propositions (see the previous section), explicit concepts of norms could be viewed as entering cognition only via second-order thoughts about those norms. But the norms themselves could be viewed as being purely abstract rules or directives as to how to behave, which provide abstract or idealized models of conduct only. Hence concrete human actions would not actually instantiate properties of rational or logical action derived from such ideal models, but instead would only be structurally isomorphic with such an idealized model, in ways related to basic propositional indexing ways.

## 10. Psychology, Philosophy of Mind and the Physical Sciences

Two related conceptions of the mind have now emerged in this essay. The first, more general conception, is that mental states are those concrete cognitive states that are propositionally indexable--whether by first-order, second-order, ... propositions. As purely physical states they obey only physical laws, and they have no concrete semantic properties whatsoever, but in virtue of their isomorphisms with propositional structures they may be described in abstract propositional terms. The second conception of the mind more specifically involves concrete cognitive states that count as *second-order* cognitive states, in virtue of their being indexable by propositions that are *about* first order propositions or cognitive states. For example, a conception of the mind as having rational powers, in virtue of abilities such as that of being able to think about, and use,

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principles of logical or scientific inference, concentrates more specifically on those physical cognitive states that are indexable by second-order propositions of the relevant kinds.

These two related conceptions of the mind enable us to explain both the purely physical nature of cognitive states, and yet also their apparently unusual relations to physical states understood independently of semantic issues. Insofar as the subject matter of psychology or the philosophy of mind is mental states understood in terms of principles of rational thinking, the subject matter is a mixed one involving both elements of physical causality and rational propositional structures. Such categorially mixed states--part physical, and part rational--are in part identified in terms of their relations to the second-order propositions that index them, plus to the first-order propositions that the second-order propositions are about. So these mixed states can count as physical states, but only as ones that are token-token rather than type-type identical with physical states, since their rational relational properties do not constitute a physical type that could be identical with some standard physical type of state.

Hence Davidson's (1980) thesis of the anomalism of the mental is an appropriate one for mental states understood in this initial, mixed way. Similarly, functionalist accounts of mental states in general, insofar as they ascribe broadly rational functions to such states, may also be regarded as initially appropriate, insofar as they impute token-token identities of a functional realizer state with a physical brain state, while denying for functionalist reasons that there are any type-type identities for functional mental types

and physical types.  So the current interactive indexing (II) view enables us to account for the widespread acceptance of functionalist or anomalist views of mental states as being appropriate at an initial or intermediate level of analysis, while yet also rejecting such accounts as providing a fundamental account of the ontology of the mind.

On the current II view, the rational powers of the mind, and of the relevant mental states, are real only in the sense that the relevant, purely physical cognitive states are indeed indexable by appropriate second-order propositions.  So standard anomalistic or functional conceptions of mental states may in effect be accused of making, at a deeper level, a category mistake.  They confuse purely physical causality, plus the abstract isomorphism between propositional semantic structures and interactive-perception-based dispositional structures--in virtue of which propositions can index such concrete cognitive states--with supposed 'mental states' which are somehow supposed to simultaneously have or instantiate both causal properties, *and* rationally appropriate semantic properties as well.

The fact that such mixed analyses have some initial plausibility could be fully explained by the current II theory, in the manner sketched above.  But the II theory denies that any concrete cognitive state could *actually instantiate* any supposed rationally-based functional properties via a first-order realization of such supposed functional properties. It also denies that there could be, strictly speaking, any causally anomalous mental states. Just as it would be a category mistake to regard objects, simply in virtue of their having different weights, as consequently somehow instantiating abstract numerical properties,

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so similarly it is a category mistake to regard mental states, simply in virtue of their being propositionally indexable, as consequently somehow being capable of instantiating abstract semantic properties.

As a consequence, the major traditional problems about how the mental relates to the physical can be avoided. The standard difficulties in making an ontological distinction of mental from physical states (e.g., Gillett and Loewer, 2001) are avoided entirely, since mental states just are physical states that happen to be also propositionally indexable. But being abstractly indexable no more impugns the physical reality of mental states than having a weight impugns the physical reality of objects that are thus describable. Similarly, supposed problems of mental causation become unproblematic, because concrete belief and desire states can unproblematically cause actions such as refridgerator-openings (see section 5), once we give up the categorially confused idea that somehow it must be in virtue of the relevant propositional contents themselves that beliefs or desires are able to cause anything.

As for the broader context of naturalized semantic theories in general, there is an expectation that any adequate naturalization of semantics should also, in so doing, provide at least a basic or central understanding of the place of mind in nature. Arguably, as the above points and previous sections show, the interactive indexing (II) theory is potentially able to satisfy that expectation. Another reasonable expectation for naturalized semantic theories is that they should be able to explain specific epistemic and diachronic aspects of the place of mind in nature, including the issue of how minds

evolved, and how we are capable of acquiring knowledge about the world and ourselves. Arguably the basic interactive theory of perception provides the required evolutionary foundation for the II theory, in that it explains how any propositionally indexable perceptual states could have evolved via sensorily and dispositionally mediated, causally interactive environmental processes. So the II theory, unlike informational semantics approaches to naturalization, has the significant advantage of being based on a fundamental, evolutionarily plausible causal mechanism that previously has been completely neglected in semantic naturalization attempts.

To be sure, in this relatively brief essay it has only been possible to outline the basic foundations of the II theory. Many issues, including that of how linguistic cognitive abilities fit into the II framework, will have to be discussed elsewhere. But any semantic naturalization project should start with the pre-linguistic basics, applying to many species at many different evolutionary levels that have at least some rudimentary, perceptually based cognitive abilities. If the II approach is correct, it is those same basic structures that explain the sophisticated cognitive abilities imputed to human beings by folk psychology. Any additional factors, including our impressive linguistic abilities, abilities to scientifically theorize, and so on, are just icing on the perceptually based cake.

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# NOTES

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[1] For more detailed criticisms see Dilworth (2004).


[2] To be sure, other authors such as Churchland (1979), Loar (1981) and McGinn (1989) have suggested weaker indexing strategies, in which structures of propositions index corresponding cognitive structures in a many-one measurement-theoretic way, but the current account seems to be the first to incorporate one-to-one propositional indexing of particular states by particular propositions into its structure.