Heavily revised version forthcoming in *Analytic Philosophy.* In *Perception* (Routledge 2021) I give my current take on these empirical arguments.

Naïve Realism and the Science of Sensory Consciousness

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In the first exuberance of liberation, I briefly became a naïve realist and rejoiced in the thought that the grass really is green, in spite of the adverse opinion of all philosophers from Locke onwards.
--Bertrand Russell, My Mental Development (1946)

The qualitative difference between red and green, the tastiness of fruit and foulness of carrion, the scariness of heights and prettiness of flowers are products of our common nervous system.
--Stephen Pinker (2008)

The apparent conflict between naïve realism and science is an old trope in philosophy. For example, here is a well-known argument from Bertrand Russell (one that Albert Einstein (1944, 282) called "marvelous"):

> We all start from "naive realism," i.e., the doctrine that things are what they seem. We think that grass is green, that stones are hard, and that snow is cold. But science assures us that the greenness of grass, the hardness of stones, and the coldness of snow, are not the greenness, hardness, and coldness that we know in our own experience, but something very different. The observer, when he seems to himself to be observing a stone, is really, if physics is to be believed, observing the effects of the stone upon himself. Naive realism leads to science, and science, if true, shows that naive realism is false. Therefore, naive realism, if true, is false; therefore it is false. (1950, 15)

Naïve realism was in this way cast aside for a long time. But times have changed. Today it is one of the most important and widely discussed theories of perception. In fact, some (e. g. Fish 2009 and Campbell 2010) hold that it changes the nature of the mind-body problem and may help with its solution. We have occasion therefore to resurrect the old issue of whether there is a conflict between naïve realism and science. Like others, I believe that the traditional arguments from science against naïve realism - Russell's causal argument here, the argument from microscopes, the argument from perceptual variation, and so on - are, all of them, bad arguments. However, here I will use more recent empirical results - not available in Russell's own day - to construct two new empirical arguments against naïve realism. These results show contemporary naïve realism to be a complete non-starter. The disconnect between contemporary naïve realism and science could not be more extreme.[1]

My plan is as follows. I begin by describing what I will call *simple naïve realism*. Then I will describe the relevant empirical results. Next, I will develop two new empirical arguments against

[1] Burge (2005) also argues that there is a conflict between the contemporary science of perception and naïve realism (or more specifically, the "disjunctivism" that goes with it). See Campbell (2010) for a convincing response. However, the arguments of this essay will be quite different from Burge's, drawing on a different range of empirical results. Elsewhere, I have used these same empirical results to develop arguments against "tracking intentionalism" (Author). However, the arguments of this essay against naive realism are new and quite different (e. g. the "argument from irregular grounding" and the new Mary case in §3 are unique to the case of naive realism), and require consideration a different range of recent replies specific to naive realists (§§6-8).

simple naive realism. Then I will briefly look at two new, more complex forms of naïve realism: one due to Keith Allen and the other due to Heather Logue and Ori Beck. I will argue that they are not satisfactory retreats for naive realists. The right course is to reject naive realism altogether. My stalking horse is contemporary naive realism but there is a larger, positive lesson: new empirical results support a brain-based theory of sensory consciousness.

1. Simple naïve realism about normal experience

I began, then, by describing what I call *simple naïve realism about normal experience* that will be my initial target. It is only a theory of "normal" (non-illusory, non-hallucinatory) experience. It is totally neutral on what goes on in cases of illusion and hallucination. In the case of normal visual experience, simple naive realism has three parts.

First, simple naive realists accept *primitivism* about sensbile colors. To illustrate, suppose that you view a blue-looking ball. Necessarily, in having this experience, you are presented with (or ostensbly presented with) a distinctive and familiar quality, which seems to you to pervade a round region. This is an example of a sensible color. It is an example of a "sensible property". Since the 17th century scientific revolution it has been common to locate sensible properties "in the mind" (e. g. as properties of sense data or regions of the visual field). Naive realists reject this approach. Instead, they locate sensible colors in the external world. In particular, colors are "primitive" and objective qualities that are spread out on the surfaces of objects. They are distinct from those objects' reflectance properties. They are distinct from reflectance properties because they have different essences: the essence of colors is exhausted by how they look ("revelation"), while this is not true of the essence of reflectances. Still, the colors of objects are grounded in their reflectances: for instance, necessarily, if a thing has a certain reflectance profile, this grounds its being canary yellow. This is a form of nonreductive physicalism about the colors. Compare: Moore thought normative properties like goodness are distinct from, but grounded in, the non-normative properties of states of affairs.[2]

Second, simple naive realists accept a kind of "general diaphaneity assumption". In particular, they hold that, *plus or minus a bit*, the qualitative character of your visual experience is constituted by your perceptual acquaintance with *objective, mind-independent* states of the external world. It implies that (with some few exceptions to be noted) if two individuals are perceptually acquainted with the very same states in normal perception, then their experiences have the same phenomenal character. Here are some representative quotations that give voice to this element of simple naive realism:

[2] One familiar argument for holding that colors are distinct from reflectances is based on "revelation" (Russell 1912, Campbell 1993). Allen (2017) develops a different argument, one based on the modal intuition that (sensible) colors could have been instantiated by objects in a world in which objects do not have reflectances at all (maybe in such a world objects' having colors is grounded in their having "alien physical properties" – a kind of multiple realizability - or maybe in this world objects' having colors is not grounded in anything more basic even if in our world it is grounded in objects' having reflectances). However, as Allen acknowledges, in making this argument, he runs a risk, for the same style of argument seems to impugn his own view. The reason is that, since there is an "objective explanatory gap" (Shoemaker 1994), we also have the reverse modal intuition that objects could have had reflectances but no colors (or different colors), which would impugn Allen's own claim that in the actual world colors are grounded in reflectances (since grounding entails necessitation).

> The phenomenal character of your experience, as you look around the room, is constituted by the actual layout of the room itself: which particular objects are there, their intrinsic properties, such as colour and shape, and how they are arranged in relation to one another and to you. (Campbell 2002, 116)

> When we see the world, the subject is acquainted with mind-independent objects and their features—where 'acquaintance' names an irreducible mental relation that the subject can only stand in to objects that exist and features that are instantiated in the part of the environment at which the subject is looking. Moreover, it is the particular elements of the environment that the subject is acquainted with that shape the contours of that subject's conscious experience. Why is it like that to have that experience? Because in having the experience, the subject is acquainted with thus and-such objects and their properties. (Fish 2009, 14-15)

Simple naive realists will say that the objective states we're acquainted with involve the instantiation of colors, shapes, distances, and so on. But they could also say that they involve more recherché objective properties: "aspects" of colors (Kalderon 2011), "viewer-relative shapes", and so on. The key point is that, by and large, the qualitative character of your visual experience is constituted by your perceptual acquaintance with *objective, mind-independent* states of the external world. Simple naive realism is neutral on the proper characterization of those objective states.

Notice that, in my formulation of the second clause of simple naive realism, I inserted a "plus or minus a bit". That is because I understand simple naive realism to be compatible one or two exceptions involving attention and perhaps visual blur. Maybe there are cases in which, due to for example differences in blurriness or the distribution of attention, different people perceive (or the same person on different occasions perceives) the same states in "different ways". Compare: many "representatioanlists" hold that in general phenomenal differences are constituted by representational differences but allow that there are a couple of types of phenomenal differences (involving differences in the distribution of attention or in visual blur) that aren't constituted by "representational differences".

Third, simple naive realists accept what we might call the *basic causal theory* of perceptual acquaintance. Physical facts, specifiable in non-experiential terms, fix all the facts. How do such physical facts fix what states you are acquainted with? Very roughly, the basic causal theory says this: in the actual world, you are perceptually acquainted with external state s (say, the instantiation by a physical object of a color or shape) just in case (i) you undergo some or other "suitable" internal subpersonal physical state and (ii) it's caused by s in the biologically normal way. That is, in the actual world, perceptual acquaintance is grounded in the long causal process going from physical objects to processing in one's brain.

To illustrate, suppose you look at a blue ball. You perceive its blue color and shape, but not its electric charge. Why? On the basic causal theory, the answer is that your visual system is causally responsive in the right way to its color and shape, but not to its electric charge. This example supports a causal constraint (ii) on acquaintance. Here is how John Campbell puts it:

Causal considerations will matter for the existence of the relation "perceives" between subject and object, or subject and property; it is not to be supposed that what one is experiencing is a matter independent of some underlying level of physical and causal facts. Causal considerations . . . have a constitutive role in determining what one is experiencing. (Campbell & Cassam 2014, p. 49)

But a "causal connection" is not enough. For instance, an individual with "blindsight" has states that are causally sensitive to various states of object (for if forced she can respond appropriately to

those states) but she is not perceptually acquainted with those states. That is why clause (i) is necessary. In order for an individual to be perceptually acquainted with an external state, she must have a "suitable" internal subpersonal physical state. Very roughly: the relevant internal state must be a "neural correlate of consciousness" that is "poised for cognitive access".[3]

As I have defined the basic causal theory, it is a "functionalist" theory of acquaintance that allows for "multiple realizability". Two individuals can be acquainted with the same external state, even if their realizing neural states are quite different. (This feature of simple naive realism will be important to my "argument from internal dependence" in §4.) To illustrate, suppose that you and a Martian look at a blue ball. Your internal state and the Martian's might be intrinsically very different. But, on the basic causal theory of perceptual acquaintance, along as your and the Martian's different internal neural states are suitably caused by the same color and shape of the ball (and are poised for cognitive access), you and the Martin are acquainted with the same color and shape of the ball, and your experiences might be exactly the same. As John Campbell says, "looking for the qualitative character of experience in the nature of a brain state is looking for it in the wrong place; we have to be looking rather at the [properties] of the objects experienced [in external world]" (2010, p. 206). Simple naïve realism, then, might be said to provide a *window-shade model* of the role of brain processing in explaining perceptual consciousness. The processing in your brain merely "opens the shades" to reveal what is there before you. The process from the object to the brain enables us to perceive the object, and it helps select what aspects of the object we get to perceive. Even though your neural state and the Martian's are very different, they enable you to be acquainted with the same states of the ball. The "window shades" are different but they open to reveal the same aspects of the world.[4]

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[3] The basic causal theory of perceptual acquaintance is somewhat analogous to the causal-covariation theory of phenomenal representation defended Tye (2000). While representationalists like Tye (2000) and also Dretske (1995) have discussed at length the issue of how the physical facts determine what you phenomenally represent, naive realists haven't discussed the corresponding issue of how the physical facts determine what you are perceptually acquainted with. The basic causal theory is a start but is much too simple as it stands. For one thing, causation seems to be too promiscuous to fix what you are perceptually acquainted with. For instance, naive realists will say that, when you view a blue ball, your brain state is actually caused by two distinct properties of the ball: its "primitive blue color" and its reflectance-type. These properties may be coextensive but they are distinct. Given that both properties count as "causes" of your current brain state, how come you are acquainted with the primitive color but *not* the underlying reflectance-type? (Recall that naive realists want to say that acquaintance with chromatic properties reveals their essences. This is one reason why they cannot say that we are acquainted with the reflectance-type as well as the primitive color it grounds. Also, it is just not the case that you acquainted with two properties of the surface of the ball with totally different natures, a primitive color *and* a reflectance-type.) Allen (2017) says that the primitive color and the reflectance-type cause your brain state in different "senses", cause_1 and cause_2 (for a rough characterization, see Allen 2017, p. 102-104). This could be questioned, but even if it is right, isn't it a bit lucky and arbitrary that you should only be acquainted with the primitive-color state that causes_1 your brain state, but not the underlying reflectance-type that causes_2 your brain state? What's so special about causation_1? Here I will set these issues aside (although "the argument from irregular grounding" in §3 will touch on issues in the vicinity).

[4] Naïve realists might argue for nonreductive physicalism about acquaintance over reductive physicalism (the idea that the acquaintance relation *just is* a complex causal relation "of the appropriate type") on the basis of arguments parallel to their arguments for a nonreductive physicalism about sensible colors (see note 2). One argument is based on revelation: maybe (contrary to Moore's claim of diaphaneity) we are "acquainted with acquaintance" (Russell 1912; Chalmers 2013), and thus know its essence – which is incompatible with the reductive physicalist claim that it has a hidden physical essence. Another argument is a kind of modal argument ("multiple realizability"). Allen (2017) develops such an argument in the case of color but it may generalize to acquaintance. For instance, intuitively, even if in

So much for simple naive realism about normal visual experience. As I have said, it is just a theory of normal experience. Of course, simple naïve realists face the question of how to explain illusion and hallucination. This is where most arguments against naïve realism start. By contrast, I will argue that what we know about how perception works in normal cases is enough to undermine naïve realism. Therefore we do not have to worry about how naïve realists might cope with the degenerate cases.

