

PERCEPTUAL CONTENT IS VERTICALLY ARTICULATE

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Philosophers tend to agree that at least some perceptual states have *content*: they are about properties, states of affairs, or some such things.¹ Arguments in favor of *non-conceptual* content often proceed by pointing out that perceptual states' contents have features uncharacteristic or at least atypical of conceptual states. Two such features stand out in the literature and are important for what follows. First, perceptual states have contents that are of a finer grain than that typically possessed by concepts. Second, their contents are typically richer than the contents of conceptual states. As Michael Tye (2005a) points out, the first of these features, but not the second, is inconsistent with the contents of perceptual states being conceptual. Without taking issue with the foregoing claims, this paper points out a heretofore unnoticed feature of perceptual contents: vertical articulateness. This feature relates in illuminating ways to the first two, and it deepens an account of how perceptual states play the role of providing perceivers with vast amounts of information about the environment. In particular, vertical articulateness provides a new perspective on the problem of perceptual abstraction.

Section 1 canvasses the first two features and why they matter. Section 2 explicates vertical articulateness and ties it to perceptual

abstraction. Section 3 provides two models of how perceptual states could have vertically articulate contents. These models take for granted different proposals about how perceptual states manage to have content in the first place. Section 4 considers whether concepts ever have vertically articulate contents and concludes that while there is no fundamental bar to such a thing, it either never happens or only happens occasionally and in a manner distinct from its perceptual counterpart. The overall goal of understanding perceptual content need not be pointing out why it cannot be conceptual or must be so. Rather, it is explicating the features typical perceptual states' contents, with an eye toward explaining how perceptual states fulfill their roles in humans' psychological economies.

1. RICHNESS AND FINENESS OF GRAIN

Perceptual states have the function of providing perceivers with information about their environments, and understanding their contents should explain how they manage to do this well. The most obvious thing to say about perception is that it provides a wealth of information about the world. Perceptual states have *rich* contents in that they represent objects as having many properties under many different determinables: shapes, orientations, relative distances, colors, tex-

tures, and so on. One's overall perceptual state—what one sees, hears, feels, etc. at any given moment—is typically quite a rich state indeed. (See Tye 2005a, §2.) Thoughts are not typically as rich as perceptual states are; they often concern rather little. It might be that some thoughts are as rich as perceptual states, but typically perceptual states and thoughts differ along this dimension, and this makes sense given the different roles that thinking and perception play.

In addition to carrying information about many properties, perceptual states are *fine grained* in that for each determinable, they can represent rather determinate properties.² Perceptual states can represent many rather specific planar shapes, though perhaps they are not sensitive enough to represent *determinate* planar shapes, and similarly for hues and the like. The level of specificity of perceptual states outstrips that of most perceptual, recognitional concepts subjects have for such properties (Dretske 1981, chap. 6; Evans 1982; Peacocke 1992b, chap. 3; Peacocke 1992a; Raffman 1995; Tye 1995, p. 139; Tye 2005a; Heck 2000). Concepts of color properties come at many levels of determinateness—reddish, red, crimson, scarlet, etc.—so the point is not one about how specific concepts can be. In fact, some color concepts seem to be at the same level of determinateness as perceptual states. For example, unique green, which is a shade of green with no admixture of blue or yellow, is a determinate perceptible shade of green for which at least some have a concept (Raffman 1995, p. 303). The point is just that no one has concepts for all of the most determinate color properties people can perceptually represent. Similar considerations hold for shapes, sounds, smells, textures and the like. In that sense, fineness of grain suggests that perceptual states' contents are *non-conceptual* (Crane 1992, pp. 153–155; Tye 2005a, §4). John McDowell (1994, chap. 3), Richard Heck (2000, §2), Sean Kelly (2001, §2), and

Alex Byrne (2005, §2.1) raise worries about such claims.

