

Précis of *Outside Color*

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There are two distinct, basic questions that philosophers working on color may pose to themselves:

(1) ‘*what is the fundamental nature of color?*’

(2) ‘*what theory of color ontology meshes best with current perceptual science?*’

In *Outside Color* I set out to address the second of these questions by giving an account of chromatic properties which is inspired by the relevant science, and speaks to the conceptual concerns of both scientists and philosophers. Below I summarise the contents of the book, but as a preliminary I will first outline my methodological assumptions.

Most philosophical work on color is best read as tackling the first question¹. In contemporary metaphysics it is frequently assumed that the best answer to the first question is de facto the best reply to the second. This is so on the assumption that both scientists and ontologists are trying to glean knowledge about the same reality – “that metaphysics is continuous with science” (Sider 2011:12). However, it is important to note that question (1) is more ambitious than (2) because it goes after knowledge of color that is true across possible worlds, not just the world we happen to live in.²

Though I do not employ the term in the book, the project of *Outside Color* is better described as *metascientific* rather than metaphysical. I associate not just one but a series of questions with the metascience of color:

¹ Two exceptions are Hardin (1993) and Johnson and Wright (2006).

² See e.g. Cohen’s (2009: 186–187) argument for his *role functionalist* theory over *realizer functionalism* about color. The modally ambitious agenda is criticised by Gert (2008).

- What are scientists committing themselves to when they talk about color and do experiments on color vision?
- Do any of these commitments line up with an established theory of color ontology?
- What are the conceptual frameworks employed by perceptual scientists working on color? (e.g. definitions of sensation vs. perception; employment of terms such as ‘representation’; ideas about the relationship between physiology and psychology of color vision.)
- What are the historical factors which have shaped these frameworks?
- Are scientists well served by the current frameworks, or do they stand in need of conceptual re-engineering?
- How do the current frameworks help or hinder the broader project developing an integrated science of the mind and brain, and what steps could be made to advance this agenda?

Note that there are both descriptive and normative questions listed here. Metascience should not be equated with naturalistic conceptual analysis. It is helpful to draw a distinction between descriptive metascience and the constructive sort, which suggests to scientists new ways to think about their fundamental terms. There is some resemblance with proposals in the recent wave of “scientific metaphysics” and “naturalized ontology”. For example in the introduction to a new collection on the topic, Harold Kincaid describes it as the use of “scientific methods and results to solve problems arising from science that are roughly scientific in nature” (Kincaid 2013:2). A key difference is that I am *not* proposing that scientific methods are themselves the appropriate ones to use when addressing metascientific questions. You cannot get clear on the conceptual framework used by scientists when designing experiments on color by doing more such experiments. The task instead involves the analysis of scientific texts and the formulation of arguments concerning the terms used in those texts. As will become clear below, the history of science (and natural philosophy) also has an important role to play here.

Now to the summary of *Outside Color*. Chapter 1 (“Color and its Questions”) introduces the reader to the philosophical debate around color and gives an overview of the central themes and conclusions of the book. Philosophers addressing the first of our two questions are attempting to discover the fundamental nature of color. As such, they strive to provide a theory of color ontology which best conforms to our everyday beliefs about colors while at the same time achieving consistency with known scientific facts (e.g. that the surfaces of objects reflect and absorb light in different amounts depending on the wavelength, and that the cones in our retina have three kinds of wavelength selectivity).

This means that a wide variety of sources of “evidence” are deemed permissible in the ontological debate: phenomenological data (what we know of the colors just from our supposedly raw visual experience, e.g. that blue appears out there when we look up at the sky, and is more like violet than the color of tangerines); common sense (the allegedly pre-theoretical intuitions which tell us that *the sky is blue*, that *tangerines are orange*); the grammatical structure of natural language (e.g. the fact that color words are adjectives which modify ordinary visible objects and not mental states); and lastly the various sciences, from optics to chemistry, to neuropsychology, to ethology, which all supply us with countless facts about color.³

The standard methodology, which takes all of these sources of evidence to be relevant to evaluating a philosophical theory of color, makes sense if your project is to address the modally ambitious question (1). The empirical evidence alone cannot

³ David Lewis (1997:325) gives the best articulation of these methodological norms: “An adequate theory of color must be both materialistic and commensensical. The former demand is non-negotiable. The latter can be compromised to some degree. But compromise has its limits. It won't do to say that colors do not exist; or that we are unable to detect them; or that they never are properties of material things; or that they go away when things are unilluminated or unobserved; or that they change with every change in the illumination, or with every change in an observer's visual capacities; or that the same surface of the same thing has different colors for different observers.”

be enough to support any claims about the nature of color in alternative possible worlds, nor can it address the metaphysician's questions about how the colors are *grounded* or *constituted*. Empirical data gathered in our one merely contingent world can but serve as counter-examples to theories of color which purport to hold across possible worlds.⁴

Given that my project is to work out the best empirically informed theory (question 2), I hold scientific evidence to be primary. I pay little heed to the "data" of common sense and ordinary language; visual phenomenology is relevant to the extent that it is itself a subject matter for perceptual psychology. It also means that I am not concerned with the metaphysical issues of the grounding or constitution of color. Instead I shift my focus to a matter which has been given more attention by scientists than by philosophers – the "Janus-faced" nature of colors.⁵ The business of explaining the colors points us both towards the "external" world of physical stimuli, and inwards to the subjective world of visual experience. How can we reconcile ourselves to the apparently dual nature of color? What kinds of qualities are colors, such that we attribute them to objects around us and yet we frequently take them to be somehow constructed or generated by our brains?

⁴ One might hold the opinion that science is sometimes in the business of making discoveries about essences or constitution, which have modal implications (e.g. that water is H₂O). While I think that is a misguided way to characterize those scientific results, I would say—less contentiously—that none of the widely known results in the science of color can be taken at face value as discoveries about the essence of color.