Naïve realists also face the question of how to explain perceptual variation. But they may be able to explain actual cases of perceptual variation by appealing to the "selection gambit". The idea is that the external world is rich with states. A flower might be blue, and it might also have an alien color C constituted by ultraviolet light that our visual system cannot detect but that the pigeon visual system can detect. Methane has multiple smells. The world is rich with "sensible beauties" (and sensible nasties). Or again, a coin is round, round-and-tilted, elliptical-from-here, brown, brown-under-shade, and so on. Different individuals' visual systems, and the different circumstances, "select" which of these objective states we perceive on any given occasion. This account could be applied to the much-discussed case of subtle variations in color perception among actual humans. For instance, Bill Fish speculates that, if the same color chip looks slightly different shades to different human subjects, then the "color signal each [subject] picks up on [detects] is, due to physical differences between the two subjects, slightly different" (2009, p. 154 fn. 3).

So far, I have merely defined a possible view. It may be wondered who accepts it. I would say that Bill Brewer, John Campbell, Bill Fish, Mark Kalderon all accept something in the vicinity of simple naive realism.

Naïve realists tend be very visuo-centric, but it would be odd if the view were true of visual experience only. And in fact naïve realists typically indicate that they would generalize their view to at least some other cases (see for instance the quotation from John Campbell below). So I will assume and what follows that "simple naive realism" generalizes to at least some other kinds of experiences, in particular, the experience of sound and the experience of smell.

Naïve realism is a radically externalist theory of the qualitative character of experience. It opposes the 17th century view inaugurated by Galileo that "qualia" must be relocated from the external world and placed in the dustbin of the mind. It is of a piece with the more general externalist revolution in the philosophy of mind. Here is John Campbell:

> The colors are out there. The smells and tastes are objective features of the world. What I disagree with is the idea that our brain makes a big contribution to experience]. The function [of brain processing] is just to reveal the world to us. (2009)

[Naïve realism holds] that qualitative properties are in fact characteristics of the world we observe; our experiences have the qualitative characters that they do in virtue of the fact that they are

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the actual world we are acquainted with external things by way of a causal process going from the things to the brain ("intromission"), in other worlds we could be acquainted with things by way of a causal process going from the brain to things, such as a ray emanating from the eyes ("extromission"). Indeed, many thinkers (Plato, Ptolemy, Euclid) used to accept this "extromission theory". In fact, perhaps there are worlds (like Chalmers's "Eden worlds") where we are acquainted with things without causal mediation at all. If these are real possibilities, the acquaintance relation cannot be identical with (reducible to) a world-to-brain causal relation, though it might in the actual world be grounded in such a relation, as naïve realists claim. (My empirical arguments in the following sections will rule out even this weaker grounding claim.)

relations to those aspects of the world. So looking for the qualitative character of experience in the nature of a brain state is looking for it in the wrong place; we have to be looking rather at the [properties] of the objects experienced [in external world] (2010, p. 206)

I will argue that the science of sensation and perception shows decisively that naïve realists like Campbell have the matter exactly the wrong way around (and that Galileo had it basically right). In many cases, looking for the qualitative character of experience in the properties of the objects experienced is looking for it in the wrong place; we have to be looking rather at the nature of the brain state.

2. Recent empirical results: three case studies

Let me begin by summarizing some recent empirical results. In particular, I will describe the three examples of what I call *bad external correlation* and *good internal correlation*. Once I have put these examples on the table, I will use them in subsequent sections to construct two new arguments against naïve realism.

My first example concerns the experience of smell. The psychophysics of smell is messy. Cowart and Rawson (2005, p. 568) sum up the situation as follows:

> Available evidence indicates that numerous chemical and molecular features (e.g., molecular weight, molecular mass and shape, polarity, resonance structure, types of bonds and sidegroups) can all influence the odorous characteristics of a chemical. However, no systematic description of how these characteristics relate to particular odor qualities has been developed. In other words, chemicals that bear little resemblance structurally can smell the same, and chemicals that are nearly identical structurally can elicit very different perceptual qualities.

Let's consider actual example of what they have in mind. Suppose that you consecutively smell the chemical-types shown in Figure 1.

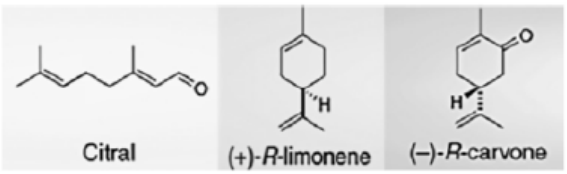

Figure 1: three chemical types (from Margot 2009)

It is not the case that the middle chemical-type (R-limonene) resembles the first chemical-type (citral) more than the third chemical-type (R-carvone). In fact, if anything, the opposite is true. However, as a matter of empirical fact, your smell experience of the middle chemical-type resembles your smell experience of the first chemical-type more than your smell experience of the third chemical-type. In particular, the middle one smells citrus-like ("$citrus_1$"); the first one smells distinct but also citrus-like ("$citrus_2$"); and the third one smells minty. This is an example of bad

external correlation. There is a big mismatch between phenomenal structure and the external chemical structure.

By contrast, neuroscience has shown that the domain of smell experience there is good internal correlation. For example, Howard and coworkers (2009) used fMRI to look at the distributed spatiotemporal neural patterns produced by different odorants in the PPC (posterior piriform cortex). Then they used multidimensional scaling to determine the relative similarities among those neural patterns. They found that neural similarity perfectly predicted a phenomenal similarity, even when chemical similarity did not. In short, neural similarity is the only known a predictor of qualitative similarity among smell experiences. As they put it,

> The group-averaged imaging and perceptual datasets were each projected onto a common three-dimensional space using MDS, indicating that the imaging maps of PPC linear correlations closely overlapped with the perceptual maps of odor quality similarity, both for individual odorants and for odor quality categories.

In fact, in this study, Howard and coworkers looked at chemical types shown in Figure 1. What they found was that, even though the middle chemical-type does not resemble the first chemical-type more than the third chemical-type, your PPC neural representation of the middle chemical-type does resemble your PPC neural representation of the first chemical-type more than your PPC neural representation of the third chemical-type, in a perfect agreement with the qualitative resemblance-order among your smell experiences (for an illustration see Figure 5 below).[5]

My second example concerns the experience of color. Suppose you look at a purple-looking grape, a blue-looking ball, and a green-looking leaf. Here are the reflectances characteristic of these items:

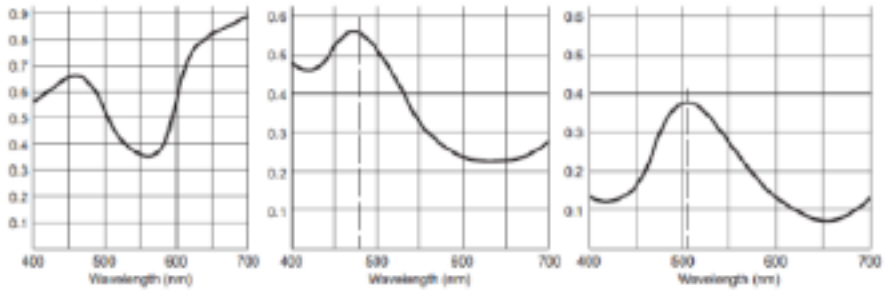

Figure 2: reflectances characteristic of a purple, blue and green thing

[5] Youngentob et al. (2006, 1343) found similar results earlier in the processing stream, namely in the olfactory bulb: "when the activity pattern for two odorants mapped relatively close to each other in the functional MDS [multidimensional scaling] space, then so did the perceptual data . . . indeed, our results show neural and perceptual relationships that could not be presumed from any prior notion of molecular similarity among the odorants." Likewise, Linster and coworkers (2001) found that those enantiomers (mirror-image molecules) that smell quite different ("bad external correlation") also produce quite different neural patterns further downstream in the olfactory bulb ("good internal correlation").

As a matter of empirical fact, it is not the case that the reflectance of the ball resembles the reflectance of the grapes more than the reflectance of the leaf. In fact, if anything, the opposite is true. By contrast, your color experience of the ball does resemble your color experience of the grapes more than your color experience of the leaf. This is another example of bad external correlation.

By contrast, recent neuroscience has demonstrated good internal correlation in the case of color experience. For example, Brouwer and Heeger (2009) used fMRI to look at distributed neural patterns in human V4 in response to various objects. Here is how they summarize the results:

> Similar colors [correspond to] similar patterns of activity, and neural representations of color [in V4] can be characterized by low-dimensional "neural color spaces" in which the positions [similarities] of [experienced] colors is determined by similarities between corresponding patterns of activity. (2009)

In a more recent study, Bohon et al. (2016) recorded the activity of neurons in V4. They then used multidimensional scaling to analyze their color-tuning. Here is how they summarize their results:

> The arrangement of the [neural responses] clearly reflects color space: points of the same hue irrespective of luminance level are plotted next to each other, and the progression of the points forms a circle that proceeds according the color wheel. Behavioral judgments of the similarity between colors closely match the similarities between the neural responses to these colors by the glob neural population. (2016, 18)

Given these results, we can conjecture that what is going on in our example is that, even though it is not the case that the reflectance of the ball resembles the reflectance of the grape more than the reflectance of the leaf, your V4 neural representation of the ball does resemble your V4 neural representation of the grape more than your V4 neural representation of the leaf, in perfect agreement with the qualitative resemblance-order of your color experiences (for an illustration see Figure 6 below). This is another case where there is good internal correlation and bad external correlation.

My third and final example concerns the experience of auditory qualities. In particular, consider the fascinating phenomenon of categorical perception.

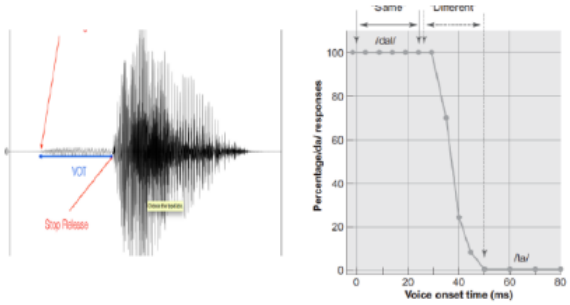

Figure 3: An acoustical waveform (on the left), with the VOT shown. If you repeatedly here such a waveform with gradual increasing VOTs, you will here /da/, /da/, /da/, until, at around 30 ms, there will be a categorical change in your auditory experience, and you will start to experience /ta/, /ta/, /ta/.

When you produce a consonant such as /da/ or /ta/, the voice onset time (VOT) is the time between the initial release of air and the onset of vocal cord vibration. The VOT has an effect on the acoustic waveform. This is indicated in Figure 3 below on the left. As Figure 3 (right) shows, if you repeatedly hear a speech sound that is increasing in VOT, then for a time you will experience the same consonant (/da/, /da/, /da/), but when it gets to, say, 30 ms, all of a sudden you will experience a quite different consonant (/ta/, /ta/, /ta/). The categorical change in the perceived audible quality corresponds to no categorical change in the stimulus: the stimulus changes gradually. This is yet another example of bad external correlation.[6]

By contrast, neuroscience has once again shown that there is good internal correlation. Chang (2010) found that in response to such a gradual change in the acoustic signal, there are occur categorical changes in neural activations in posterior temporal gyrus (part of Wernicke's area), perfectly corresponding to categorical changes in our experience of sound.[7]

So much for the empirical results. You can see how they tell against naïve realism. On the face of it, they suggest that naïve realists like Campbell have the matter exactly backwards. Looking for

[6] For a demonstration, go to https://www.youtube.com/watch?v=4V5pQyKsgg4. In general, structural relations among perceived audible qualities (such as loudness, timbre and pitch) do not map onto structural relations among the corresponding physical properties of audible events. See Moore (2003).

[7] A natural question at this point is: why do we undergo a big neural difference (and hence a big difference in auditory experience, from /da/ to /ta/) once the VOT reaches 30 ms, rather than at some other time? In general, why does it happen that stimulus features are sometimes mapped on to neural patterns in the brain in a way that fails to "preserve structure"? The answer will be different in different cases. For instance, in the case of phonemic perception, the answer undoubtedly has something to do with our history of training during the language-learning process. (Indeed, Kleunder et al. (1987) have shown that quail can be trained to come to experience discontinuities in acoustic events that don't correspond to any objective physical discontinuities.) In other cases, the mismatch might be an evolutionary adaptation (for instance, even if poisonous things were physically very similar to healthy things, we should have evolved to perceive them very differently). In still other cases, it just might be a fluke – a result of the vagaries of the transduction process or our postreceptoral wiring. Not every feature of the sensory systems must be an adaptation.

the qualitative character of experience in the properties of the objects experienced is looking for it in the wrong place; we have to be looking rather at the nature of the brain state.