There is another sense in which conceptual states are fine-grained and perceptual states are not. Conceptual states are (hyper-)intensional, in that concepts can be distinct even though they (necessarily) co-refer. In this sense, concepts of triangles are distinct from concepts of trilaterals but there is no distinction between perceptual states that represent triangles and those that represent trilaterals (Dretske 1981, chaps. 7, 9; Tye 2005b, pp. 221–225). This failure of fineness is not central in what follows, so it can be set to one side.

The fact that perceptual states are rich and fine-grained contributes to their usefulness. Perceptual needs vary in at least two salient dimensions. First, perceivers need information about different properties—movement, color, distance, etc.—so it helps that perceptual states have rich contents. Second, they need information at different levels of abstraction. Perception provides details and sometimes those details about specific colors, locations, and distances matter. More often, what matters is information at a considerable remove from the fine-grained content of perceptual states, but it can't hurt to have more information than one typically needs.

Spatial metaphors can aid the understanding, and in this case it is tempting to think of richness as the breadth of perceptual states' contents while fineness-of-grain corresponds to their depth. Compared to the contents of concepts and the thoughts they constitute, perceptual states are broader and deeper. This spatial metaphor is misleading, however, in that it obscures the feature that this paper intends to explicate. Breadth and depth are important, but philosophers have not asked whether abstractions from that most determinate property represented by a perceptual state are also part of its representational content. Are perceptual contents vertically articulate in that abstractions from the most

determinate properties they represent are also represented by those perceptual states? The next section explains vertical articulateness in more detail, and argues that perceptual content is like that.

2. VERTICAL ARTICULATENESS

The concept of scarlet represents the color scarlet. Everything that is scarlet is red, and everything that is red is colored, but that does not mean that the concept of scarlet also *represents* red or being colored. Similarly, the concept of red represents neither being colored—a less determinate property—nor anything more determinate than redness. Conceptual content is not in general vertically articulate: it picks out a property but nothing more determinate or more abstract than that. (Section 4 considers whether conceptual contents are *ever* vertically articulate.) For its content to be vertically articulate, a perceptual state that represents scarlet must also *represent* some abstractions from that property, such as red and being colored. A vertically articulate state has representational content that cuts across levels of abstraction. The claim is not that *all* abstractions from a determinate property are also part of a perceptual state's representational content, but just that typically some or even many are.

To be more specific, a state *S* has vertically articulate content when for some property *P* that it represents, it also represents some *Q*, which is an abstraction from *P*. It is difficult to unpack just how two properties need to be related for one to be an abstraction from the other. For present purposes, the following suffices: *Q* is an abstraction from *P* only if being *P* entails being *Q* but the converse fails. Being scarlet entails being red but not conversely. Being square entails being quadrilateral but not conversely. And so on. One might worry about this proposal because being scarlet entails being scarlet-or-loud, and so on for any disjunct one cares to include. Such liberal disjunction certainly does not capture the

sense in which determinates relate to their determinables. For present purposes, however, it doesn't matter much whether there is a special relation that holds between determinates and determinables distinct from the latter satisfying the entailment schema presented above. All that is required for vertical articulateness is that a state represents some property and another property that is an abstraction from it. As it turns out, the most interesting cases of the phenomenon concern properties along the intuitively clear line between determinates and determinables, whatever that distinction ultimately amounts to. The end of section 3a, which discusses quality spaces for colors and other perceptible qualities, helps clarify why these particular kinds of abstractions are relevant when dealing with perceptual content.

In addition to the distinction between being vertically articulate and not, states can be distinguished based on the extent to which they are vertically articulate. Given two states that represent *P*, and nothing more determinate than *P*, one is *more* vertically articulate than the other if one represents a greater number of properties that are abstractions from *P* than the other does. The comparison might be undermined if one of those states also represents some *R*, from which *P* itself is an abstraction, which is why the condition ‘and nothing more determinate than *P*’ is needed above. As will become clear at the end of section 3a, there is reason for thinking that perceptual states are *very* vertically articulate. If conceptual states ever have vertically articulate contents—see section 4—they are not very vertically articulate contents.