⁵ Vision scientists Anya Hurlbert (2013, 375) writes, "[t]his view, that color is neither purely subjective nor purely physical, sounds like a convenient halfway-house, placed in between extreme positions for the comfort of people who like to look both ways. But it is more than that, being a view for people who like to look in depth and detail at how and why color comes into being, not just what color is. It is a view of color that is neither novel nor unique, but becomes ever more entrenched the more knowledge becomes available about the physiology and phenomenology of color vision."

Cf. Mausfeld et al. (1992, 47) and Hurvich (1981, 52)

Chapter 2 (“What Everyone Thinks About Color, and Why”) examines the theories of perception which originated in the late middle ages and in the seventeenth century, as a response to developments in the physical sciences. I argue that the pre-modern and early modern doctrines have shaped the debate over color ontology in ways which are not often appreciated, and the task of this chapter is to unearth and evaluate them. Furthermore, a critical examination of them will inform the positive proposals which I present in later chapters.

The first assumption is *detection*, the idea that if colors are real, it is the job of the color visual system simply to detect them; if they are not real, then it is the mind that projects them onto its surroundings. The second is a *construction of common sense* as being committed to colors as mind-independent properties instantiated on the surfaces of ordinary material objects. In other words, it is the idea that pre-theoretical intuition is committed to realism (probably naïve realism) about the colors. The third posit, *Inner vs. Outer* makes the claim that colors must be properties either instantiated in physical stimuli or in perceiving minds. This position fails to acknowledge the Janus-faced nature of color.

In Chapter 3 (“Realism, Anti-Realism, Relationism”) I discuss the three main genera of color ontologies. My taxonomy contrasts *realism*, the views which assert that colors are instantiated in material objects, and that such instantiations are not dependent on the existence of perceiving minds with anti-realist theories which assert that colors are not instantiated in material objects, either because colors are never instantiated (*eliminativism*) (e.g. Hardin 1993) or because they are only instantiated in minds (*mentalism*). Finally, *relationist* theories posit that the colors are relational properties which involve a material stimulus, viewing conditions and the perceiver as *relata* (e.g. Cohen 2009). It is important also to contrast reductive, *physicalist* versions of realism which identify colors with physical properties such as *spectral surface reflectance* (SSR; e.g. Matthen 1988, Byrne and Hilbert 2003) with non-reductive, *primitivist* theories (e.g. Gert 2008, Allen 2016).

I present arguments against the case made by physicalists, that the perceptual science of color constancy supports their assertion that the visual system detects or “recovers” the SSR’s of surfaces viewed. Their assertion relies on a contentious way of operationalizing color constancy. Physicalism also faces problems accounting for a range of psychological phenomena, such as categorization, which cannot be explained in terms just of SSR’s but which are central to the science of color. Similarly, Hardin’s (1993) scientific case for anti-realism gives us a promissory note that neuroscience alone will be in a position to explain a complete gamut of color phenomena, a claim not born out in the last two decades of research.

I argue that relationist theories are uniquely positioned to accommodate the Janus-facedness of color, but that well-known theories, based on Lockean dispositionalism, do not live up to expectations here. I also contend that the historically entrenched assumptions discussed in Chapter 2 have shaped and constrained the contemporary debate in problematic ways. The existing color ontologies are unsatisfactory precisely because they leave unchallenged the posits which make it difficult to integrate color into a naturalistic world picture. For example, because of the detection assumption anti-realists imagine that achromatic, material reality is falsely colored by the projections of the mind, while realists take colors to be intrinsic properties of objects that are detected independently of our responses to other visible stimuli. Both realists and anti-realists disregard the interactions between color perception and other visual functions, assuming that the function of color vision is simply to *color in* the outlines of objects which are independently recovered by the non-chromatic visual modalities.

Crucially, though, this coloring in model does not mesh with empirical findings about the various uses of color vision, and the influence of perceptual context on perceived color. In Chapter 4 (“Coloring in, and Coloring for”) I present the case for the alternative to the coloring in model. Inspiration comes from the scientific results showing that color vision is not separate or separable from the rest of vision; instead it serves many tasks that are integrated with various visual functions. In one

review, Shevell and Kingdom (2008) catalogue the evidence that color vision contributes to a wide range of important tasks including segmentation of objects, perception of shape, grouping of objects, perception of contours and texture, object detection and identification, perception of depth and motion, and the recognition of shadows. I argue that color vision should not be thought of as a means of seeing color, but as a way of seeing things. Coloring in is replaced by *coloring for*.

Chapter 4 analyses a body of empirical research on color which, I hold, has significant implications for the philosophical debate. Philosophy has good reason to pay attention to the science, if only to wrest itself from certain preconceptions about the nature of color vision that have till now constrained discussions. Chapter 5 (“Perceptual Pragmatism”) considers the further question of whether there can be any such thing as a naturalised metaphysics (or metascience) of color— in the sense of a distillation of the ontological commitments of the science. I discuss some philosophical (or at least theoretical) statements made by scientists in the published literature, and note that owing to significant disagreements in explicit views about the nature of color properties, an ontology of color cannot simply be read off from scientists’ definitions and theoretical commitments.

For instance, Leo Hurvich, one of the originators of the opponent coding theory of color vision, writes that:

“It should be clear by now that object color is not physical light radiation itself, that it is not something that inheres in objects....nor is it only the nervous excitation that occurs in the eye and brain of an observer. In our perception of object color all these elements are involved.”

(1981, 51; quoted in Cohen 2009, 45)

This could be interpreted as an endorsement of relationism, but cherry picking is a risky activity and it is easy to find scientists espousing diametrically opposed theories.

As an alternative route towards a naturalised ontology of color, I reconstruct a *naturalised epistemology* of perception. I ask how the truth and informativeness of perceptual states is understood by contemporary perceptual science. I argue that instead of evaluating the success of perceptual states in terms of the detectionist ideal of correspondence between external stimulus and visual representation, science upholds a pragmatic ideal of usefulness. That is, a perceptual state is correct if it successfully guides an animal's activity. Furthermore, perception is theorized as an active and interactive engagement between the animal and its environment and not as the passive process of detection.