But we need to say more. We must turn these empirical results into clear arguments against simple naïve realism.

3. The argument from irregular grounding against simple naive realism

My first argument I call the *argument from the regular grounding*. The argument can be put like this:

1. Given good internal correlation and bad external correlation, naïve realism needs a swarm of inexplicable, irregular grounding connections in the external world.
2. By contrast, a rival brain-based view of sensible-quality perception only requires regular, simple grounding connections between neural processes and experiences.
3. This provides a reason to accept a brain-based view over naïve realism.

Let me explain how the argument goes in all three of our case-studies from the previous section. Let us start with the experience of audible qualities. In particular, consider the transition from the experience of /da/ to the experience of /ta/ represented in Figure 3. Recall naïve realists hold that sensible qualities (sensible colors, audible qualities, smell qualities) are objective, primitive qualities of external items and events that are grounded in their objective physical properties. So naïve realists must say that the continuous change in the acoustic waveform grounds, once the VOT (represented in Figure 3) reaches 30ms, a discontinuous difference in the alleged objective audible quality, from /da/ to /ta/, out there in the world. For that is what we perceive.[8]

In fact, they must say that if, by chance, the same series of acoustic events had happened millions of years ago, prior to the evolution of any sentient creatures, then the objective audible quality would have jumped from /da/ to /ta/ once the VOT reaches exactly 30 ms, even though no one would have been around to hear it, like the sound of the proverbial tree falling in the forest. And they must say that it is just a fluke of reality that the categorical change in the alleged objective quality occurs at 30 ms, rather than at (say) 25 ms. There is no way for them to explain this in more basic terms; in their view, these qualities are just primitive, objective qualities, and these grounding connections are just basic facts, with no further explanation. This illustrates Premise 1: naïve realism needs inexplicable, irregular grounding connections.

Now the naïve realist account of what is going on in this case is coherent. There is no contradiction between science and naïve realism here. For recall that naïve realists hold that sensible qualities, such as audible qualities like /da/ and /ta/, are distinct from the objective physical features of objective items, even if they are grounded in those objective physical features. If audible qualities are distinct from the underlying objective physical properties of waveforms, it is coherent to hold

[8] You might wonder why the naive realist could not accept an alternative, radically pluralist account of the case, according to which the audible event instantiates both of audible qualities, /da/ and /ta/, throughout the entire process (or indeed all possible audible qualities), and all that changes at 30 ms is which of them you perceive. The answer is that the naive realist could accept such an account. But it would require rejecting simple naive realism that is my current target (in particular, as I will explain in §6, it would require giving up the simple causal theory of acquaintance that is part of simple naive realism as I have defined it). So I will ignore it for now and take it up in §6.

that the audible qualities undergo a categorical change while the underlying physical properties do not. There is no violation of Leibniz's law here. However, while this view is coherent, it is evidently implausible. We should avoid such inexplicable, irregular grounding connections if we can.

And we can avoid them. We can avoid them if we instead accept an alternative *brain-based account* of the experience of audible qualities. There are many brain-based accounts: type-type neurobiological identity theory (McLaughlin, Papineau), sense datum theory (Jackson, Peacocke), and various forms of "internalist representationalism" (Chalmers, Horgan, McGinn, Shoemaker). What unites them are two claims. First, there is a negative claim about *sensible properties:* contrary to naïve realism, the traditional sensible properties ("qualia") that are "presented in" certain experiences (audible qualities, taste and smell qualities, color qualities) are *not* objective, response-independent properties of external items wholly grounded in their objective physical properties. Instead, they are properties of sense data (Jackson, Peacocke); or response-dependent properties of external things grounded in their neural effects on us (Shoemaker, McGinn); or properties that external things appear to have but that in fact belong to nothing at all (Chalmers, Horgan,). Second, there is a positive claim about our *experience* of sensible properties: contrary to simple naïve realism, our experiences of sensible properties are most directly dependent on our subjective *neural response* to external items (more clarification of this claim will come in the next section).

Given the empirical facts, such a brain-based view the provides the only reasonable account of categorical changes in the experience of audible qualities. On the brain base view, audible qualities, like /da/ to /ta/, are not objective qualities of external acoustic events, contrary to naïve realism. In fact, the objective physical features of waveforms by themselves do not ground anything qualitative. Rather, the picture of this. Once the VOT reaches 30 ms, there is a big, categorical change in our neural response. There is a continuous change in the stimulus, but a discontinuous change in our neural response. The big categorical change in our experience of audible quality, from /da/ to /ta/, is grounded in a big categorical change in our neural response. So, where simple naïve realism requires inexplicable, irregular grounding connections, a brain based account only requires explicable, regular grounding connections. So it is just totally obvious that, given the empirical situation, we should prefer a brain-based account of auditory perception to naïve realism. There are many versions of the brain-based account and at the end of this section I will describe some of them.

So far, we have illustrated the argument from irregular grounding in the case of audible qualities. Let us turn next to smell. Naive realism here again requires inexplicable, highly irregular grounding connections. Suppose again that you consecutively smell the chemical-types show in Figure 1. The chemical types citral and R-limonene have very different physical properties. Nevertheless, naïve realists hold that those very different physical properties ground extremely similar smell qualities, which I have called citrus_1 and cirtus_2. Naïve realists must hold this, because those are the qualities we seem to perceive, when we smell these chemical types. They will presumably hold that these smell qualities are instantiated by clouds of the relevant chemical types that that make contact with the smell receptors in your olfactory epithelium. Contrariwise, the chemical types citral and R-carvone have very similar physical properties. Nevertheless, naïve realists hold that they ground very different smell qualities, namely citrus_1 and minty. In sum, naïve realists must hold that the chemical types shown in Figure 1 fall into a certain resemblance-order, but that they inexplicably ground objective olfactory qualities that fall into the opposite resemblance-order. This grounding connection is just a brute fact that cannot be derived from more basic facts.

Here again the brain-based approach provides a much more reasonable interpretation of the empirical situation. On this view, the objective physical properties of the chemical types, by themselves, play no role in grounding anything qualitative. Rather, they cause, via a complex transduction process, neural activations across the olfactory response neurons, leading to neutral patterns in the olfactory bulb and eventually in the PPC. It is only here that we find physical states whose patterns of similarity predict the patterns of similarity in our experiences of smell. Therefore, a brain-based view of qualitative character can trade the highly irregular and unsystematic grounding connections required by naïve realism with regular and systematic ones.

We come finally to the experience of color. The situation here is much the same. Just look at Figure 2. By any natural measure, it is not the case that the reflectance of the blue ball resembles that of the purple grape more than that of the green leaf. If anything, the reflectance of the blue ball resembles that of the green leaf more than that of the purple grape. Still, naïve realists require that these reflectances ground sensible colors that stand in the very opposite resemblance-order. Again, this view is coherent (it is no offense to Leibniz's law). But it is just totally implausible.

Given the twin facts of bad external correlation and good internal correlation, the only plausible account of the case is the brain-based account. On this view, sensible colors, whatever they are, are not objective features of external objects that are grounded only in their reflectance properties, contrary to simple naïve realism. As for the *experience* of color, this is grounded in our V4 neural responses to objects, whose resemblance-order has been found to match the resemblance-order of our color experiences. Thus, this view trades the irregular grounding connections required by naïve realism with regular grounding connections.[9]

True, naïve realism may be very plausible for visual experience. As Augustine said, color certainly appears to be "a quality that is spread out on the surface of bodies", one that is independent of us (quotation from Strawson 2015). And it is very intuitive to suppose that the character of visual experience is constituted by simply perceiving the colors and shapes of things. It is no wonder why naïve realists focus almost exclusively on the visual case where their view is most intuitively plausible. But I would urge that we step back and look at the big picture. That is why I have been discussing non-visual experiences as well as visual experience. The relevant empirical facts ("bad external correlation" with "good internal correlation") are the same across all the cases. The situation with respect to the experience of color is not fundamentally different from the situation with respect to the experience of smell. If we accept a brain-based account of the experience of smell, then consistency demands that we accept a parallel brain-based account of the experience of color.

So far, I have argued that naïve realists need irregular grounding connections concerning the sensible qualities. But it is worth noting as an aside that they also are committed to the possibility of very bizarre, arbitrary-looking grounding connections when it comes to the relation of

[9] Allen (2017, 110) considers the objection that his view requires problematic brute grounding connections between primitive (audible, olfactory, color) qualities and distinct physical properties. His reply is just to allow brute grounding connections "with natural piety". But my argument from irregular grounding here is quite different. It is not based on any objection to brute grounding connections in general. Rather, it based on the more specific idea that if one theory (in this case simple naive realism) requires a huge giant slew of unsystematizable and irregular basic grounding connections, while a second theory (a brain-based account) avoids them and only requires a handful of systematic and regular basic grounding connections, then this is a strong (though of course defeasible) reason to prefer the second theory.

perceptual acquaintance which, on their view, we bear to the instantiation of such qualities by external items (audible events, smell-clouds, the surfaces of physical objects).

To see this, imagine *black and white earth* (Figure 4). In this scenario, let us take for granted, for the sake of argument, the naïve realist's theory of colors as real qualities of external items that are grounded in their reflectance properties. And, let us suppose, the following things are also true on black and white earth. First, every object contains a smaller object as a part (an "inner object"). Second, the outer objects always have the achromatic colors black, gray or white. Third, the black outer objects contain red inner objects, the gray outer objects contain reddish-orange inner objects, and the white outer objects contain green inner objects. Third, the color of inner object and that of the outer object are causally yoked together by way of a natural, super-fast chemical process. So, for instance, if an inner object has a red reflectance (and hence a red quality), this causes its outer object to have a black reflectance (and hence a black quality). So if you could directly change the color of the inner object, this would change the achromatic color of the outer object by way of the super-fast chemical process. And conversely if you change the color of the outer object (say from black to grey) you change the color of the inner object (from red to orange). In short, the colors of outer and inner objects are nomically yoked together.

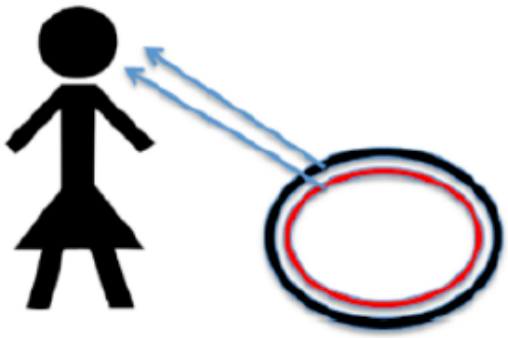

Figure 4

Now suppose that someone, call her Mary, views a black object on black and white earth. Then her visual system causally detects two colors at the same time: the black color of outer object and the red color of the inner object.

Now, recall that naïve realists hold that causation undergirds acquaintance. On their view, what would happen in such a case where multiple colors are involved in the causal process? One option would be to say that Mary is acquainted with both a black surface and red surface in the same region. Another option would be to say that it is indeterminate whether Mary is acquainted with the black quality or the red quality (and hence it is indeterminate whether she enjoying a reddish

qualitative character or blackish one!). A final option would be to say that there is some kind of hard-to-specify difference between Mary's causal relation, causation$_{17}$, to the black of the outer object, and her causal relation, causation$_{18}$, to the red of the inner object; and that acquaintance is grounded in causation$_{17}$ but not causation$_{18}$; so that Mary is perceptually acquainted with the black of the outer object but not the red of the inner object.

On the face of it, the first two options are incoherent. So I think that naïve realists must go in for the third option. In general, the idea is that Mary is only ever conscious of the achromatic colors black, white and gray that characterize the outer objects, never the chromatic colors that are lying just beneath them. Although there is a riot of vibrant colors lying just below the surface, poor Mary has no acquaintance with them (and the same goes for the other inhabitants of black-and-white earth). On this view, even though the vibrant colors of the inner objects are just as much part of the causal process as the achromatic colors of the outer objects, Mary does not perceive them (no more than she perceives photons in the air).

On this view, then, our Mary is somewhat like Frank Jackson's famous Mary: she only knows what achromatic colors are like and knows nothing about what chromatic colors like red are like.