With a clearer sense of vertical articulateness in mind, why believe perceptual states have contents like that? First, perceptually represented properties are typically taken to affect the phenomenology of perceptual experiences. These properties include colors, shapes, distances and the like, while generally they exclude properties like being a penny

and being a Bishop. Bishops can be identified perceptually, but this is accomplished in virtue of perceiving other properties, like the colors and shapes of pieces of clothing. What makes a phenomenological difference is not being a Bishop, *per se*, but the shapes, colors, and spatial organization of the Bishop's clothing and other surface features.³ Abstractions from the most determinate perceptible color properties, however, do seem to be phenomenologically salient. Not only does one perceive specific shades of red, but those shades, phenomenally, seem to fall into more abstract classes, like the dark reds, the bright reds, the reds, and so on. To the extent that such abstractions from the determinate perceptible shades seem phenomenologically salient, they are good candidates for being part of the representational contents of perceptual states.

Second, perceptual representations bear an important relationship to demonstrative and recognitional concepts. In particular, “Perceptual states with nonconceptual content make these general [recognitional] concepts available to a thinker by providing the canonical, noninferential basis for the application of these concepts to things given in experience” (Peacocke 2001, p. 242). Bracketing issues about whether this content must be *nonconceptual*, perceptual states do seem to play such a role. These recognitional concepts range over, albeit incompletely, the most determinate perceptible shades—unique green, e.g.—and much less specific colors such as aquamarine, chartreuse, and green. Vertical articulateness is one way to fill out an explanation of how perceptual states fill this role. Breadth and depth alone are not up to the task.

For example, Tye claims that “if the world is already presented to us, at a non-conceptual level, as being made up of three-dimensional surfaces of varying colors and shapes, it is easy to understand how we can come to conceptualize the world via color and shape

concepts” (Tye 2005b, p. 228). There is still some mystery left over, however, even if one claims that perceptual states have broad and deep contents. The question is not just how recognitional concepts—for example, concepts of determinate shades of color—might be acquired, but how abstract recognitional concepts like ‘red’ are applied to things in the world that are perceptually represented as being a rather *specific* shade of color that happens to be one of the reds. Similarly, Peacocke (2001, p. 254) claims that “the holding of the correctness condition for the nonconceptual content in question ensures the holding of the correctness condition for the conceptual content *That's F*” for recognitional concepts. But this seems insufficient to explain how perceptual states make such “general concepts available to a thinker” (Peacocke 2001, p. 242) if it is agreed that a state can represent being chartreuse but not represent being greenish. Being chartreuse ensures that the correctness condition for *that's greenish* holds, but that's not to say any state representing chartreuse makes being greenish available in the sense Peacocke seems to have in mind, since it might not represent being greenish. A vertically articulate state that *also* represents being greenish, however, would do the job well.

That's not to say vertical articulateness is the only way to explain how perception delivers the goods. Over time perceivers might develop a suite of inferences, associations, or something else that allows ready access to the abstractions that matter most. This might be unnoticed once the procedure becomes suitably automatic, just as inferring from someone's visual appearance that he is a Bishop can be automatic. All of this suggests that the reasons adumbrated above are inconclusive, but that is unsurprising. With a clear notion of vertical articulateness on the table, one can ask whether developed theories of perceptual content allow for, or even require, that perceptual content is this way. If theories

exclude it, they need a different explanation of how to abstract from the specific contents of perceptual states to things less determinate. The next section shows that two accounts of perceptual representational content suggest that it is vertically articulate.

Before moving on, it is worth noting that though vertical articulateness *per se* has not been prominent in philosophers' minds, it's clear that some, like Michael Thau, find the idea implausible:

[I]t's completely obvious that, even if . . . colors *are* represented in visual perception, the color red—or, for that matter, blue, green, or yellow, etc.—is never represented in visual perception; rather, objects are visually represented as being *some determinate shade* of red, or blue, or green, or yellow, etc. (Thau 2002, p. 217)