So while one cannot read off a consistent ontology of color from scientists' theoretical statements, an epistemology of perception can be derived from the scientific orthodoxy, and I argue that this is significant for the ontology of color. My point is that both realists and anti-realists gain their motivation from the detection model of perception, and the correspondence epistemology of perception which is associated with it. The ideal of correspondence spurs the realist (here, physicalist) to find a match between our inner perceptual states and the outer physical properties which they are thought to represent, and so they identify color with SSR. Likewise, the anti-realist notes the mismatch between our perceptual states and the known features of SSR's, and infers the conclusion that color is unreal from the failure of correspondence. So the negative case for color relationism is just that this class of color theory retains its motivation even when, as naturalists, we have abandoned correspondence as a framework for assessing perceptual states.

The task of Chapter 6 ("Active Color") is to outline the specific version of relationism which is underwritten by perceptual science. I begin with an important question for the metascientific project of this book: *what would vision science want from a relational philosophy of color?* The important desiderata are that a theory should accommodate the "Janus-facedness", and that it should be *monistic* in the sense that it lays the groundwork for a truly integrated science of mind and brain.

I argue that a new theory—*color adverbialism*—is best able to deliver on these points. The adverbialist defines colors as follows:

Colors are properties of perceptual interactions involving a perceiver (*P*) endowed with a spectrally discriminating visual system (*V*) and a stimulus (*S*) with spectral contrast of the sort that can be exploited by *V*.⁶

I also give the following articulation of the theory:

Colors are ways stimuli appear to certain kinds of individuals.

and

Colors are ways that individuals perceive certain kinds of stimuli.

Here, perceiving and appearing should be thought of as a mutually dependent pair of activities that together make up the perceptual interaction which instantiates color. Thus colors can be treated as modes of appearing-and-perceiving. For example, when a person looks at the sky on a cloudless afternoon, the expanse above her appears to her (shows up for her) in a blue way, and likewise, she is perceiving it in a blue manner.

The proposal is that colors are properties not of objects, nor of perceivers, but of the perceptual interactions that relate these two. It is a kind of *adverbialism* because colors are attributed not to things but to an activity (perceiving). For example, instead of saying that the cucumbers are green, the adverbialist opts to say that they are seen in a green way—seen greenly.

The point of my proposal is not to encourage people to replace ordinary English with these awkward adverbial rephrasings. Rather, it is to capture the insight of the

⁶ *P* is any sighted animal with the right kind of visual system; *V* is intended to include the visual machinery of all creatures conventionally classified as having color vision proper, i.e. with opponent processing and some degree of color constancy, but not those systems with just the capacity to perform reflexive behaviours on response to stimulation with specific wavelengths of light; *S* must bear spectral contrast – i.e. it must reflect or generate patterns of light with wavelengths in the discriminable range of at least one kind of visual system.

scientific work presented in Chapter 4 on the interaction between chromatic vision and other visual processes. The important lesson is that seeing in color reveals a world of things around us, regardless of whether or not those things bear a physical or mind-independent property that corresponds to our chromatic experiences.

Color adverbialism has three salient features:

1. *Activity*. Color is primarily to be analysed in terms of processes occurring, not things subsisting. The idea of perception as an activity is central.
2. *Relationality*. The processes in terms of which color is to be analysed relate perceivers to their environment. They are not the internal sensing events of traditional adverbial theories.
3. *Attribution*. An unusual notion of color attribution. Strictly speaking, color is not a property which can be attributed to extra-dermal objects or to perceivers.

In the closing sections of Chapter 6 I discuss the implications of the first two of these features. Regarding (1), I defend the “idealist” implication that no colors are instantiated in an object unless a perceiver is currently looking at it. Regarding (2) I discuss the objection that there can be colors even in the absence of perceived objects, e.g. in dreams and hallucinations, and give a “disjunctivist” response. The point is that colors appearing in such cases, since they are instantiated in a purely internal process, are of a different property type from the standard colors, even though they have a phenomenological similarity.

Chapter 7 (“True Colors”) addresses some obvious objections to color adverbialism which arise from considering the dominant frameworks within the philosophy of perception -- representationalism and naïve realism. The motivations for color adverbialism stem largely from consideration of the theoretical commitments and conceptual needs of perceptual science. As such, the theory is not intended as an ontology which will make sense of ordinary color discourse, or as an analysis of color visual experience. However, it is still beneficial to see how it stands with respect to mainstream theories in the philosophy of perception.

I argue that color adverbialism is compatible with Fregean version of representational theory. On this account, experiences involving color are elicited by configurations of numerous kinds of properties in the environment—spectral ones like SSR and wavelength of light, and non spectral ones like texture, shape and motion. The phenomenal contents of an experience of these properties involve modes of presentation (MOP's) of them. For example, when I see an a “red ball”, the redness I experience is a mode of presentation of its spectral and non-spectral properties – i.e. I see its sphericity, smoothness and SSR redly.

I also argue that color adverbialism can be accommodated by the naïve realist if she takes seriously the new picture of the functions of color vision presented in Chapter 4. Color vision does not serve us as a means to acquainting us with the colors of things; rather, it helps us to see *things*. Once one accepts the idea that color vision is integral to the perception of objects—their material boundaries, their 3-D structure, and their very there-ness amongst other objects in space—it becomes intuitive to say that color vision gives us access to the presence of those things or “acquaints” us with them.

A further advantage of the new functional picture is that it gives the adverbialist (unlike the standard color relationist) the resources for a substantial account of misperception. When there are dramatic failures of color constancy, for example when everything is bathed in bright green light, and in such viewing conditions white tea cups look green to you, it really is the case that you are seeing less well.⁷ A host of functions served by color, such as scene segmentation, differentiation of shadows from surfaces, and object recognition, will all be under-performing. The adverbialist asserts that genuine misperception does occur, without analysing it in terms of the attribution of the wrong color to an object. This is called *ecologically relevant misperception*.

⁷ It is not just that the teacups are (correctly) seen as green-in-conditions-of-green-light, as Cohen's relationist asserts.