But this requires yet another case of irregular grounding. The difference between Mary's physical relation to the red of the inner object and the black of the outer object is minute. In fact, it is hard to specify any difference. The red of the inner object and the black of the outer object are just slightly different steps in the causal chain. A Martian observer who only knew all fundamental physical facts (which ground everything) could truly say "there is no significance difference in Mary's physical relation to the black and to the red". However, naïve realism requires that, while there is an extremely minute physical difference in Mary's physical relations to the red of the inner object and the black of the outer object, this minute physical difference grounds an enormous mental difference in her relations to these qualities. In particular, the black of the outer object is present to her mind, and she knows what it is like. By contrast, she has no awareness at all of the red of the inner object, and knows nothing of what it is like. And this is the case, on naïve realism, even though her physical relation to the black of the inner object is very nearly identical with her physical relation to the red of the outer object. So naïve realism requires an arbitrary "discontinuity" or "singularity" in nature, with an exceedingly minute (indeed hard-to-specify) physical difference grounding a utterly monumental mental and epistemic difference. This is intrinsically implausible and happens nowhere else in nature. Once again, a brain-based view ignores avoids this kind of irregular grounding connection. For a brain-based view rejects the assumptions that the problem relies upon: namely, that sensible colors are objective features of external items (such as the inner rock and the outer rock) and that acquaintance with sensible properties is grounded in external, causal relations to those items.

Let me now briefly address two objections to my argument from irregular grounding for a brain-based view over simple naïve realism.

The first objection is that what I am calling "irregular grounding" is just multiple realizability under another name. And (the objection continues) multiple realizability is not objectionable. In fact, it is everywhere in nature. For instance, the property being a chair can be realized by very many different physical structures. So how is it a big mark against naïve realism if it likewise requires that the same sensible quality (the same audible quality, the same smell quality, or the same

color quality) should be realizable by heterogeneous physical structures. In fact, far from being an objection against naïve realism, this is just what naïve realists are themselves already claiming![10]

My reply is that this objection mischaracterizes my argument from irregular grounding. In fact, irregular grounding is not the familiar phenomenon of multiple realizability. For instance, naïve realism requires that the different audible qualities /da/ to /ta/ are grounded in ("realized by") nearly identical physical structures. There is a discontinuity in the grounded quality but continuous variation in the physical ground. This is evidently not just another case of the widespread phenomenon of multiple realizability. Or again, it requires that the very similar but distinct olfactory qualities citrus$_1$ and cirtus$_2$ are grounded in very different physical structures. It implies that the reflectance of the ball resembles the reflectance of the leaf more than the reflectance of the grape, but that these reflectance grounds sensible colors that stand in the opposite resemblance order (viz. blue, green, purple). In general, it requires many cases where physical structures (chemical types, reflectance properties) can stand in a certain resemblance-order, but ground qualities that stand in the opposite resemblance-order. Again, this is not the same as multiple realizability.

I agree with the objector that multiple realizability is not objectionable. It is everywhere in nature. And we can explain it in a simple way. A natural and common view is that being a chair is not a "primitive" property; rather, it is a functional property, and the relation between it and its realizers is just the role-filler relation. So multiple realizability can be explained by more basic facts. By contrast, irregular grounding is objectionable. It is not everywhere in nature: elsewhere in nature, "higher-order" similarities and differences are grounded in "lower-order" similarities and differences (more on this below in connection with the second objection). Furthermore, naïve realists must hold that all these basic and unsystematizable irregular grounding connections are inexplicable: they must say that they are not explained by any functionalist or other "real definition" of sensible properties because they are "primitivists" who deny that sensible properties admit of any real definition at all. For this reason, their view is extremely complex. (Compare a normative non-naturalist who is also a "particularist": she must accept a huge swarm of extra-logical, unsystematizable basic principles connecting complex non-normative states-of-affairs with distinct normative states-of-affairs.) It goes without saying that we should avoid this view if we can. And we can: we can accept a brain-based view. This view trades naïve realists' raft of irregular and unsystematic grounding connections in the external world with more regular and systematic grounding connections between internal brain states and experiences. It is just obvious that this is the only reasonable response to the empirical findings.

Let me now turn to a second objection. This objection concedes that, yes, irregular grounding is different from the familiar phenomenon of multiple realizability. But it insists that, like multiple realizability, irregular grounding is widespread in nature, so that it is not nearly as objectionable as you might think. For example, there's a small non-normative difference between giving somebody a "high five" and slapping them. But there is a big normative difference. Once we accept some irregular grounding connections in nature, what is so bad about accepting some more, as required by a naïve realist view that locates qualitative character in the external world?[11]

[10] I am very much indebted to discussion with John Campbell here.

[11] Here I am indebted to Bill Brewer.

My reply is twofold. First, I just disagree that irregular grounding is widespread in nature. For instance, in slapping case, the total ground of the moral badness of your action surely includes your intent and your victim's emotional response. Once we take into account the total ground, we see that there is a big non-normative difference between giving a "high five" and slapping them. (And if we consider a continuum of cases, in which we start with a high five and then gradually increase the violence of the act and the malignancy of the intent, these small non-normative differences ground small normative differences in how permissible the action is.) Second, even if we absolutely must accept a few cases of irregular grounding in nature, this just doesn't affect my point. My point is not just that naïve realism requires that we obnoxiously multiply arbitrary and unsystematic grounding connections in the external world. In addition, the empirical facts clearly point to an alternative view, the brain-based view, that avoids this mess, requiring only systematic and regular grounding connections. It is a truism that we should prefer simple and systematic theories to complex and unsystematic theories. Therefore, the empirical findings provide a very strong reason to prefer a brain-based view over naïve realism. There is just no way to get around this point.

The conclusion of the argument is that there is reason to accept a brain-based account over naive realism. But what brain-based view is correct? Wouldn't a brain-based view require giving up on the "transparency observation" (Tye 2000)? Or maybe it would require belief in brain-generated sense data? Or maybe it would require the peculiar idea that sensible colors and smells and sounds are instantiated *in the brain*?

In fact, there are forms of the brain-based view that avoid these consequences. In my view, the best brain-based view is internalist representationalism. The basic idea is this: experiencing consists in representing things and qualities in space, but in some cases how we perceptually represent the external world is due to our own internal processing, rather than to the character of the world itself. For instance, contrary to naive realists, before the evolution of sentient creatures, it was not the case that external items (such as the odor molecules shown in Figure 1 or the objects shown in Figure 2) had sensible smell and colors, grounded in very irregular ways in their physical properties. They were entirely without sensible properties. Thus, this view avoids the kind of "irregular grounding" in the external world that naive realism requires. Then brains evolved. Our brains evolved the capacity to perceptually things as having properties of a novel sort - namely, sensible properties - even if they have never objectively possessed such properties. In explaining this view, Campbell (2014) uses an apt phrase: the brain is a "projective apparatus". For instance, even if objects don't objectively possess sensible colors, our brains evolved to enable us to perceptually represent sensible colors, in order to help us keep track of objects. Perceptual representation, then, is unique: it is internally-determined. So our usual externalist models for explaining representation (Dretske 1995, Tye 2000) do not apply in the special case of perceptual representation. True, this view posits its own grounding connections: grounding connections between internal brain states and relational-representational properties of the form: *perceptually representing sensible property P*. (Compare: on the sense datum theory, our brain states ground relational properties of the form: *being acquainted with a sense datum with sensible property P*.) But, given "good internal correlation", these grounding connections are highly regular. For instance, similar neural states in V4 ground the perceptual representation of similar colors. Indeed, maybe there is a general grounding law of the form: necessarily, if you undergo V4 neural state *N*, then you thereby perceptually

represent sensible color *f*(*N*), where *f* is a systematic function from neural states onto experienced sensible colors.[12]

Internalist representationalism could be combined with irrealism or with realism about the sensible properties. The irrealist (Chalmers 2006, Horgan 2014) holds that sensible properties don't belong to anything at all: they don't belong to physical objects, sense data, or regions of the brain. They only live in the contents of our experiences. In one version of realism (McGinn 1996), our brain states help ground what sensible colors things are disposed to look to have. In turn, these dispositions ground the colors of things. So the colors of things and our color experiences *co-evolved*, both being grounded in a regular way in our neural responses to objects. Likewise for other sensible properties. In either version, internalist representationalism avoids naive realism's slew of irregular and unsystematic brute grounding connections between physical properties (molecular properties, reflectance properties) and sensible properties (smell qualities, color qualities) in the external world; it replaces them with a handful of regular and systematic connections between internal brain states and experiences of sensible properties. Again, it is undeniable that this provides a reason to prefer this view to naive realism.[13]

4. The argument from internal dependence against simple naive realism

Now I turn to a second arguments against naïve realism based on empirical results I reviewed earlier. I call it the *argument from internal dependence*. It provides a reason to reject naïve realism that goes beyond the argument from irregular grounding.

While the argument from irregular grounding concerned only actual cases, the argument from internal dependence concerns hypothetical ones.

Suppose that you consecutively smell the chemical types in Figure 5. Recall that, in the actual world, even though the middle chemical-type does not resemble the first chemical-type more than the third chemical-type, your PPC neural representation of the middle chemical-type resembles your PPC neural representation of the first chemical-type more than your PPC neural representation of the third chemical-type. In particular, in the actual world, your smell experience is of the middle chemical type is citrus-like, like your smell experience of the third chemical-type.

Now imagine a counterfactual scenario where everything is the same but for one thing: because of naturally evolved differences in humans' postreceptoral smell processing, your twin's PPC neural representation of the middle chemical-type resembles your PPC neural representation of the

[12] As is well-known, color space is asymmetric. For example, dark blue is more like blue than dark yellow (brown) is like yellow. Desaturated greenish-yellow is more similar to saturated greenish-yellow than desaturated bluish-red (pink) is like saturated bluish-red. Yellow is brighter/lighter than blue at equiluminance. Presumably, these facts are mirrored in the underlying neural patterns. So even if the grounding connections looks a bit arbitrary to us now (e. g. why does this brain state ground the perceptual representation of this sensible color rather than a complementary color?), they would look less arbitrary if we knew all the facts.

[13] Other views in the vicinity of internalist intentionalism include internalist forms of the property-complex theory (Bealer 1982, 235ff; Sosa 2007, 257) and Alston's theory of appearing (1999).

minty-smelling third chemical-type more than it does your PPC neural representation of the citrus-smelling third chemical-type - the exact opposite of how matters stand the actual world.

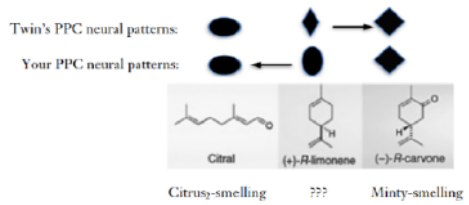

Figure 5: In the actual world, the spatiotemporal "shape" of your PPC neural pattern of the middle-chemical type is more like your PPC neural representation of the citrus-smelling first chemical-type. In the counterfactual situation, the only difference is that it is instead more like the minty-smelling third chemical type. What would your twin's experience of the middle chemical-type be like?

So the only difference in the counterfactual situation is that your twin's normal neural response to the middle chemical type occupies in a different position in the "neural similarity space" for smell. Suppose, moreover, that, as a consequence, whereas in the actual world you sort the middle chemical type with the citrus-smelling first chemical type, in this counterfactual scenario you sort it with the minty-smelling third chemical type.

Now, I haven't made any stipulation one way or the other concerning the qualitative character of your twin's experience of the middle chemical-type in the counterfactual scenario. I have not said whether it is citrus-like, as in the actual world, or instead minty. That is precisely what I am asking: if this scenario had been actual, what would your smell experience of the middle chemical type been like?

The answer is obvious. Given that neural similarity has been found to be the only predictor of similarity in smell experience, and given that in the counterfactual scenario your PPC neural representation of the middle chemical-type occupies a different position in the neural similarity-space for smell (the "minty" region rather than the "citrus" region as in the actual world), we should say that in the counterfactual scenario the middle chemical-type would smell different to how it actually smells. In particular, whereas in the actual world it smells citrus-like, in the counterfactual situation it would smell to you similar to, but distinct from, the first, minty-smelling chemical type, because your twin's PPC neural representation of it would be similar to, but distinct from, your PPC neural representation of that minty-smelling chemical type. This prediction also fits with the fact that, whereas in the actual world your sort the middle chemical type with the first, citrus-smelling chemical-type, in the counterfactual situation you sort it with the third, minty-smelling chemical-type. As I say, this is the obvious verdict. It supports a brain-based view of the character of smell experience.