His reasoning seems to be that perceptual states clearly represent rather determinate color properties, and so there is no reason to think that they also *represent* abstractions from them. One cannot simply infer from the fact that a state represents crimson that it represents redness, after all, even though all crimson things are red. Perhaps his point is that the qualitative character of a visual experience is always determinate, and since he thinks qualitative character is to be explained in terms of representational content, the latter had better be fully determinate as well. Notice, however, that vertical articulateness does not suggest perceptual content *only* includes determinable properties. It suggests that the content extends across levels of abstraction. There is no conflict between a perceptual state representing red and scarlet and a few abstractions in between. If phenomenology is Thau's motivation, he would need to show that, phenomenologically, redness *per se* plays no role in explaining what a perceptual state is like whenever a particular shade of red is also phenomenologically relevant. This seems false, as mentioned above. In fact, Kulwicki (2007, §4) suggests that such abstractions can

help explain phenomenology, although that paper fails to notice vertical articulateness *per se* as a phenomenon of interest. None of this suggests the current proposal is obviously correct, but only that it's not completely obvious that a perceptual state does not represent redness *because* it represents a more determinate shade of red.

3. HOW TO BE VERTICALLY ARTICULATE . . .

3a. . . . for Information Theorists

The line of thought about perceptual content that traces from Paul Grice's (1957) notion of natural meaning through Gareth Evans (1982) and Fred Dretske (1981, 1995) provides the raw materials for showing how a representational state's content can be vertically articulate.⁴ What perceptual states represent, on this view, depends on what they have the function of carrying information about, which is understood in terms of the causal generalizations into which such states enter in ideal circumstances.

For Dretske (1981), some physical state of affairs, S, carries the information that some object x is 60 degrees if and only if in normal circumstances necessarily, if S then x is 60 degrees.⁵ A thermometer carries information about temperature because whenever the circumstances are normal—the device comes to thermal equilibrium with its surroundings—necessarily, if the height of the mercury is H then the temperature is T. The height of the mercury is an *information-carrying property* of the thermometer: the height depends lawfully on the ambient temperature under normal circumstances (Dretske 1981, p. 65). Perceptual states have the biological function of carrying information, which is why they are representational states with content.

One piece of information can, in Dretske's terms (1981, p. 71), be *nested* in another piece of information. For example, the height of the

mercury column carries information about the temperature of the thermometer. The temperature of the thermometer, under normal circumstances, itself carries information about the temperature of the ambient air. This is easy enough to see: under normal conditions necessarily, if the thermometer's temperature is 60 degrees then the ambient air is 60 degrees. Information about the thermometer's temperature thus nests information about the ambient temperature. Similarly, the information that the temperature is 60 degrees nests the information that the temperature is between 50 and 70 degrees, that the temperature is greater than 57 degrees, that it is less than 63 degrees, and so on. Indeed, any signal that carries the information that the temperature is 60 degrees also carries information about all of those abstractions from that determinate piece of information.

Perceptual representations have fine grained contents in that they carry quite specific pieces of information about objects' features like shade of color, shape, orientation, illumination, location, and so on. What matters cognitively is often not the specific information carried by a perceptual state but the nested, abstract information that it carries. How is this abstract information extracted from such a perceptual state? Causal generalizations underwrite information-theoretic links, so in order to extract abstract information from the perceptual signal, one forms a state that is sensitive to that abstract piece of information and nothing more specific than that. “[O]f all the information carried by an incoming signal, a semantic structure is causally sensitive to a unique component of this incoming information” (Dretske 1981, p. 180). Signals can differ in whether they make it possible to be causally sensitive to individual components of the information that they carry.

Imagine, for example, a fancy thermometer. The height of the mercury column corresponds to temperature, and the color of

the thermometer corresponds to the ambient relative humidity. In that case, being causally sensitive to its color, to the exclusion of the height of the mercury, amounts to extracting information about humidity from a signal that carries information about both temperature and humidity. Similar considerations hold for extracting information about abstractions from the determinate temperature the thermometer represents. The height of mercury carries information about temperature, so height H carries the information that the temperature is 60 degrees. Perhaps one needs to know whether the temperature is between 55 and 65 degrees, which is an abstraction from the information that the temperature is 60. Is that abstract piece of information *extractable* from the thermometer? It is. As long as the mercury's height is between the value representing 55 degrees and that representing 65 degrees, the temperature is within that range. Having a *height within the relevant range* is a property of the mercury representing 60 degrees, and one can be causally sensitive to that property without being differentially sensitive to each of the heights within the range. Doing so amounts to extracting the abstract piece of information from the signal, which carries much more specific information. This need not be an inference *from* the determinate height to the less specific height, since one can be sensitive to the latter without being sensitive to the former.