Numerous authors have claimed that color relationism is simply not compatible with the deliverances of introspectible experience. Since visual experience is a source of data in perceptual psychology, I give this objection more weight than the similar objections based on common sense and ordinary language. In Chapter 8 (“Outerness Without Ontological Commitment”) I address this criticism of color relationism, in general, and tackle the implications for color adverbialism, in particular. I argue that the objectors to relationism have yet to demonstrate that experiences of color per se—and not experiences of objects with color, shape, size, and numerous other properties—are the source of their intuition that colors are out there in the world, and perceiver independent. Phenomenology, I will argue, is uncommitted about the ontological issues. Moreover, the objectors have yet to show that their supposed phenomenological facts are independent of theoretical views about the nature of color. Color adverbialism is no more vulnerable to phenomenological objections than other versions of relationism.

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Reply to Joshua Gert

Amongst many helpful and insightful comments, Gert proposes two friendly amendments to the theory presented in *Outside Color*. Firstly, the suggestion is to replace the “local pragmatism” of Chapter 5 with a “global pragmatist” account; and secondly, to restrict adverbialism to the unstable “apparent colors”. I will discuss each of these options in turn.

My local pragmatism amounts to the rejection of an analysis of perceptual states whereby their veridicality is assessed by how closely they correspond to external states of affairs. From a biological perspective, I argue, success in action (e.g. locating and recovering the items crucial to one’s survival) is the relevant standard for assessment, not accuracy per se. Importantly, though, it is left open that the having of representationally accurate perceptual states may lead the animal to perform successful actions.⁸ Even in such cases, it is the behavioural outcomes that are the benchmarks of success, not correspondence per se.

Gert is concerned that unless we follow the global pragmatist in garnishing perceptual states with some representational notions of mind-world matching (albeit understood in a deflationary way), there is nothing to distinguish a perceptual from an emotional state. Both perception and emotion are embedded, interactive, and action guiding, and both can be implicated in successful and maladaptive behaviour.

In response I would like to focus on the characteristic role that perception, but not emotion, plays in motor control. As Dewey (1896) brought home long ago in his essay on the reflex arc, perceptual processes are bound up with motor systems to make a functional unit which executes behaviour appropriate to environmental

⁸ Though some simulations in evolutionary game theory indicate that accuracy-seeking is, in general, a losing strategy (O’Connor 2014).

conditions.⁹ While behaviours are certainly influenced and spurred by emotions, their execution (stepping, dodging, reaching) is reliant on a flow of multi-modal perceptual input. We are misled by the framing of the question as the difference between perceptual and emotional *states*, such as looks and feelings. If we only examine these, it is tempting to mark the difference with the idea that the former states have external accuracy conditions but the latter do not. However, if we look more broadly at perceptual and emotional *processes* and their role in behaviour—the seeking of and acting according to visual stimulation, versus the fearing that may or may not lead to fleeing—the outer-directedness of perception, the fact that perceptual systems seek out and are constantly modulated by external stimuli, stands out in contrast to the relative disconnect between environment and affect.

In order to evaluate the relative merits of global and local pragmatism about color, it is worth considering more broadly what shapes the dispute between proponents of these views. We have been pulled in two opposite directions because the deliverances of science, on the one hand, and ordinary discourse, on the other, are at odds on the question of what norms and constraints are to be employed when analyzing perceptual states. Ordinary color discourse does feature norms of correctness regarding chromatic perceptual states. For example, I stand to be corrected if I refer to some foliage observed during a nighttime walk as “being black”; it only “seems” or “appears” that way, my companion would tell me.

In contrast, empirical findings of widespread variation amongst normal (i.e. trichromatic) color perceivers, species of animals, and viewing conditions, along with the finding that for most of these examples *nothing in natural science* confers veridicality on one of the variants, makes it reasonable to conclude that there are no absolute norms for the accuracy of color visual states. Cohen (2009) settles for the

⁹ “[W]hat is wanted is that sensory stimulus, central connections and motor responses shall be viewed, not as separate and complete entities in themselves, but as divisions of labor, functioning factors, within the single concrete whole, now designated the reflex arc.” (Dewey 1896:358).

view that there is no way for a perceptual state to *misrepresent* color. Every color is a relation between an object, perceiver and viewing condition, and ultimately there are no normative constraints which divide veridical from false perceptual variants.¹⁰ Since my theory intends to reconstruct and elaborate on the concept of color in perceptual science, I have to take very seriously the finding of widespread variation without empirically determinable correct variants. But like Matthen (2005) I think that success in behaviour is an alternative, scientifically grounded, source of normativity – this is the essence of my local “perceptual pragmatism”.

The starting point for the global pragmatist is not the corpus of scientific results but the normativity observed in ordinary language used to communicate perceptual states. The idea is that success in coordinating behavior using such language, and the usefulness of the representational idiom, is enough to impose normative constraints on color perception and language. The success-to-truth move is somewhat like the perceptual pragmatist’s one, but it goes via human language rather than animal behavior. Since *Outside Color* is intended to provide an account of color inspired by and fitted to the science of animal (human and non-human) perception, I prefer the behavioral over the discursive sources of normativity. Yet one very significant limitation of my account is that it is entirely individualistic – it assumes that the paradigmatic visual perceiver is an isolated animal, and that all of the behaviors relevant to judging perceptual success can be performed by an animal isolated from its social group.

So it is fair for Gert to point out that the utility-to-correctness move I describe in the case of the person who is unconsciously motivated to steal a new coat runs into trouble as soon as we put our thief in a social context – when she is challenged by another person to provide reasons for her perceptually informed beliefs. By its nature, a philosophical account of perceptual discourse and reason-giving amongst

¹⁰ See Cohen’s (2015) answer to the question of how relationists should account for common sense standards of correctness and the genuine disagreements over color ascriptions which occur in ordinary discourse.

humans cannot be individualistic. It is much clearer to me now than when I wrote the book that the metascientific project reaches its limits when theorizing the role of color in these distinctly human activities.¹¹

Thus I find myself in agreement with Gert that the best analysis of “coarse-grained color vocabularies” is not an adverbialist one. These can only be understood in a human, social context and it is clear, there, that our ordinary color terms function in a representational way. As Gert suspects, I do think that we should recognize that we are theorizing different kinds of properties. But this is not just a dialectical dodge – it is an acknowledgement of the complexity of our topic, and the limitations of a one-size-fits all theory.