But simple naïve realism delivers the opposite verdict. To see this, recall how simple naïve realists account for the qualitative character of your experience in the actual world. They hold that, when you smell the middle chemical-type, the citrus-like quality that you are perceptually acquainted with is out there in the mind-independent world. In particular, it is a primitive, object quality of the cloud of chemicals that you smell, one that is grounded in its chemical nature. As John Campbell put in the quote from §1, "the smells and tastes are objective features of the world". Furthermore, simple naive realists accept the *basic causal account of acquaintance*. This is a functionalist theory of acquaintance which says that you are perceptually acquainted with this quality

because you are in a suitable internal brain state or other (in this case the realizer is your PPC neural representation) that is caused by the occurrence of this quality in the normal way. Now turn to the counterfactual scenario. And let us assume, for the sake of argument, that naïve realists are correct that the citrus-like quality is an objective feature of the odor cloud, grounded in its chemical nature. Then, even though in the counterfactual scenario your PPC neural representation of cloud filled with the middle chemical type is different from what it is in the actual world, we can stipulate that it is caused in the normal way by the very same primitive, objective citrus-like quality of that chemical cloud. In general, there is a complete *symmetry* in your and your twin's causal relations to to alleged olfactory state of the odor cloud. Hence, it follows from the basic functionalist theory of perceptual acquaintance that, even though in the counterfactual situation your PPC neural representation of the middle chemical type is totally different (and occupies a different position in the neural similarity-space for smell) than in the actual world, it would enable you to be perceptually acquainted with the very same smell quality. The internal physical processes are different but they "open the window shade" to reveal the same aspect of the world. Here is an analogy: a mercury thermometer and a thermoelectric thermometer undergo different states (mercury level states vs thermoelectric states), but those very different states enable them to "perceive" the same temperatures. Therefore, on naïve realism, your smell experience of the middle chemical type should be qualitatively exactly the same as in the actual world ("citrus-like"), despite your radically different PPC neural representation (occupying a different position in the neural similarity space for smell) and your radically different sorting behavior. On naïve realism, the switch in the internal neural state would not make a difference to what smell quality you are acquainted with.

To underscore just how implausible this prediction is, let us suppose that the counterfactual version of you is an actual person on a "twin earth" where evolution went a bit differently. We have our best olfactory scientists take a look at your twin on this planet with the aim of figuring out how the world smells to him ("radical phenomenal interpretation"). They know that, in the actual world, PPC similarity is the only known predictor of perceived smell similarity. They know that, whereas your PPC neural representation of the middle chemical-type is more like your PPC neural representation of the citrus-smelling chemical-type, your twin's is more like his PPC neural representation of the minty-smelling chemical-type. And they know that you and your twin's sorting behavior differs accordingly. Of course, they would all say that on this "twin earth" the middle chemical type smells differently to you twin than it does to you (viz. minty rather than citrus-like). All the evidence points to this verdict. Now suppose that some naïve realists come around (having just arisen from their armchairs). They say "No, all you scientists are wrong. Maybe all the evidence suggests that you and your twin have different smell experiences. But the evidence is misleading. In fact, you and your twin have exactly the same experiences." Who would you believe?

Here is a second case. Let's suppose that you consecutively perceive the objects illustrated in Figure 6. As we saw, what is going on in this example is that, even though it is not the case that the reflectance of the blue-looking ball resembles the reflectance of the grape more than the reflectance of the leaf, your V4 neural representation of the ball does resemble your V4 neural representation of the grape more than your V4 neural representation of the leaf. Thus, while there is a big mismatch between the resemblance-order of your color experiences and the resemblance-order of reflectances in the world, there is a perfect agreement between the resemblance-order of your color experiences and your V4 neural representations in the brain.

Now imagine a counterfactual scenario where, because of naturally involved differences in your postreceptoral wiring, your twin's V4 neural representation of the ball resembles his V4

neural representation of the green-looking leaf more than his V4 neural representation of the purple-looking grape - the exact opposite how things stand the actual world. Because of this, whereas in the actual world you sort the ball with the purple-looking grapes, in the counterfactual situation your twin sorts the ball with the green-looking leaf.

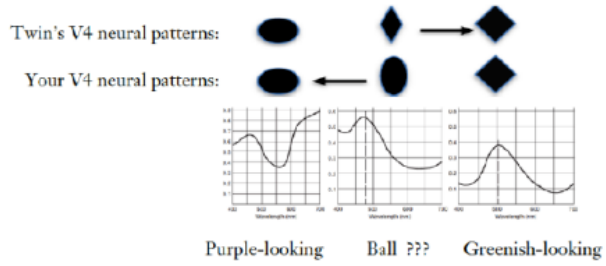

Figure 6

The question is how the ball would look to your twin in this counterfactual situation. The answer is again obvious. Given that V4 neural similarity is the only good predictor of similarity in color experience, and that in the counterfactual situation your twin's V4 neural representation of the ball occupies a different position in the neural similarity-space for color (viz. closer to the "green" region), the most reasonable view is that the ball would look greenish to your twin in the counterfactual scenario, instead of bluish as in the actual world. This prediction also agrees with the fact that in the counterfactual situation your twin would sort the ball with the green-looking leaf rather than with the purple-looking grape. Of course, this prediction is in line with a brain-based view of the character of color experience.

But naïve realism delivers opposite prediction. For, on this view, the blue quality you perceive in the actual world is an objective feature of the ball's surface that is grounded in its reflectance property. And we can stipulate that, even though in the counterfactual situation your V4 neural representation of the ball is different from what it is in the actual world, it is caused in the normal way by the instantiation of this same chromatic property by the ball. Whatever objective feature you are acquainted with in the actual world (whether you want to call it a "shade", "objective look", or what have you), your twin is also acquainted with it, because the relevant, acquaintance-grounding causal connections are preserved. Therefore, on the functionalist, basic causal theory of acquaintance that is part of naïve realism, the big change in your V4 neural representation of the ball (occupying a different position in the neural similarity-space for color) would not make any different to *what you are acquainted with;* hence it should also not make a difference to what your experience is like. Therefore, on this view, in the counterfactual scenario, the qualitative character of your experience would be unaltered, despite the radical difference in internal color processing and color-related behavioral dispositions. This prediction is no more plausible in this case than in the olfactory case.

We can summarize the argument from internal dependence in two steps.

First, in view of good internal correlation and bad external correlation, it is obvious that internal postreceptoral processing plays a role in shaping how we experience the world. We should therefore accept that in these cases your experiences of the world differ across the actual and counterfactual situations, because of your different internal processing. We can call this *internal-*

dependence. And we can call these cases *coincidental variation cases*, because in them there is an exact coincidence in the external features that two individuals (you and your twin in the counterfactual situation) track or "select", but with massive variation in your postreceptoral processes and consequent behavior. These hypothetical cases provide a way of making precise the second, positive clause of the brain-based approach, which said "the qualitative character of our experiences of sensible properties is most directly dependent on our subjective neural response to external items".

Second, simple naïve realism does not accommodate internal-dependence in this sense. Simple naïve realism entails that your experiences of the world should be the same across the actual and counterfactual situations, despite your radically different internal processing and behavior, because on this externalist view your different internal processing should not make a difference to what you are acquainted with in the external world.

Let me make two points about this argument.

(1) Previously (§1), I remarked that simple naïve realists handle actual cases of perceptual variation by invoking the selection gambit. They can speculate that whenever two individuals (such as a person and a pigeon, or two persons with slightly different wiring) have different experiences in normal conditions, this is because their sensory systems are causally tuned to, and so "select", different external properties for them to be acquainted with. However, simple naïve realists cannot handle my hypothetical cases in this way. Even if naïve realists are correct that external items have multiple smell qualities and color qualities (grounded in different physical properties), I have stipulated that in the actual and counterfactual situations, your sensory systems appropriately causally detect the same ones, so that, on simple naïve realism's *basic causal theory* of perceptual acquaintance, your sensory systems "select" the same objective properties for you to be acquainted with across the actual and counterfactual situations. Therefore, naïve realism is stuck with the mistaken verdict that there is no difference in the qualitative character of our experiences, despite the radical neural and behavioral differences. Against this, the science supports a brain-based view according to which postreceptoral processing can make a contribution to qualitative character above and beyond determining what objective states your sensory systems detect.

(2) You might wonder why all this science is needed to refute naïve realism. Can't we refute it on the basis of an old fashioned "inverted spectrum" argument? As everyone knows, John Locke said it is just obviously possible that "the same Object should produce in several Men's Minds different Ideas [color experiences] at the same time". He seemed to think that this is not in need of argument. Here we find David Chalmers wielding this old argument against contemporary naïve realism:

> A naïve realist (such as Campbell) who is also an externalist about phenomenology may [hold] that phenomenal greenness is constituted by a normal [acquaintance-enabling] causal connection to instances of primitive greenness in the environment. On such a view, while it may be possible for a single instance of phenomenal greenness to be caused by an apple that is not primitively green, it will not be possible for this to be the normal state of affairs. [But] one could also argue for the possibility of the relevant state of affairs by noting that it is hard to deny that it is at least conceivable, and by arguing for a connection between conceivability and possibility. (2010, p. 400, fn. 7)

But there is a problem with this line of argument against simple naïve realism. The link between conceivability and possibility is controversial. In fact, philosophers today would reject this move precisely when it comes to the qualitative character of experience (Tye 2000, 109-110). In a way, this style of argument is too powerful: it can be used to rule out just about any view of how

qualitative character is grounded in the physical world (for we can always conceive the relevant physical conditions – whether they be external or internal – remaining the same while qualitative character is inverted). So naïve realists might then say that this kind of scenario is conceivable, but not possible. For naïve realism, they might say, provides the best overall view of how qualitative character is grounded in the physical world. And, on this view, if the visual systems of the actual population and some other population (counterfactual humans, Martins, or whatever) are normally tuned to the same objective chromatic feature of an apple (or a ball, or whatever), they must have the same color experience of the apple, even if it conceivable that they should have different color experiences.

Now I can say why I think that to refute naïve realism, and support a brain-based approach, we have to look at the science. By looking at the science, we remove the need to rely on a questionable move from conceivability to possibility. It enables us to argue for the possibility that an individual should respond normally to the same objective features as you, but still have radically different experiences, in a way that goes against simple naïve realism. The argument is that they might differ radically from you in their postreceptoral processing, and as we have seen all the science supports that postreceptoral wiring plays a big role in shaping what our experience of the world is like (it is more than a general "enabling condition").

Let me conclude by addressing an objection to the argument from internal dependence; seeing what is wrong with the objection will help us to appreciate the empirical support for internal-dependence.[14]

I have naturally been assuming that the general finding of good internal correlation supports internal-dependence: our internal neural states play a role in shaping qualitative character. But simple naïve realists might suggest that they can come up with another explanation of good internal correlation, one that shows that it is not after all good evidence of internal-dependence (a "debunking" explanation).

1. In general, similar experiences are realized by neural states that are caused by similar physical properties in the world (similar chemical properties, similar reflectance properties, etc.).
2. Similar physical properties (similar chemical properties, similar reflectance properties, etc. in the world) are likely to cause similar neural states (assuming a simple transduction process).
3. Therefore, given just (1) and (2), we should expect that similar experiences are realized by similar neural states – we would expect "good internal correlation". The coincidence between qualitative similarity and neural similarity is just an artifact of stimulus-similarity.

Roughly, the general idea here is that, if the correlation between x and y (in this case, qualitative similarity and neural similarity) is explained by the fact that x and y have a "common cause" or "common source" (in this case, similarity in external features), then that correlation is not indicative of an explanatory link between x and y. It just looks as if there is an explanatory link.

Evidently, (1) and (2) are compatible with simple nave realism. So even if simple naïve realism is correct, and the explanation for qualitative character resides in the world and not in the brain,

[14] Something like this objection was suggested to me by Bill Brewer.

we would expect good internal correlation. If this is right, then good internal correlation is not very strong evidence of "internal dependence" and a brain-based view. Simple naïve realists can "explain away" good internal correlation as a kind of artifact. Or at least, so the objection goes.

But this objection rests on a complete misunderstanding of the empirical situation. This kind of debunking explanation simply doesn't apply in the cases we have discussed.

Take cases of categorical changes in the perception of audible qualities. Why is there is a categorical change in our neural response exactly when there is a categorical change in auditory experience (e. g. from /da/ to /ta/ once the VOT reaches 30 ms)? The naïve realist cannot explain away this apparent evidence for internal dependence by saying, "Oh, there's a big categorical change in both the experience and in the neural response only because, at exactly that point, there is a big categorical change in the stimulus", because it is just not the case that at this point there is a big categorical change in the stimulus – the stimulus increases gradually (see Figure 3). After all, it is a case of good internal correlation with bad external correlation. So there is only one reasonable interpretation of the pattern of the results: our postreceptoral neural processing, and our internal postreceptoral neural processing alone, is responsible for the categorical change in auditory experience, in accordance internal dependence.