It is easy to imagine cases in which one is unable to extract information from a signal in the sense just adumbrated. Imagine a device that indicates the shapes of objects on a screen: square, circle, isosceles triangle, etc. The device represents squares with the name ‘square.’ This representation carries the information that the object before one is square, but it has no information-carrying parts that carry information more abstract than that. That is to say, there is no information-carrying property of the ‘square’ readout that is responsible for carrying the informa-

tion that the figure is four-sided, and nothing more determinate than that. Anyone who knows what squares are will be in a position to learn these things about the objects based on the representation ‘square,’ but this would not amount to extracting the information in question. By contrast, a device that reads out ‘right internal angles, sides of equal length, opposing sides parallel’ would provide the same overall information, but make more of its parts extractable. To be specific about the technical sense of extractability on the table:

A signal, S , carries the information that x is f in *extractable form* just in case there is some property of S , h , in virtue of which S carries the information that x is f but not any information that nests the information that x is f .⁶

A signal can carry the information that x is f even though it does not carry it in extractable form because no information-carrying property of the signal carries the information that x is f and nothing more specific than that. When information is extractable, the signal is structured so that a system can be causally sensitive to the properties in virtue of which that information is carried.

Extractability, as defined above, allows one to see how perceptual states *can* have vertically articulate contents. In particular, nested information is more abstract—i.e., less determinate—than the specific information a state carries. Some nested information is carried in extractable form while much is not, and extractability is a good way to distinguish nested information that forms part of the state’s representational content from nested information that does not (Kulwicki 2005). But thinking of representational content in these terms suggests that perceptual states can have vertically articulate contents: they can represent a property and an abstraction from that property. Of course, a state carrying a given piece of information will inevitably

nest myriad other pieces of information that are not extractable. For example, any state carrying the information that x is red nests the information that x is red-or-feline, but such information need not be extractable from that state. Whether perceptual states are structured so as to make such information extractable, and thus whether they have vertically articulate contents given a Dretskean account of content, are empirical questions. Kulwicki (2005, §3) suggests that the empirical data favor the claim that perceptual states make much abstract information extractable (though that paper misses the idea that this makes perceptual content vertically articulate), so in the sense explicated here it seems as though such states do have vertically articulate contents.

Before moving on to see how vertical articulateness fits with a different account of perceptual representation, it’s worth pointing out an interesting dividend of the foregoing discussion. Perceptible properties come in organized bundles, or quality spaces. The colors are all members of a quality space, as are sounds, smells, and the like. The discussion of extractability sheds some light on why quality spaces per se are valuable perceptually. If there is a space of properties that a system represents, and the system has a distinct representation for each member of that space, then indefinitely many abstractions from that system’s most determinate information are extractable. This is exactly the way to build a system that provides myriad bits of information at many levels of abstraction. Representing all of the members of a quality space, given a Dretskean account of perceptual content, means that perceptual states will typically have *very* vertically articulate contents. Moreover, this helps to explain why the kinds of abstractions that seem most relevant to the present discussion are found along the intuitively clear lines between determinate properties and determinables. The members of a quality space just are determinates and

the determinables thereof are abstractions from them about which information is carried in extractable form.

As an example of this, it helps to recall the thermometer example. One height corresponds to each temperature in a range, and abstracting over features of such heights—e.g., to all heights within a certain range—yields an abstract information-carrying property—e.g., a height between *a* and *b*—that carries information about an abstraction from the determinate content of the representation—a temperature between *c* and *d*. Abstracting from the most determinate content of these representations amounts to finding an abstraction over information carrying properties—in this case, heights of mercury—that carries information about an abstraction over the determinate values of temperature about which the heights of mercury carry information. In general, any system that carries extractable information about a number of properties—say the determinate members of a quality space—will also carry information about abstractions from those determinates—i.e., the determinables—in extractable form.