I will now move on to discuss Gert’s terminological suggestion. Color adverbialism needs all the friends it can get and so it might seem a minor concession, well worth making, to re-label it a theory just of “color appearances”. I employ scare-quotes here because I prefer to think of these as *the colors we encounter in visual experience*, without prejudice in favor of the idea that these colors are *mere* appearances, less real than the stable ones which we refer to in color discourse. The colors we encounter in visual experience are often, but not always, shifting and unstable.¹² In contrast, ordinary color discourse deals with coarse-grained, stable colors whose relationship to the subject matter of the sciences is contested. For now, let’s call the ones encountered in experience “E-colors,” and I’ll designate those featured in ordinary language as “L-colors.”

E-colors are the starting point for the psychology of color, and the target for mechanistic explanations of color discrimination in neuroscience. Gert tells us that it would be an unsatisfactory outcome if we were to use such terms to carve out

¹¹ I will take up this point below in my reply to Gupta.

¹² It seems right to say that visually-encountered colors are stable when we experience color constancy. But introspection is notoriously indecisive here. Philosophers introspecting on shape constancy have reported the shape of the tilted penny as being either circular or elliptical, or both (Schwitzgebel 2011)

separate and distinct ontologies. Indeed, he thinks an advantage of the term “color appearances” is that it makes obvious the relationship between the properties so designated and the “colors” simpliciter – as analogous to difference between the real shape of the penny, and the unstable shapes that appear as I tilt it. I will now make some conjectures about the relationship between these two color ontologies, as an alternative to the color/appearance proposal.

Let us step back a moment and consider the whole debate over color as a *placement problem* as described by Price (2011). We have before us the material world which is investigated by physical science and biology. Both visual experience and ordinary color discourse seem to be committed to properties that are hard to place in this material world – qualitative, sui generis, perceiver independent chromatic properties which abide on the surfaces of things.

Gert’s pragmatist tells us why color discourse is not *really* so committed to color properties which stand in a reference relationship to our ordinary color words. In a similar way, the account of visual experience I give in Chapter 8 urges that *visual experience* is ontologically non-committal – the chromatic properties presented to us in visual experience do not seem to be perceiver dependent or independent, neither thing-modifying nor process-modifying. (What I do say, in a more committed vein, is that the best naturalistic account of the fact of our visual experiences featuring color is the adverbial one.¹³)

¹³ That is, in Chapter 6 I do not treat the ontological commitments of color *science* in a deflationary way; instead, I take scientific models and theories to be describing (or attempting to describe) how things are even with respect to metaphysical issues such as the nature of sensible qualities. An alternative to this position is to treat the ontological commitments of the sciences in a non-descriptive, deflationary way, as urged by Carnap (1950/1956), when he draws the distinction between internal and external existence questions. Fully articulated, this view would be a variety global pragmatism, but one which starts with the analysis of scientific rather than ordinary discourse.

To reiterate, I see no reason to designate “L” and “E” colors as “actual” and “apparent”, respectively, other than deference to ordinary language conventions. And since my naturalist rejects these conventions she might even be tempted to flip the designation and treat L-colors as less fundamental than E-color. Color is interestingly different from shape because both the naturalist and the ordinary language speaker agree on the designation of stable L-shapes as mind-independent properties of objects, and that E-shapes are mere appearances.

It is in the naturalist’s interests to say something about the emergence of ordinary, stable color discourse from the flux of our visual encounters with color,¹⁴ where this discourse is required primarily for inter-subjective communication about everyday items. Such an account is beyond the scope of these brief responses but one source of inspiration might be Sellars’ (1956:270-275) case of John and the necktie. John learns to describe the tie as “looking green” in artificial light but “being blue” only by learning to follow the convention that daylight is the illuminant under which things look the way they are. The point of the color adverbialist supplementing her account with such a story is not to engage in speculative anthropology but to show how, in principle, it is quite plausible that a community of speakers who only ever have visual experiences of E-colors could still end up with a language of stable L-colors by instituting norms of standard conditions and perceivers.

¹⁴ Ugly prefixes should only ever be a stepping stone towards a unified account!

Reply to Anil Gupta

With much precision and clarity, Gupta presents two important objections to color adverbialism, and sets two requirements on the successful defense of the view. I will address each of these points in turn.¹⁵ Firstly, the *Objection from Experience* is that visual experience is a reason giving presentation of items. Thus the presentation of a tomato as red gives one a reason for claiming that object is red. Prima facie, this is incompatible with the color adverbialist claim that ordinary visual experience of a ripe tomato presents it in a *red way* without any attribution of redness to the fruit. So the question is, what reasons does color visual experience, understood adverbially, provide us with?

The conservative response is to marry color adverbialism to one of the standard accounts of visual experience, as outlined in Chapter 7. If we accept either the naïve realist or neo-Fregean version of color adverbialism, we can say that the color visual experience of a tomato provides us with reasons for making claims about the *non-chromatic* properties of the object – that it is round, glossy, ripe, and there on the table. Because this response is conservative, it falls back on much of the conceptual machinery that I wish in *Outside Color* to disrupt – in particular, it reinstates the correspondence account of the accuracy of perceptual states.

Furthermore, Gupta states his concerns about the viability of these hybrid accounts. I would like to take a moment here to address these concerns, even if ultimately I do not endorse the hybrid positions. One proposal, inspired by naïve realism, is that colors be considered as properties of processes of acquaintance. Gupta writes, however, that “[a]cquaintance is a relation of knowing, and while it makes sense to speak of knowing of blue and red things, it makes little sense to speak of red and blue knowings.”

¹⁵ The challenge of providing empirical reasons to adopt color adverbialism is addressed below, in conjunction to my responses to Matthen.