The same point applies to the case of color experience. Your color experience of the blue-looking ball resembles your color experience of the grape more than your color experience of the leaf. Your V4 neural representations of the ball, the grape and the leaf fall into the exact same resemblance-order. (This is represented in Figure 6 by the shapes.) On the face of it, this is great evidence for internal dependence. The alternative debunking explanation offered by the naïve realist above fails at the first step (1). The naïve realist cannot say, "Oh, the reflectance of the hat is more like the reflectance of the grape than the reflectance of the leaf, so we would expect that our V4 neural states to fall into the same resemblance-order". For it is just not the case that the reflectance of the hat is more like the reflectance of the grape than the reflectance of the leaf! This is a case of "good internal correlation" with "bad external correlation". So in such a case the only good explanation of the coincidence between qualitative similarity and neural similarity is that it is neural similarity in V4 that determines qualitative similarity in experience, in accordance with internal dependence. The correlation is not epiphenomenal, but is rather indicative of a determination relationship. No other explanation of the pattern of results is possible. And, as our hypothetical situation illustrates, this goes against naïve realism.

The very same point, of course, applies to the experience of smell. Just look at Figure 5. Why, in the actual world, is there such a perfect agreement between the resemblance-order of your smell experiences and the resemblance-order of your PPC neural patterns, discovered by Howard and coworkers? The naïve realist cannot dismiss this by saying "Oh, both are just the result of the resemblance-order of the chemical types, so that the nice phenomenal-neural correlation is merely an artifact" – for the chemical types evidently don't stand in the same resemblance-order! It is a case of good internal correlation with bad external correlation. Once again, the only explanation of this coincidence is that the resemblance-order of the PPC neural patterns determines the resemblance-order of your smell experiences, which (as we saw) goes against naïve realism. In fact, this is precisely the whole point of the study of Howard and coworkers (2009). Here is how Margot sums it up in a commentary on their study:

> "[Because structurally diverse chemicals were chosen] the fMRI effects were not merely reflecting [or artifacts of] odorant-specific similarities. . . . The fMRI effects unequivocally demonstrated that only the PPC ensemble

> activities are predictive of the [qualitative] category (minty or citrus) of the odor that the subjects smelled. Because the chemical structure of the odors in each odor category are very different, [while the PPC ensemble activities are very similar], this is strong support for the idea that the PPC [determines] odor quality rather than [the physical characteristics of the odorants perceived]."

Likewise, Youngentob et al. (2009, p. 1343) write, concerning their own similar study, "Indeed, our results show neural and perceptual relationships that could not be presumed [predicted from] from any prior notion of molecular similarity among the odorants". To sum up: simple naïve realists have no good way of explaining away the evidence ("good internal correlation" with "bad external correlation") for internal dependence. Holding onto simple naïve realism would therefore require dismissing as a widespread fluke all the remarkable correlations between qualitative structure and neural structure discussed here (akin to dismissing as a widespread fluke all the correlational evidence for a connection between smoking and cancer). This point goes beyond our previous point that simple naïve realism requires a raft of arbitrary and unsystematic grounding connections in the external world ("the argument from irregular grounding"). It therefore adds to the case against naïve realism. The only reasonable interpretation of the empirical findings to accept internal dependence (part of the "brain-based view"), contrary to simple naïve realism.

5. Two comments on the arguments: pain and empirically defeasibilty

In my view, the arguments I have presented against simple naïve realism are overwhelming. Nevertheless, I have found in discussion that some simple naïve realists are willing to dig in their heels and retain their position. For these hold outs, I wish to offer two further comments.

My first comment is this. In the case of the sensory intensity of pain, there is ample evidence of bad external correlation and good internal correlation. In fact, even under perfectly normal conditions, there is just no uniform relationship at all between stimulus features (stimulus intensity, stimulus area on the skin, stimulus duration) and sensory pain intensity. By contrast, many studies have shown that there is a simple, uniform relationship between sensory pain intensity and a single neural parameter in the head: firing rates of neurons in the pain-matrix. As Coghill et al. write, neural firing rates in the pain matrix are "linearly related to subjects' perceived pain intensity" (1999, 1936). Here now is a simple point:

1. Everyone – even simple naïve realists - will agree that the finding of bad external correlation and good internal correlation supports a brain-based view of sensory pain intensity over naive realism: sensory pain intensities are not objective properties of bodily disturbances; what sensory pain intensities we experience "out there" in regions of the body depends most directly only on cortical firing rates "in here".
2. But if so, the exactly parallel finding of bad external correlation and good internal correlation for experience of sound, smell and color must be acknowledged to support brain-based view here as well – contrary to naïve realism. If naïve realists accept a brain-based view of pain intensity on the strength of the evidence, but reject a brain-based view of other types of experiences, they are guilty of a kind of inconsistency.[15]

[15] In the case of pain, there are empirical reasons to doubt externalist theories such as naive realism and tracking representationalism, deriving from the "percipi" intuition that pains are not perception-independent items (Cutter 2017). Because of such considerations, naive realists about the experience of color, sound and taste may be unlikely to

Now many readers will recognize the point I am making to be similar to a point pressed by John Locke:

> Why are whiteness and coldness in snow, and pain not, when it produces each idea in us, and can do so only through the size, shape, number, and motion of its solid parts? (Locke 1869, II.viii.16)

Locke is giving a simple argument from analogy. If pain qualities are not objective qualities of external items, then we should hold that color qualities (and audible qualities and olfactory qualities, etc.) are also not objective qualities of external items, contrary to naive realism.

But I am not trying to make such a simple argument from analogy. In fact, I think that Locke's point is very weak. Let us suppose, as I think is the case, that empirical and a priori considerations support a brain-based view of pain over a "naïve realist" theory of pain. By itself, this just doesn't support a brain-based view of other kinds of experiences. For instance, it could have been that matters stand very differently with other types of experiences. For instance, it could have been that all aspects of the qualitative character of colors are well matched by features of reflectances. And it could have been that we do not find in the brain any good explanations of qualitative structure. In that case, while I would accept a brain-based view of the qualitative character of pain experience, I would have accepted a quite different externalist theory of the qualitative character of color experiences, contrary to Locke's simple argument from analogy.

The point I am making is different from Locke's. It is, if you like, an updated version of Locke's point. My point is that, while the scenario I just described is (epistemically) possible, it is just not how the cards have fallen. In fact, the same pattern of good internal correlation and bad external correlation that we find in the case of pain is one that we find across the sense modalities. If we take such findings to support a brain-based view of sensory pain intensity, as we surely must, then consistency demands taking exactly parallel findings in other sense-modalities to support a brain-based view of other types of experiences. This is, if you like, a kind of "spreading argument".

The second comment I would like to make is that, if simple naïve realists nevertheless dig in their heels and insist that the empirical evidence I have adduced does not support rejecting naïve realism in favor of a brain-based view, then we can ask them: "Then, according to you, what empirical evidence *would* support rejecting naïve realism in favor of a brain-based view – what in the world would it take?" It is very hard to see how to answer this question. So if naïve realists are not convinced by the arguments I have adduced, they are, in effect, saying that naïve realism is empirically indefeasible! But this is an absurd stance. For naïve realism is not only a view about the phenomenology of experience; it is also, in part, an empirical thesis about how experience is to be integrated with the natural world. It is, therefore, subject to empirical disconfirmation. And, as it turns out, the empirical situation goes decisively against it.

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accept "naive realism" about the experience of pain in any case. However, this doesn't affect my point here. For my point here is that all of us - including naive realists about perceptual modalities - should recognize that there are *also* empirical findings that undermine naive realism about the experience of pain (the case against this view is over-determined); so that, if there are exactly parallel findings in case of the experience of color and smell and sound, then consistency demands that we take them to undermine naive realism about these other experiences. (Here I am indebted to discussion with Imogen Dickie.)

6. Complex naïve realism I: Keith Allen

So far, I have marshaled two new empirical argument against simple naive realism, a popular position defended by Bill Brewer, John Campbell, Bill Fish, and Mark Kalderon. At this point, naive realists might agree that simple naive realism fails for empirical reasons but then go on to develop a more complex form of naive realism that fits better with the empirical results. We will look at two such complex forms of naïve realism: super pluralistic naïve realism suggested by Keith Allen, and extreme ways-based naïve realism suggested by Heather Logue and Ori Beck.

In his recent book *A Naive Realist Theory of Colour*, Keith Allen briefly addresses the argument from internal dependence. In particular, he briefly responds to the case involving you and your twin with different color vision in a counterfactual situation (illustrated in Figure 6).

Here is what he says:

> If selectionism is combined with a naïve realist theory of colour, then the same physical properties can realize a number of distinct properties with different qualitative natures that different perceivers [like you and your twin in the counterfactual situation] select in virtue of differences in their visual systems considered as a whole - where this include their post-retinal processing mechanisms. (2017, p. 72)

To understand how Allen's view departs from simple naïve realism as I have formulated it, we must first review what simple naive realism says about the hypothetical case. Suppose again that you are looking at the blue-looking ball. On simple naïve realism, the reflectance of the ball grounds its blue color. Further, on the simple causal theory that is part of naïve realism, both you and your twin perceive the blue of the ball, despite your radically different post-retinal V4 states and behavioral differences, because we stipulated that those different V4 neural states are both appropriately caused by the blue of the ball. In general, your post-retinal internal states, although different, are exactly alike in what they would be caused by in the external world. So simple naive realism delivers the totally implausible verdict that there is no difference in the qualitative character of your and your twin's color experiences. This verdict is not reasonable. The only reasonable verdict is that, while the ball looks blue to you (similar to the grape), it looks (or would look) greenish to your twin (similar to the leaf).

Allen is suggesting that a different form of naïve realism can accommodate this prediction. To begin with, he thinks that naïve realists should hold that the reflectance of the ball grounds, not only the color blue, but also a greenish color. (Thus he rejects the intuition that these colors exclude.) You and your twin have different color experiences because you are acquainted with the blue of the ball and your twin is acquainted with the greenish color of the ball. This view is in line with simple naive realism general diaphaneity assumption: for the difference in the character of your experiences is down to a difference in what objective states of the world you are perpetually acquainted with. But it requires that Allen depart from simple naive realism in rejecting the *basic causal theory of perceptual acquaintance* that is part of simple naïve realism. The reason is that, again, we stipulated that your V4 neural state and your twin's different V4 neural state are exactly alike in what they are caused by under all circumstances. In the present case, they are both caused by the same reflectance of the ball, which on Allen's view grounds two colors. If one of these colors counts as a "supervenient cause" of your V4 state, then so does the other. Given this stipulation, causal relations are not enough to determine that you perceive only the blue of the ball, while your

twin perceives only the greenish color of the ball. They are not enough to "select" different color properties for you and your twin to perceive.[16]

But then what is Allen's alternative to the basic causal theory of perceptual acquaintance? What is his general theory of the form "If subject x . . . external state s, then x is acquainted with s", where the dots are filled by a description of physical facts described in non-experiential terms, and where the resulting view implies that you are acquainted with the blue color of the ball but not its greenish color, while your twin is acquainted with the green color of the ball but not its blue color? He does not really say. He only says that you and your twin's "visual systems as a whole" determine that you perceive the blue color of the ball, while your twin perceives the greenish color of the ball. But he doesn't provide the details.

Allen's alternative to simple naive realism, then, is crucially incomplete. Still, we can raise three problems for any attempt to develop the form of naïve realism that Allen is here gesturing at.

(1) Since the view must be generalized to every hypothetical case of "coincidental variation", it entails that every reflectance ground every possible color, that every molecular property ground every possible smell quality, that every physical property of every acoustic event ground every audible quality, and so on so forth! This is why I have called the view super pluralistic naïve realism.