3b. . . for Homomorphism Theorists

David Rosenthal understands the contents of perceptual states in a way that places the notion of a quality space more centrally than the information theorist's account does. Like Dretske's view, Rosenthal's is complex, and the focus will be on the details of his account that are relevant for understanding whether it makes room for vertical articulateness.

Perceptual states allow one to be differentially sensitive to ranges of properties in the environment. These properties are perceived as standing in certain relations of similarity and difference to one another. For example, scarlet is more similar to vermillion than it is to pink, just as the reds are more similar to the oranges than they are to the blues. According to Rosenthal, perceptual states

not only pick out rather determinate shades of color, but they are organized with respect to one another into mental quality spaces whose members mirror the relations between the perceptible qualities that they represent. States representing the reds are more similar to states representing the oranges than they are to states representing the blues. Similarly, the state representing scarlet is more similar to the state representing vermillion than it is to the state that represents pink. Part of being a perceptual state that represents red, in fact, is being a state that is similar to and different from the other perceptual states representing colors in a way that mirrors the similarities that red bears to the other colors. “A mental quality counts as red* if it resembles and differs from other color* properties in ways that parallel the similarities and differences that commonsense physical red bears to other physical color properties” (Rosenthal 2005, p. 204).⁷ It need not be that the mental quality red—‘red*’ in Rosenthal’s terminology—is *darker* than the mental quality yellow*, even though reds are generally darker than yellows. What matters is that there is some other dimension, dark*, along which red* differs from yellow*, and similarly for the other ways in which colors seem to relate to one another. The set of mental qualities representing colors is thus *homomorphic* to the set of colors (Rosenthal 2005, p. 198).

Occurrences of red* are certainly correlated with occurrences of red in one’s environment, so it is consistent with Rosenthal’s account that red* states often carry the information, in Dretske’s sense, that there is something red out there. “Mental qualities are properties of states in virtue of which an organism responds to a range of perceptible properties” (Rosenthal 2005, p. 202). Rosenthal does not appeal to information theory as an explanation of perceptual content, however, in part because merely carrying information about some property seems insufficient to account for the qualitative aspects of perceptual states

that seem lacking in other mental states, such as thoughts. “It is these mental qualities by which perceptual experiences, unlike non-perceptual thoughts, represent things in a distinctively qualitative way” (Rosenthal 2005, pp. 118). Perceptual states represent what they do at least partly in virtue of being homomorphic to classes of properties in the world at large. These homomorphisms account for “the distinctively qualitative way” in which perceptual states represent, though it is beyond this paper’s scope to discuss this issue in detail.

How might vertical articulateness fit into Rosenthal’s picture? According to Rosenthal, humans have a collection of possible perceptual states, one corresponding to each of the most determinate perceptible shades of color. Now consider a particular perceptual state, S , that stands for a determinate shade of color, red_{17} . The mental quality of this state, red_{17}^* , is *that* mental quality partly because of the similarity and difference relationships it bears to the other mental qualities within that quality space. To know whether S has a vertically articulate content requires ascertaining whether S is also, for example red^* , and not just red_{17}^* . If a state that is red_{17}^* is *eo ipso* a red^* state, then there is good reason for claiming that the contents of perceptual states are vertically articulate. This is so because all there is to being a perceptual state that represents red is being a red^* state, so any state that is both red^* and red_{17}^* represents both red and red_{17} .