A quick defense is just to say that the proposal is no *less* strange than other ways that naïve realists have characterized acquaintance. For instance, I struggle with William Fish's notion of phenomenal character being a property of acquainting us with properties of perceived objects.¹⁶ I take the idea to be that green phenomenal character, say, is my visual experience's property of acquainting me with fact that a cucumber is green. I do not grant that this is any less problematic than the adverbialist's characterization of greenness as a property of my perceptual interaction, understood as visual acquaintance, with the non-chromatic qualities of the cucumber – with its presence, its shape, and its glossiness. In fact, I think it much more helpful to classify acquaintance as a process, rather than a property.

Gupta also takes issue with the proposal to assimilate adverbialism to Fregean representationalism, whereby perceptual interactions are understood to be modes of presentation. In developing the proposal I was deliberately following the various neo-Fregeans who do mentalise modes of presentation and employ them when theorizing the sensible qualities.¹⁷ The point of the exercise was to develop a version of color adverbialism which would appeal to philosophers already committed to a version of representationalism, and so the cogency of such a view was assumed at the outset. My aim was not to preach to the unconverted.

Putting these matters aside, an alternative line of response Gupta's objection from experience does not marry color adverbialism to either the naïve realist and neo-Fregean accounts of visual experience, but instead extends the pragmatist elements of the account. As mentioned above in reply to Gert, the local perceptual pragmatism of *Outside Color* is intended to offer norms for evaluating the sensory states of

¹⁶ Fish (2009, 75–6) “When we see a ripe McIntosh apple, the phenomenal character of our experience is its property of acquainting us with the fact of the object's being *red*, when we see a ripe cucumber, it is the experience's property of acquainting us with the fact of the object's being *green*.”

¹⁷ E.g. Lycan (2015) “the posited introspective modes of presentation for sensory qualities in the first-order sense are strong candidates for the title of “qualia” in a distinct, higher-order sense of the term....”

individual animals going about their lives. The outlook is individualistic; following the lead of most perceptual science, it only considers the visual responses of the isolated animal to be relevant to understanding the visual system.

However, reason giving is a communal and characteristically human behaviour. It is pragmatically appropriate for us as a community to treat the colors encountered in visual experience as intrinsic properties of things, as long as they are *fairly* stable across subjects and viewing conditions. And it is at this point that it makes most sense to apply the norms and constraints indicated by ordinary discourse, rather than the action-relative ones of the perceptual scientist. At this stage, global pragmatism is highly appealing.

But one might well balk at the philosophical opportunism displayed here -- invoking norms, and theories of perceptual experience willy nilly, as suits the case in hand. This highlights the importance of pursuing the agenda I set out at the end of my responses to Gert. For the adverbialist to account properly for reason-giving experience, she needs an integrated account which shows how the “L-colors” of human discourse make their way into our conceptual world on the coat-tails of the “E-colors” that feature in the visual experience of humans and other animals, are the subject matter of visual science, and are best analyzed adverbially. L-colors, in contrast, are attributive (object modifying) and are to be understood in the metaphysically-deflationary way outlined by Gert. L-colors earn their place in our ontology not because they are really out there on the surfaces of things (or because science tells us they are there), but because they are integral to our way of describing visual experience, and hence giving reasons for beliefs about many things around us – the beliefs, for example, that the tomatoes are ready to pick and the bird in the tree over there is a cardinal.

This position ought to take the teeth out of the *Objection from Common Sense*. In *Outside Color* I am impatient with the methodological stricture which says that color ontology must be equally accountable to science and common sense. However, the

fact that other philosophers have developed rival ontologies which are not inconsistent with scientific results,¹⁸ while being more compatible with common sense, puts adverbialism at a dialectical disadvantage. The situation is ameliorated once the adverbialist explains how the commonsense view is simply an explication of the pragmatically useful L-color concepts, which are themselves an abstraction from the E-colors encountered in experience and investigated by science.

For the purposes of dividing conceptual territory I have separated scientific discourse from the common sense language used to describe visual experience. However, as Gupta points out, perceptual observation is fundamental to scientific practice and scientific progress occurs, in part, through the communication of perceptual reports from one scientist to another. It is legitimate to worry that the proposed deflationary treatment of the colors referred to in ordinary language is too non-committal to figure in an account of the reason-giving practices of empirical science.

For example, one could object that the biologist's observation of colors in order to recognise novel species of birds, and the chemist's investigation of new reagents by watching for chromatic changes, is more than a pragmatically useful social practice – it is their means of making discoveries about nature. One might go as far as to say that the fact that scientists use color in their descriptions of the natural world is reason to assert that color discourse is *fundamentally* descriptive, contrary to Gert's pragmatist reinterpretation. And this puts a robustly realist color ontology back on the table of options.

I would like to advocate for a more nuanced view. My first point is that scientific observation is itself a highly regimented, social practice. In order to become scientific observers, individuals must be trained to perceive the world in unusual ways, and proficiency requires that distinct norms and constraints on acceptable

¹⁸ As Matthen notes in his comments, these views are suspiciously impervious to disconfirmatory scientific data.

perceptual states become incorporated by the novice. This is a process not so unlike Sellars' account of John learning to describe the color of neckties seen under different lights.¹⁹ It is easiest to recognize the process in cases where the novice is trained to categorize particular kinds of objects (e.g. fossil bones), but equally so when the task is to learn to associate subtle shifts in color with differences in chemical composition.

My second point is that the development of norms for scientific observation is part of the intellectual process through which scientific theories and experimental practices are formed. Regarding color, the lesson from Meli (2011) is that the reliability of color observations as a marker of biologically significant phenomena was highly contested by early modern anatomists and physiologists. Similarly, Baker (2015) shows how Robert Boyle's extensive research into the production of color effects was, in part, prompted by the question of whether and how color observations could be used as indicators of chemical changes. One outcome of his efforts was the invention of the litmus test.

The upshot of all this is that the empirical sciences can only leverage perceptual observation to develop and adjudicate theories of natural phenomena after substantial groundwork has been put in place in order to systematize observations and to glean some theory of the relationship between sensory states and the phenomena under investigation. There is no straightforward path from sensory experience to revision of scientific theory, and empirical reasoning in the sciences deserves to be treated differently from the use of perceptual experience to justify beliefs in the context of everyday life. In these brief comments I have not presented an account of perceptual rationality in the sciences but only pointed out an area in which more work needs to be done by philosophers.