To see why, consider a slightly different case. Suppose that, in the actual world, you consecutively view a grape, the blue looking ball, and a lemon. In the actual world, the ball looks bluish to you, somewhat like the grape, because of V4 neural representation of the ball is close to your V4 neural representation of the grape in the neural similarity space for color. Now imagine a new counterfactual example. In this new example, we are to imagine that, because of post-retinal differences in V4 processing, the ball looks yellowish to your twin, because your twin's V4 neural state is similar to that produced by the lemon-looking lemon. If Allen is consistent, he must apply his same account to this new counterfactual case as well. Thus, he must say that, here in the actual world, the reflectance of the ball not only grounds blue and green, but also yellow. You perceive the blue. Your twin in the old counterfactual situation perceives the green; your twin in the new counterfactual situation perceives the yellow. And so on and so forth. And the point does not just apply to hypothetical coincidental variation cases involving color experiences: it also applies to hypothetical cases involving the experience of sound, taste, smell, and so on. Thus, the view implies a gigantic explosion in the sensible properties of external items: every perceivable item has every possible sensible property (it is just that we are only perceiving a subset of those properties). This makes the view exceedingly complex and counterintuitive.[17]

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[16] You might think, "maybe Allen could retain a simple causal theory of how you and your twin are acquainted with different colors, if he appeals to counterfactuals about what would cause your different V4 neural states?" But this is not the case. Let X be your V4 neural state on looking at the ball, and let Y be your twin's (see Figure 6). Given our stipulations, X and Y are not only exactly alike in what they are actually caused by in this case, namely the reflectance, R, of the ball; they are also exactly alike in what they would be caused by. In particular, let R*, R**, R***, etc. be other reflectances that would have the same effect on receptor activity as R (they are "metameric matches" to R). Then both X and Y would be caused by R*, R**, R***, if objects with any of those reflectances were before you or your twin's eyes. These objects would look blue to you and greenish to your twin. So, on Allen's super pluralistic naïve realist view, they are both blue and greenish. So, on his view, in both counterfactual and actual situations, X and Y are caused by the same blue and greenish objects. Therefore, even if we consider counterfactual causes, Allen cannot use a simple causal theory of acquaintance in order to explain how, on viewing the ball, you are perceptually acquainted with the color blue while your twin is acquainted with the greenish color.

[17] Allen acknowledged this implication of his view (personal discussion).

(2) So, Allen must hold that every physical property to which our sensory systems are keyed grounds every possible sensible property! Above I noted that, in order to explain why, in a given perceptual situation, you perceive one of these sensible properties rather than any of the others, Allen must reject the simple causal theory of perceptual acquaintance that is part of simple naïve realism. And I noted that he doesn't really put anything in its place, except to say that "your sensory systems considered as a whole" select what sensible properties you are acquainted with.
Elsewhere (Author), in a quite different connection, I have described, on behalf of naïve realists, a two-factor theory of acquaintance. The idea is that being acquaintance with the occurrence of a property P in the external world is grounded (i) undergoing processing that is suitably caused by that occurrence of P and (ii) undergoing processing that "matches" the occurrence P, where "matching" might be defined in terms of a "second-order isomorphism" in something like Shepard and Chipman's (1970) sense. This second matching condition fits with Allen's remark that "the sensory system as a whole" helps select what properties in the external world you are acquainted with. So he might co-opt this kind of account. The idea would be that even though you and your twin's brain states are caused by the same external physical properties that ground multiple sensible properties, you perceive the ones that "match" your internal states while your twin perceives the ones that "match" her internal states. However, the account remains sketchy, and there are serious problems with working out the details.

(3) So far, I have suggested that Allen super pluralistic naïve realism does not provide a plausible answer to the argument from internal dependence. A final problem is that he does not address at all my argument from irregular grounding. His super pluralistic naïve realism does not provide any answer at all to this argument. Just like simple naïve realism, it requires irregular grounding. For instance, the reflectance of the ball resembles the reflectance of the leaf more than the reflectance of the grape. Still, Allen holds that they ground distinct color properties (viz. blue, green, and purple) that stand in the opposite resemblance-order. Or again, the chemical character of the middle chemical type resembles that of the right chemical type more than the left one. But, if he accepts naïve realism here too, Allen must hold that they ground olfactory qualities that stand in the opposite resemblance-order (viz. citrus1, minty, and citrus2) – for those are the qualities we perceive them as having. His super-pluralism doesn't not take this problem away, for he still accepts these grounding claims. In fact, it exacerbates the problem. Since he holds that every physical property of every item grounds every sensible property, he must accept infinitely many cases of irregular grounding!

Of course, all these problems faced by Allen's super pluralistic naïve realism are avoidable. We can avoid them by accepting a brain-based view.

7. Complex naïve realism II: Logue, Beck, French, and Phillips

Let us look now at the *extreme ways-based naïve realism* that has recently been proposed by Heather Logue (2012), Ori Beck (2018), and Craig French and Ian Phillips (ms). We can introduce this view by contrasting it with Allen's super-pluralistic naive realism. Consider again the "coincidental variation" case where you and your twin view a ball. You and your twin undergo different postreceptoral V4 neural states (differently located in the neural similarity-space for color). But those different postreceptoral V4 states are exactly alike in what they are caused by in the external

world (Figure 6). Because of the neural differences, while you have a bluish experience of the ball, your twin has a different color experience: the ball looks to him exactly as a green ball looks to us. On Allen's view, you and your twin have different color experiences because you and your twin are perceptually acquainted with different color qualities in the ball (blue and green-blue), even though you and your twin are in neural states that are exactly alike in what they are caused by. We saw that this view is in line with diaphaneity but requires giving up the basic causal theory of acquaintance. In brief, extreme ways-based naive realism takes the opposite tack: it retains the basic causal theory of acquaintance but rejects general diaphaneity. In more detail, on this view, in line with the functionalist, basic causal theory of perceptual acquaintance, you and your twin count as both perceiving the objective, blue quality of the ball (because your neural realizers, although different, are exactly alike in what they are caused by). So, even though your color experiences are quite different, there is no difference in *what* you perceive, contrary to diaphaneity. Instead, this view holds that the phenomenal difference is down to a difference in the different "ways" in which you perceive the same color of the ball. The different "ways" in which you perceive the color of the ball are grounded by you different neural responses to the ball. Likewise in general. On extreme ways-based naïve realism, *whenever* you have an experience of sensible properties (color, smell, sound), the qualitative character of your experience is not determined by *what* you perceive; it is determined by the *way* you perceive it, which is partly grounded in your neural response. In §1, we formulated simple naive realism's diaphaneity assumption with a "plus or minus" qualification to allow for a couple of exceptions involving blur and attention-shifts. By contrast, extreme ways-based naive realism holds that the diaphaneity assumption is *generally* totally mistaken.[18]

Obviously, this view remains somewhat under-specified. Proponents of the view say that "perceiving in different ways" is *not.* They say it is not *sensing sense data with different properties* or *perceptually representing different properties.* But they don't really provide much by way of a positive characterization. Still, I think that we have heard enough about the view in order to evaluate it. I have five objections.

(1) On this view, it appears that what is being perceived is no longer doing any work in determining the qualitative character of our experience of sensible properties. All the way is being done by the "way" you perceive, which is constituted by your neural response. In fact, Logue (2012, 223) explicitly concedes the point: she writes, "the phenomenal character of [some] veridical experiences of them is *entirely* down to the [neural features of] subject" (my italics). And Beck (2018) calls his view *neurocomputational* naive realism. But in that case it is better characterized as giving up naïve realism altogether when it comes to the experience of sensible properties. Indeed, the view

[18] See Logue (2012), Beck (2018), and French and Phillips (ms). Logue (2012) doesn't use the "ways of perceiving" talk; instead, she speaks of "features of the subject". For instance, she writes (p. 223) that "both features of the subject and features of the objects perceived play a role in determining phenomenal character". French and Philips (ms) cash out talk of different ways of perceiving in terms of different dyadic perceptual relations all of which are determinates of the determinable of perceptual acquaintance. For instance, if the same item looks red to one perceiver and orange to another perceiver, they would account for this by saying that two perceivers stand in different unanalyzable two-place relations of perceptual acquaintance, P_1 and P_2, to that item. Their view seems equivalent to Chisholm's (1957, 116) view. In particular, Chisholm's different two-place relations between external items and perceivers, *looks-red*, *look-orange*, are just the converses of P_1, P_2, *etc.* Jackson (1977, 90) calls it the "two-place multiple relation theory".

seems more similar to type-type neurobiological identity theory of the experience of sensible properties (Block, Papineau, McLaughlin), which is the polar opposite of standard naive realism.[19]

(2) The extreme ways-based naïve realist agrees that your twin's experience of the ball is just like our experience of a green ball. But then it is very implausible to say that your twin perceives the blue quality of ball, but perceives it is a radically different way from you. I agree that we allow that the same quality-instance (or trope) can be perceived in different ways: for instance, you can see the same instance of blue clearly with your glasses on, and then blurrily with your glasses off. But if the "way" varies too radically, we no longer count as perceiving the trope. Here is an analogy. You look at the blue ball. Your twin looks at the same ball, but, because of (highly!) aberrant neural processing, he has an experience as of a blue cube. It is then wrong to say that you both perceive the circularity of the ball, but in different ways. Your twin doesn't perceive the circularity of the ball at all.

(3) So far, we have only heard how the view can answer the argument from internal dependence. We have not heard how the view might answer the argument from irregular grounding.

Would they not hold that the chemical types shown in Figure 1 fall into a certain resemblance-order, but that they ground objective olfactory qualities that fall into the opposite resemblance-order? Would they not hold that the reflectance properties shown in Figure 2 fall into a certain resemblance-order, but that the objective sensible colors that they ground fall into the opposite resemblance-order? Would they not say that a gradual increase in VOT leads, at 30 ms, to a categorical shift in the perceived audible quality, from /da/ to /ta/ - that there is, out in the world, a giant objective change in the quality of the audible event, a change which is inexplicable from the point of view of physics? But if they say these things, then they are stuck with irregular grounding. Likewise, in the Mary case, would they not say that the minute physical difference between Mary's causal relations to the outer black and the inner red grounds a monumental mental and epistemic difference. They must say that, despite the parity in Mary's physical relations to these colors, Mary is only acquainted with the black color, but is not at all acquainted with the red color, and cannot know what red is line. Brain-based views traded all these irregular grounding connections for highly regular and simple ones. In my view, this point alone is enough to support a brain-based view over ways-based naive realism.

(4) In having visual experiences, we are ostensibly presented with *color qualities*. Moreover, these color qualities appear to fill variously-shaped regions in various locations, often at a distance

[19] In reply, proponents of ways-based naive realism could put forward a *joint-determination* view: the character of our experience of color, smell and sound is partly grounded in what is perceived (grounded in causal connections to objects) *as well as* the way in which it is perceived (grounded in the neural response). Compare: a resultant force is jointly determined by both component forces. This would indeed make the view different from a purely neurobiological view. But it is also a view that faces problems. What is the relative "contribution" of each factor? What could this even mean? And what is the general rule whereby the two components determine phenomenal character? Also, take the so-called "inverted earth" thought-experiment in which you and a twin are neural duplicates but have a history of interacting with ("perceiving") differently-colored objects (Block 1990). The joint-determination version of the view implies that you and your twin have different color experiences even though you are neural duplicates (because there is a difference in the "what-is-perceived" factor). But what *evidence* could possibly be adduced for this view? Indeed, it would seem that "bad external correlation" provides a reason to reject this view. Given that there is good internal correlation and bad external correlation, the most reasonable view is that all the work is being done by the "way of being perceived", grounded in the neural response. But then we are back to the point in the text: this is hardly a "naive realist" theory of the experience of color, smell and sound. (Here I am indebted to correspondence with Ori Beck and Craig French.)

from us. Even if color experience is internally-dependent, it is also essentially externally-directed. In particular, consider again the case where you and your twin with different post-retinal color processing perceive the ball. The following description is evidently true as a point of phenomenology:

> [#] There is a quality q that seems to you to pervade a round region, and a distinct quality q* that seems to your twin to pervade a round region. In fact, this is built into what it is to have the relevant experiences.[20]

To appreciate the plausibility of [#], imagine that you could "flip" back and forth between your experience of the ball and your twin's experience of the ball. To you the ball looks blue. Your twin's experience of the ball is exactly like our experience of a greenish ball. Clearly, in flipping back and forth, distinct qualities would seem to you to pervade the round region before you. It is quite different from a case where you first perceive the blue of the ball *while having a mild headache* and then you perceive the blue of the ball *while having a severe headache.* In such a headache case, you perceive the blue of the ball in different ways (after all "while...." is an adverbial modifier modifying "perceive"), but it's not the case that distinct qualities seem to you to pervade the round region before you. By contrast, in the flipping case, distinct qualities would seem to you to pervade the round region.

Before I explain why [#] makes a problem for extreme ways-based naïve realism, let me say right away that the problem differs from problem (2) above. My problem (2) above was that it is just implausible to say that you and your twin perceive the very same color-trope (only in extremely different "ways"), as extreme ways-based naïve realists say. But my present point is neutral on this issue. Let us just grant the description of the case given by ways-based naïve realists: you and your twin perceive the very same color. My present point is that, even if we accept this description of the case, we must also recognize a sense in which they ostensibly perceive distinct qualities pervading a round region: that is, we must also accept [#].