It is easy enough to claim that any red_{17}^* state has the following disjunctive property: $\text{red}_1^* \text{-or-} \text{red}_2^* \text{-or} \dots \text{-or-} \text{red}_{17}^* \text{-or-} \dots$. That is, one can disjoin all of the mental qualities responsible for representing determinate shades of red. One cannot simply assume, however, that

$$\text{red}_1^* \text{-or-} \text{red}_2^* \text{-or} \dots \text{-or-} \text{red}_{17}^* \text{-or-} \dots = \text{red}^*$$

It might be that the left hand side of the identity does not resemble and differ “from

other color* properties in ways that parallel the similarities and differences that commonsense physical red bears to other physical color properties” (Rosenthal 2005, p. 204). If the foregoing identity holds then red_{17}^* perceptual states are also red^* and thus have contents that are vertically articulate. That is, they represent both specific shades of red and red more generally. Exactly how vertically articulate such contents are depends on how many abstractions from those determinate shades they represent. If red_{17} is a dark red, for example, one can ask whether some less inclusive disjunction than red^* includes red_{17}^* and all of the other color* properties that correspond to dark reds. That is to say, if red_{17} is a dark red, it is reasonable to ask whether red_{17}^* states are also dark-red* just as one can ask whether red_{17}^* states are red^* . The overall point is that if perceptual states are homomorphic to the perceptible properties at many levels of abstraction, then on Rosenthal’s view they have vertically articulate contents; if not, not.

There are two good reasons for thinking that the contents of perceptual states are vertically articulate given Rosenthal’s view of perceptual content. First, the disjunctive property on the left hand side of the identity above is a property of perceptual states that correlates with instantiations of redness in the environment. Even though Rosenthal is not an information theorist, it would be odd to insist that red^* is some other property, distinct from the disjunction, which correlates with redness. And it would be difficult to deny that there is any red^* property at all, because that disjunction on the left hand side is at least a good candidate for being red^* . Second, fixing homomorphisms at one level of determinateness commonly fixes them for abstractions from that level of determinateness as well. This point mirrors the claim made about extractable information and quality spaces at the end of the previous sub-section, so consider a thermometer one last time. The

thermometer's states are homomorphic to the temperatures in that if one height of mercury is greater than another then the temperature corresponding to the former is greater than the temperature corresponding to the latter. It just so happens that many abstractions from determinate height and temperature reveal the same kind of homomorphism. For example, if heights between *a* and *b* are greater than heights between *c* and *d*, then temperatures within the range corresponding to the former range of heights are greater than temperatures corresponding to the latter range. Often, if a system exhibits homomorphisms at one level of abstraction, it will exhibit them at others, so it is reasonable to expect this to be true for perceptual states if perceptual content works as Rosenthal says it does. Thus, it is reasonable to think that for Rosenthal perceptual states tend to be not just vertically articulate but *very* vertically articulate.

4. CONCEPTS AND ARTICULATENESS

At least two accounts of perceptual content make room for vertical articulateness. Are conceptual contents ever vertically articulate? There may be no fundamental bar to their being so, but this is true for both the depth and breadth of perceptual states too. There can be concepts with very specific contents—recall unique green—and concepts cover the whole range of perceptible properties: sights, sounds, smells, and everything in between. While it is important for perceptual states to be vertically articulate, however, there is no particular reason for concepts to be. In addition, either no lexical concepts have vertically articulate contents or if some do (a) these contents are not *very* vertically articulate and (b) they are not articulate along the line between determinates and determinables.

There are thoughts whose conceptual contents include properties across many levels of abstraction. For example, consider the blue, dark blue, indigo thing. Such a thought represents color properties at many levels of

abstraction. It is easy to construct a thought that has a vertically articulate content: just conjoin concepts for properties at many levels of abstraction in thought. It is certainly unusual to think such thoughts, and there are few conversational contexts in which it would be appropriate to express them, but there is no problem with *formulating* them.

What about lexical concepts, however? As far as lexical concepts concerning perceptible properties go, it seems clear that there are none with vertically articulate contents. The concept of vermillion does not represent redness, even though it represents one of the reds. And it seems one can have beliefs about vermillion without having a concept of red at all. This latter point is not essential to establish that color concepts fail to be vertically articulate, however. It could be, for example, that the possession conditions on the concept of vermillion include having a concept of red even though the concept of vermillion does not *represent* redness (Fodor 1998, pp. 108–112).