¹⁹ See essays in Daston and Lunckebek (2011). In particular, Pomata (2011) demonstrates the importance of the dual meaning of "observe" as "to perceive" and "to follow a rule".

Reply to Mohan Matthen

In a sequence of most interesting and provocative comments, Matthen challenges the methodological agenda behind *Outside Color*, in particular its engagement with existing debates over color ontology. Here I will make the case for why one should pursue empirically informed color ontology, while also responding to Matthen's criticisms of my historical and conceptual arguments.

Matthen contends that theories of color ontology are entirely insulated from countervailing empirical evidence. In contrast, Gupta is optimistic that the color adverbialist will be able to provide empirical reasons in favour of her theory. In response both to Gupta and Matthen I will now defend an intermediate position, explaining why I think that color ontologies are answerable to scientific results, even though the contact between metaphysics and experimental science is indirect.

As Matthen rightly observes, philosophers do not waste their time disagreeing about the facts of color science. Instead, philosophers writing on color subscribe to a common body of empirical knowledge, which includes the visual science of trichromacy, opponent processing, color constancy, and the physics of light transmission and reflection. Let us call this the "core empirical knowledge". The standard theories of color ontology can be thought of as the product of combining this core empirical knowledge with a broad philosophical view about the nature of sensory awareness. For instance, if one's philosophical inclinations are towards *internalism*, the thesis that sensory states are entirely determined by what is inside the skull, then color *mentalism* is the natural conclusion to draw from the empirical facts about correlations between brain states and subjective experiences. In contrast, the *externalist* thesis that sensible qualities are physical qualities²⁰ leads inexorably to color physicalism once confronted with the core empirical knowledge. In short, the physicalist identifies color with the distal, external triggers of

²⁰ See Pautz's (2013) characterization of "tracking intentionalism".

chromatic sensory states (classes of spectral surface reflectance, etc.), whereas the mentalist claims that colors are only instantiated in inner sensory states.

The broad philosophical outlook which motivates color adverbialism is that of *mediation*. This is the idea that perception should be characterized as openness to the world – that sensory states should be characterized in terms of the relation between the perceiver and its environment. It is a view which appreciates the strengths and weakness both of externalism and internalism while asserting that sensory states should not be characterized exclusively either in terms of distal physical stimuli or internal sensory responses.

The three theses cannot be directly confirmed or disconfirmed by empirical data.²¹ In other words, there is no experimental test for internalism, externalism, or the mediation thesis. However, I do think that empirical findings do have traction in the evaluation of the theses. In Chapter 6 I make the case that the interdisciplinary nature of color science – that it spans the territory of physics, physiology and psychology – stands against internalism and externalism. I also contend that progress towards an integrated science of the mind and brain has been hampered by the mental-physical dichotomy which both the internalist and externalist endorse and entrench.

It is worth expanding upon these points in the terms of the metascientific methodology discussed in the précis. The first point is that science never proceeds in an intellectual vacuum. Scientists also breathe in the rarefied air of metaphysics, and such metaphysical conceits as internalism can be animating ideas within their research programmes. It is one of the tasks of metascience to analyse the role of such non-empirical, theoretical assumptions within the sciences. Internalism, externalism and mediation could all serve as metascientific frameworks for perceptual psychology. Therefore, the empirical sciences built on them can be

²¹ Pace Pautz (2013). Chirimuuta (2008) gives the argument that non-empirical theoretical suppositions play an important role in color constancy research.

evaluated for success and fruitfulness. Even if we grant Matthen that there is no scientific fact “at stake in contemporary dispute about the ontology of color,” we can still ask if the science of perception has the best chance for progress if it takes up either internalism or externalism as its conceptual framework, or if the mediation thesis is the most promising option.

The next issue to be addressed is Matthen’s rejoinder to my conceptual case against color realism (here, physicalism). Matthen’s worry is that I conflate questions about the “structure of the colors” with those about “attribution”. Matthen points out the distinctness of questions concerning the relations between *blue*, *yellow*, and *turquoise* – e.g. whether turquoise is a kind of blue, and whether such relations are perceiver-dependent. Such structure questions are contrasted with attribution questions, those which ask for the conditions in which chromatic properties are rightly said to be instantiated by their bearers. A key question of attribution is whether or not the instantiation of colors is perceiver independent.

Matthen writes,

“[t]he questions are independent. You can hold that the color structure is mind-dependent and still hold that objects are brown or red independently of the circumstances in which they are viewed. Conversely, you can hold that the [structural relationships between] colors are mind-independent, but think that because their attribution to objects is not absolute, they are relations.”

Agreed, there are genuine distinctions to be made here. However, color realism in its full blooded sense goes aims at mind-independence both for structure and attribution -- this is why primitivists attack physicalists for letting the side down over structure. Moreover, answering the question of whether or not the attribution of colors is mind independent means getting clear on what the colors are like; and this means taking into consideration their structural relations, amongst other

things.²² If the salient features of color are structural, and structure is mind dependent, that is a good reason to think that the colors themselves are mind-dependent.

Matthen himself endorses a realism of an attenuated sort, where structure is mind-dependent and attribution is mind-independent. Here, red, for humans like me, is whatever property it is that stimulates my L-cones more than the others. Once red is defined, for humans like me, it is an objective fact of the matter whether or not rubies are red, and if they are they will be so whether or not anyone looks at them. My worry here is that an ontological theory of colour should not be silent about the qualitative aspect of colour – that colours feature in visual experience; but if colours are to be explained by with these cone-stimulation tendencies, perhaps supervening on them, they cannot be visible properties.