Here now is the problem. If extreme ways-based naïve realists accept [#], then they face following question: what are these distinct qualities, q and q*? They cannot answer: they are distinct objective colors perceived by you and your twin (grounded in the reflectance of the ball). For they think you and your twin perceive the same objective chromatic feature of the ball (since your internal processing, though different, is caused in the normal way by the same objective chromatic feature of the ball). But then what in the world are the distinct qualities, q and q*?

Now, in developing their "ways-based" form of naive realism, Logue (2012) and Beck (2017) emphasize individuals' neural properties. So you might think that proponents of ways-based naïve realism could accept [#] and then go on to say that the distinct qualities or q and q* are in fact distinct neural features of you and your twin's different V4 neural processes (neither of which is round!). But this would amount to a bizarre projective view whereby properties of our own neural

[20] It is worthwhile to note that [#] would be generally accepted, which testifies to its truth. Certainly "internalist representationalists" will accept it. They hold that you and your twin perceptually represent distinct color qualities as co-instantiated with the same shape. In fact, even "the theory of ideas" or the "sense datum view" is compatible with [#]. For instance, Berkeley (1713, 157-8) noted, in general, sensible colors and shapes "appear as being in the same place" – it's just that he located them both "in the mind". See also Jackson (1977, 129) and Peacocke's (2008). On these views, you are aware of a bluish and round sense datum (or "idea"), while your twin is aware of a greenish and round sense datum.

states are "projected onto" variously-shaped external regions. There are two reasons why proponents of extreme ways-based naive realism could not accept this view. First, it could hardly be said to be a "naive realist" theory of our experience of colors and other sensible properties. It is more like a strange form of internalist representationalism on which color experience massively misrepresents things has having shapes and (projected) neural properties. Second, in any case, this kind of projective view simply is not workable, for reasons I have explained elsewhere (Author).[21]

Of course, in view of these difficulties, proponents of extreme ways-based naïve realism could just reject [#].[22] But this would be implausible. Again, imagine that you flip back and forth between your experience of the ball and your twin's experience of the ball. It's just so obvious that [#] is true! Distinct qualities would seem to you to pervade a round region. It is quite different from the case where you first perceive the blue of the ball *while having a mild headache* and then you perceive the blue of the ball *while having a severe headache* (where the distinct painful qualities would *not* seem to pervade the round region). How could anything be more obvious?

(5) Those such as Beck, Logue and French and Phillips who accept a ways-based account of the experience of traditional "secondary qualities" are *some* under pressure to generalize this account to the experience of traditional primary qualities. For experiences of secondary qualities and experiences primarily qualities are inseparable and the underlying physical processes are relevantly similar. It would therefore be surprising if the metaphysics of primary quality perception were very different from the metaphysics of secondary quality perception. (For instance, no one would say that the sense datum theory is correct for the experience of color but say representationalism is correct for the experience of shape.) And, in fact, Beck as well as French and Phillips both explicitly extend their "ways-based" view to the experience of primary qualities.

But a ways-based theory of the experience of primary qualities is, if anything, even more implausible than a ways-based theory of the experience of secondary qualities, and for similar reasons. To illustrate, let's consider a new case. I have been discussing a hypothetical case where you and your twin have different *color experiences* of a spherical ball because of neural differences. Call this the Color Case. But now consider a hypothetical case where you and your friend have markedly different *shape experiences* of the spherical ball. It looks blue to both of you but looks different in shape. For instance, suppose that, while it looks round to you, it looks markedly *oval* to your friend, elongated along the vertical dimension. It loos a bit like a blue egg, only even more oval than an egg. Maybe it's an optical illusion or maybe the illusion has a cortical origin. Call this the Shape Case. Now my main criticism of the ways-based account of the Color Case was that it violates [#]. (I also pointed out that it is not really properly considered a "naive realist" account of the experience of traditional secondary qualities.) I think that a similar problem besets a "ways-based" account of the Shape Case.

In particular, consider the following plausible claim:

[21] Neurobiological type-type identity theory (Block, McLaughlin, Papineau) also has trouble accommodating [#]. (For discussion, see Tye 2000 and Author.) It is not surprising that ways-based naive realism and type-type identity theory share this problem. For, as we noted in connection with problem (1) above, they provide quite similar accounts of our experience of sensible properties.

[22] Heather Logue takes this line (personal communication).

> [&] You and your friend are ostensibly presented with different shape properties, namely *round* and *oval*. In fact, *round* essentially figures somehow in the account of your experiential episode. By contrast, *oval* essentially figures somehow in the account of your friend's experiential episode.

To appreciate how plausible [&] is, suppose that you could magically flip back and forth between your experience of the ball and your friend's experience. Evidently, you'd be ostensibly presented with different shape features. Indeed, it just seems obvious that *round* must figure somehow in the metaphysical account (or real definition) of what it is for you to have your experience, whereas *oval* must figure somehow in the metaphysical account (or real definition) of what it is for your friend to undergo his experience of the ball. Relatedly, your experience puts you in a position to predicate *round* of something, while your friend's experience puts him in a position to predicate *oval* of something.

But the ways-based account of the Shape Case violates [&]. To see this, consider your friend's experience. On the ways-based account, what it is for your friend to have this experience of the ball is for your friend to stand in a certain two-place relation to the ball that we might put this way: *x perceives y roundly.* And this is *not* in turn analyzed in terms of *sensing an oval sense datum* or *perceptually representing that the thing is oval* - otherwise the view would collapse into the sense datum view or representationalism. In fact, according to French and Phillips (ms), it is a two-place mental relation that cannot be further analyzed. (True, it is *grounded* in a complex physical relation that your friend bears to the ball: namely, his undergoing certain aberrant neural processing in response to the ball.) To bring this out, we might call it the "Charlie relation". So in the end their view is that for your friend to have his experience of the ball is for him to stand in the Charlie relation to the ball. This dyadic Charlie relation is (of course) not the shape *oval* and its real definition doesn't bring in the shape *oval* (e. g., as already mentioned, it is not to be analyzed in terms of experiencing an oval sense datum or perceptually representing that the presented item is oval). This makes it clear that, on this view, the shape *oval* doesn't enter into the account of the experiential episode at all at all. Hence the view violates [&]. In addition, since it implies that your friend's illusory experience in no way involves the shape *oval*, this view makes it entirely unclear how it is that his experience immediately enables him to predicate *oval* of the presented object in thought.[23] But since [&] is very plausible, we should reject the ways-based account of the Shape Case.[24]

I hasten to add that there are brain-based, non-naive-realist accounts that avoid all these problems. For instance, the sense datum theory accommodates [&] in the Shape Case as well as [#] in the Color Case. On this view, what it is for you and your twin to have different color experiences

[23] It is true that proponents of the ways-based account can *indirectly refer to* your friend's experiential episode by using the term oval: they can say that it is an experiential episode that is like the ones people undergo when the view oval things. It remains the case, however, that their view violates [&]. For, as explained in the text, the shape oval figures in no way in their account of *what it is to* undergo the experiential episode.

[24] This objection to the way-based account parallels an objection I have elsewhere developed against neurobiological type-type identity theory (Author forthcoming). Intuitively, *round* will somehow somehow figure in the correct real definition of what it is to have the ball-experience. But neurobiological type-type identity theory violates this. For on this view, to have the ball experience is just to undergo a neural state, whose essential nature is fully definable in terms of types of *neurons* and the *times, directions and intensities* at which they fire, without mentioning shapes at all. By contrast, on sense datum theory and representationalism, *round* does indeed essentially feature in the real definition of what it is to have the ball-experience (because it characterizes the sense datum or figures predicatively in the content of the experience). This favors such accounts over neurobiological type-type identity theory.

in the Color Case is for you to experience round sense data possessing different color qualities, namely, blue and greenish-blue. Likewise, what it is for you and your friend to have your different shape experiences in the Shape Case is for you to experience sense data possessing different shapes, namely round and oval. But you don't have to believe in sense data to accommodate [&] and [#]. Internalist representationalism - my own favorite brain-based view - also accommodates [&] and [#], while also avoiding sense data. For on this view, what is to have the different experiences in these cases is to perceptually represent distinct color qualities or distinct shape features of the presented ball. Likewise, on the so-called property-complex theory (Bealer 1982, 235ff; Sosa 2007, 257), what it is to have the different experiences in these cases is to be conscious of property-complexes in which different color qualities or shape properties figure. In my view, then, we should prefer one of these brain-based accounts to the "ways-based" account.

8. Concluding remarks

The findings of good internal correlation and bad external correlation provide good reason to accept internalist, non-naive-realist account of the experience of traditional secondary qualities. But some big questions remain. I conclude by raising some questions about the experience of traditional primary qualities (shape, size, distance, number, motion).

The empirical evidence for a brain-based, non-naive-realist account is strongest for the experience of secondary qualities. It is weaker when it comes to the experience of primary qualities. For instance, if the apparent length of a line doubles, then the length that you neural state has the function of indicating doubles. So here, unlike in the case of smell, color and sound, there is a good correlation between the character of experience and the character of the physical properties in the world that our neural states have the function of indicating.

This raises the question: could naive realists retreat to a mixed view? Could they combine an internalist, non-naive-realist account of the experience of traditional secondary qualities, with an externalist, naive realist account of the experience of primary qualities? Could color phenomenology be internally-determined while spatial phenomenology is externally-determined?

There is reason to think not. For one thing, the experience of primary qualities is inseparable from the experience of secondary qualities. For instance, necessarily, if you have experiences as of colors, you must have experience as of extension and location. So if the experience of secondary qualities is internally-determined, so too must be the experience of primary qualities.[25]
So, for instance, a life-long "brain-in-a-vat" could have experiences as of shapes as well as experiences as of colors. If you like, our ideas of primary qualities are just as innate as our ideas of secondary qualities. We are familiar with "spreading arguments" against naive realism that start with a non-naive-realist theory of hallucination and then use a "spreading premise" to support generalizing that non-naive-realist theory to normal experience. The considerations I have adduced provide the materials for a different kind of spreading argument against naive realism that does not bring in hallucination at all. It starts with a non-naive-realist theory of normal experience of secondary qualities and generalizes to the experience of primary qualities.

[25] See Cutter (2016, 7-8) for this point. For some independent lines of argument against externalism and for internalism about the experience of "primary qualities", see Chalmers (2012, 296-297, 333), Masrour (2015), and McLaughlin (2016, 292).

This in turn leads to another question. Suppose we accept such an across-the-board internalist account of experience. Then there is considerable pressure on us to also accept a kind of across-the-board irrealism. It is a familiar thought that, if our experiences of colors are entirely internally-determined, then, barring some kind of pre-established harmony or giant coincidence, it is very unlikely that colors are really out there.[26]

But what is less often appreciated is that the same point applies to the experience of "primary qualities". If, contrary to externalist accounts, the brain entirely determines what spatial properties we perceptually represent, in a manner that is constitutively independent of links to the actual properties of external objects, then, barring a pre-established harmony, it seems very unlikely that these properties should really be "out there". So, if we accept across-the-board internalism, it is very hard to see how we might be justified in accepting a Lockean middle position which says that colors-as-we-see-them are not out there but shapes-as-we-see-them are out there. Instead, we must accept a more Kantian picture of things. When Russell ended his flirtation with naive realism mentioned at the start of the essay, and moved to an across-the-board internalist view, he saw this point clearly: he said, "Real shape is a shape in physical space, which has no more resemblance to visual space than light-waves have to colour . . . .shape as the sense-datum is in just the same position as colour" (Russell 1913, 79).[27]

We have briefly motivated this view from considerations in the philosophy and science of perceptual experience, but in fact the view may be independently supported by our current physical theories which suggest that all that is really out there is a multidimensional wavefunction or something equally acrane (Chalmers 2012, 296-297, 333; Strawson 2018). Many would recoil from such a view, which "interiozes" experience and "alienates" us from the external world (in the language of McDowell 1986). Myself, I think, like it or not, maybe that is just how it is; maybe the physical world is just hard to know.

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[26] McGinn's (1996) complex theory, briefly mentioned at the end of §3, manages to combine internalism and realism without coincidence. But it faces insurmountable problems (Author).

[27] Russell here goes on to say, "spatial order reduces to relations, and these relations have certain logical properties in virtue of which they generate a three-dimensional manifold. I suggest that the apparent shape corresponds as a rule to a real shape, due to relations having similar logical properties. But it is a case of correspondence, not identity, just as in the case of colours and their physical correlates."

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