There are some lexical concepts whose contents seem complex, albeit not exactly in the way considered in earlier sections. For example, the concept of a bachelor picks out youngish, unmarried men. Does this concept also *represent* being unmarried? If so, there is a sense in which this concept has a vertically articulate content because being unmarried is an abstraction from being a youngish, unmarried man. This is not the kind of abstraction, from determinates to determinables, characteristic of perceptual states, but it is an abstraction nonetheless and thus fits the bill for vertical articulateness. As it stands in the literature, however, it is deeply controversial whether the concept *bachelor* represents unmarriedness in addition to representing bachelorhood. The answer depends in part on whether some lexical concepts are semantically complex, in that they have semantically significant constituents, or whether they are semantic atoms, as Fodor (1998) suggests

they are. If Fodor is right, *no* lexical concepts have vertically articulate contents.⁸ If Fodor is wrong, then some lexical concepts might have vertically articulate contents.

These debates need not be settled for present purposes, even though the way they are resolved will affect the strength of this paper's thesis. Perceptual states characteristically have very vertically articulate contents, and the kind of vertical articulateness that characterizes them manifests itself along the line between determinate perceptible properties and determinables thereof. This helps to explain how perceptual states do what they are supposed to do: provide information about many features of the environment across levels of abstraction. Some lexical concepts might have vertically articulate contents, though none seem to be very articulate or to cover the determinate/determinable line. Furthermore, it is unclear why vertical articulateness is important for allowing concepts to play the roles they play.

It's also worth mentioning that *conceptions* of concepts typically extend across levels of abstraction. A conception is a (perhaps tacit) understanding that one has of a concept (Higginbotham 1998, p. 150; Ezcurdia 1998). For example, it is typical to conceive of scarlet as being a color, as being one of the reds, as being redder than vermillion,

etc. Understanding what scarlet is involves, in part, understanding how scarlet relates to other properties. Since properties of interest relate to one another along many dimensions of abstraction, it is unsurprising that conceptions of those properties cover many levels of abstraction. Indeed, the fuller and more accurate one's conception happens to be, the more levels of abstraction one would expect it to cover. Aside from insisting, however, that one's conception is *constitutive* of one's concept, this does not suggest that conceptual contents are vertically articulate.

5. CONCLUSION

Understanding perceptual content amounts in part to figuring out what makes perceptual states qua representational states different from conceptual states generally speaking, given the role that perceptual states are supposed to play in perceivers' psychological economies. Putting the breadth, depth, and vertical articulateness of perceptual states together shows how they do what they are supposed to do. No one of these features is up to the task by itself. In addition, at least two accounts of perceptual content allow for vertical articulateness and thus avoid the task of explaining, by some other means, abstraction from their determinate contents to what are often the contents of interest.

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NOTES

1. Two anonymous referees for this journal provided quite helpful comments, for which the author is most grateful.
2. This way of distinguishing richness and fineness of grain follows Tye (2005a). Others, for example, Heck (2000) and Byrne (2003, 2005) use 'richness' to denote fineness of grain, as here conceived.
3. See, e.g., Dretske (1981, p. 161ff.), Tye (1995, p. 141), Peacocke (2001, p. 253), and Siegel (2006).
4. Tye's work (1995, 2000) is located in this vein as well, but it will not be the focus of what follows.

5. There is more to Dretske's account than this, but this formulation brackets details irrelevant to showing how perceptual states can have vertically articulate contents. The explication of Dretske and the discussion of extractability that follows are drawn from Kulvicki (2004, 2005).
6. This formulation follows Kulvicki (2005).
7. The similarities among perceptual states are generated from the organisms' ability to discriminate different physical qualities from one another, a la Goodman (1977, pp. 197–200) (Rosenthal 2005, p. 201).
8. It's open to Fodor to claim that some lexical concepts represent properties one would characterize as *A&B*, for example, but he would balk at claiming that such a concept thus represents *A* and represents *B*, as vertical articulateness would require.

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