These points bear on Matthen's comments on the notion, central to *Outside Color*, that chromatic properties are "Janus-faced". Taking the inner-outer nature of colour makes me weight the visible dimension of colour more seriously in my theorizing than Matthen does. Before going into a detailed response to Matthen's criticism of "Janus-facedness", I wish to make an initial point about the interpretation of the variety of relationism which I espouse. Matthen casts it as the claim that in undergoing color experiences I am sensing "facts about myself" or a "relational property of myself." It is important for me that sensory states involving color are "outer directed"²³ – that they yield information about external objects and can be contrasted with proprioceptive and interoceptive states which inform me about the state of my own body. So I never took it as commitment of color adverbialism, or color relationism more generally, that in experiencing color I sense facts about myself (in any straightforward way).

²² This approach is by no means peculiar to me. It is central to the arguments against physicalism by Allen (2016) and Pautz (2013).

²³ The point of Chapter 8 is to argue that this outer-directedness is not incompatible with color relationism.

A better way to characterize how the perceiver comes into the picture is with the idea that perception involving color is inherently perspectival. As I state in Chapter 6, colors are ways that objects appear to perceivers with certain kinds of visual systems. Similarly, the projected shapes of a dinner plate are the ways that it appears to individuals positioned at particular angles of view. In viewing the projected shape, the perceiver is not sensing a fact about herself, but she is sensing a relational property which involves herself as a relatum, namely, the shape as projected to her retinae.

Interpretative points aside, the substantial criticism from Matthen here is that the empirical case presented in Chapter 4, that the function of color vision is not to detect any particular set of perceiver independent properties (“the colors”), makes no dialectical dent on the color realist. As Matthen summarises (and I do not disagree), “it is still a real [i.e. perceiver independent] property of ripe tomatoes and strawberries that they reflect comparatively more light that stimulates the L-cone.” None of the empirical evidence I present in *Outside Color* can prevent a realist defining “red” in terms of such real properties of ripe tomatoes, strawberries, etc., if she so chooses. But my argument against the realist works by removing the motivation for this dialectical move, rather than actively impeding it. In short, the point is that absent empirical evidence that the function of color vision is the detection of some putative, mind-independent chromatic properties, why should you be tempted to identify colors with the distal causes of sensations which fill this theoretical job description? I argue in Chapter 5 that the realist’s motivation is not a good one – it comes not from a grasp of the scientific facts, but from unreflecting loyalty to the model of perception as a process of detection.

This act of forcing philosophers to unearth and examine the root assumptions and motivations behind their positions, by subjecting them to comparison with ideas emerging from the empirical sciences, is another substantial way in which those sciences can make a difference to philosophical debates. Indeed, it is true that one

can tinker with any philosophical theory of color to make it compatible with the empirical data and, as Matthen describes, each rival philosopher can translate the adverbialist characterization of perceptual processes and interactions, which I claim are conceptually significant revisions offered to us by the science, into her preferred idiom. But I, for one, view this activity with suspicion. It requires a closed mindedness to the conceptual possibilities opened up by advances in the science. It is not a mindset to be encouraged when doing naturalistic philosophy of mind.

In Chapter 2 I offer the history of natural philosophy as another source of inspiration for conceptual overhaul. In a rhetorical flourish I urge contemporary philosophers finally to cast aside the sensible forms of the Scholastics. But my argument is not that color realism, in all its forms, is a throwback to the middle ages. The central point is that many philosophers – including contemporary realists and anti-realists and the early moderns -- subscribe to an interpretation of common sense and color experience which can be stated as follows: absent any sophisticated theoretical and empirical investigation, it just seems to people that colors are mind-independent properties of visible surfaces. The importance of this point in my case for color adverbialism is that it loosens us from the grip of the idea that any view differing from realism is in conflict with raw visual experience and people's native beliefs about the visual world, based on such experiences. Common sense, it is argued, is historically contingent.

In sum, the argument is not that contemporary color realists are "stuck with scholastic sensible forms". Physicalists are certainly not ontologically committed to such obsolete theoretical posits. An interesting issue, mentioned in passing by Matthen, is whether naïve realists who subscribe to a primitivist theory of color do hold something like the pre-modern view. On Allen's (2016:4) account, naïve realists are committed to the thesis that colors are "distinct from properties identified by the physical sciences." This of course raises the question of what kinds of properties the colors could then be – are they something like the pre-modern sensible forms? I do not think that even the naïve realists are committed to such

ontological excesses. There are many ways for properties to be distinct from those of the physical sciences – *faithfulness*, *fitness*, and *greenness* (as understood by the color adverbialist) – all have this mark of distinction. The challenge for the naïve realist is to show how distinctness is consistent with the mind-independence of the colors, since science is most often taken to be uniquely qualified to describe the entities and properties of the mind-independent world.

So my argument is not that philosophers need to make an evolutionary leap from a medieval to a seventeenth century ontology of color. Matthen is right to emphasise the infelicities and inconsistencies that come along with the early modern theory of perception and sensible qualities. My examination of the entrenched, historical problems in the philosophy of color did not lead me to the view that this domain of philosophy is in some blanket way “less evolved” (less modern, naturalistic and sophisticated) than it should be. Instead, I think of philosophical theories in the way that a structuralist evolutionary biologist would analyse the body of a living animal. The creature is completely modern and quite well adapted to the current intellectual environment; at the same time, its anatomy is the legacy of the many generations of ancestors that it evolved from, and some of its structures are entirely vestigial, serving no function in the landscape of today.²⁴

The detection model of perception is one such vestigial trait in contemporary philosophy of color. Indeed, the “eye is not a camera trope” is not in itself an argument against recent color realists, because these philosophers are not rehashing Kepler’s *Optics*. Rather, the point is that conceptualization of biological vision as the passive reception of external light rays and/or sensible qualities was there in Kepler’s model of the eye as a camera, and it also animates the realist when she asserts that the problem of color ontology is solved when we have found the external property that the visual system is responding to when we experience color.

²⁴ Adams (2016) employs a different metaphor to make a similar point. He observes that the modern concept of color is like a rope knitted from numerous strands, including Cartesian and Aristotelian ones.

The aim of *Outside Color* is to convince the reader that a solution to this problem cannot be so simple. We will not find out what color is just by looking outside – or inside – but by reconsidering the nature of, and relationship between, these apparently divided realms.

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