Is Perceptual Indiscriminability Nontransitive?

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It is widely supposed that one family of sorites paradoxes, perhaps the most perplexing versions of the puzzle, owe at least in part to the nontransitivity of perceptual indiscriminability. To a first approximation, perceptual indiscriminability is the relationship obtaining among objects (stimuli) that appear identical in some perceptual respect—for example, hue, or pitch, or texture. Indiscriminable objects look the same, or sound the same, or feel the same. Received wisdom has it that there are or could be series of objects \( o_1, \ldots, o_n \) in which \( o_i \) and \( o_j \) are indiscriminable, \( o_j \) and \( o_k \) are indiscriminable, etc., and \( o_{n-1} \) and \( o_n \) are indiscriminable, but \( o_i \) and \( o_n \) are discriminably different. For example, there could be a series of colored patches so ordered that each patch looks the same in hue as its immediate neighbors, but the whole progresses from a clear case of red to a clear case of orange. On the assumption that an observational word like ‘red’ applies to both if to either of a pair of perceptually indiscriminable items, the absurd conclusion of the sorites comes into view. Crispin Wright (1975) explains:

Since colour predicates are observational, any pair of objects indistinguishable in point of colour must satisfy the condition that any basic colour predicate applicable to either is applicable to both. It is, however, familiar that we may construct a series of suitable, homogeneously coloured patches, in such a way as to give the impression of a smooth transition from red to
orange, where each patch is *indiscernible* in colour from those immediately next to it; it is the non-transitivity of indiscriminability which generates this possibility. So, since precise matching is to be sufficient for sameness of colour, we can force the application of ‘red’ to all the patches in the series, some of which are not red but orange. (338–39)

Sorites series in which adjacent items are indiscriminable, as opposed to slightly or just noticeably different, are thought to generate the most baffling versions of the puzzle because indiscriminable items look exactly alike. It is thus especially difficult to see how one might block “the application of ‘red’ to all the patches in the series.”

The sorites is not the only philosophical conundrum blamed on the alleged nontransitivity of indiscriminability. Consider, for example, the project of specifying identity conditions for determinate shades of color, the finest hues we can discriminate. Christopher Peacocke (1992: 83) writes:

> it is pretheoretically tempting to suppose that . . . perceived shades s and s’ are identical if and only if s is not discriminally different from s’. The nontransitivity of nondiscriminable difference (“matching”) entails that there is no way of dividing the spectrum into shades that meets that condition. Take an example in which, in respect of color, x matches y, y matches z, but x does not match z. To conform to the above principle about shades, the shade of y would have to be identical with shades that are distinct from one another.

Taking a different tack, David Armstrong (1968: 218) uses the supposed nontransitivity of indiscriminability to advantage in his well-known attack on sense datum theories of perception:

> ‘Exact similarity in a particular respect’ is necessarily a transitive relation. Now suppose that we have three samples of cloth, A, B, and C, which are exactly alike except that they differ very slightly in colour. Suppose further, however, that A and B are perceptually completely indistinguishable in respect of colour, and B and C are perceptually completely indistinguishable in respect of colour. Suppose, however, that A and C can be perceptually distinguished from each other in this respect. . . . Now consider the situation if we hold a ‘sensory item’ view of perception. . . . [I]t will seem to follow that the two sensory items A, and B, that we have when we look at the two pieces [A and B] actually are identical in colour. . . . In the same way B, and C, will be sensory items that are identical in colour. Yet, by hypothesis, sensory items A, and C, are not identical in colour.

These are just a few among many philosophical contexts in which the relation of perceptual indiscriminability plays a central and sometimes problematic role. What these diverse discussions share is the assumption that indiscriminability is nontransitive—or, anyway, that the existence of “Armstrong triads” and longer sorites series shows that it is. My aim here is to question this assumption. Specifically, I will suggest a way in which indiscriminability might work that would allow it to be transitive, in spite of
the existence of series of the sort described. I should emphasize at the start that by the nature of the case, much of what I say here will be speculative, incomplete, and in need of empirical test. However, if the view I propose is at least coherent and empirically non-incredible, it will show that a claim of nontransitivity cannot be taken for granted. I will suppose throughout that, all things being equal, a view that permits indiscriminability to be transitive is preferable to one that does not: the apparent nontransitivity of indiscriminability strikes us as a puzzle.

I

First we need to clarify what is meant by ‘perceptual indiscriminability’ (‘nondiscriminability’, ‘indistinguishability’, ‘match’). Many cases of indiscriminability have nothing in particular to do with perception—for instance, the indiscriminability of good from bad investments by someone ignorant of finance, or the indiscriminability of rational from irrational numbers by someone ignorant of mathematics—and even in the perceptual domain, the relation takes many forms that will not be relevant to our discussion (see note 4 for an example). I cannot sift through all of these here, but I want to note several distinctions, and in general to lay some groundwork, that will be useful later on.

(1) I will be concerned with (in)discriminability as a two-place relation between objects, specifically physical bodies, in respect of some perceptual property. For instance, two cloth patches will be (in)distinguishable in respect of hue, or two tones (in)distinguishable in respect of pitch. (Perceptual or ‘observational’ properties are, roughly, properties whose instantiation can be discerned by unaided perceptual inspection.) Several well-known philosophical discussions of (in)discriminability treat the relation as it holds between perceptual properties themselves (e.g., shades of color), or as it holds between qualia, or as it holds between experiences in respect of their qualia. But since I believe that questions about the (in)discriminability of objects are ultimately prior to questions about the (in)discriminability of these other things, and since puzzles about the nontransitivity of indiscriminability seem to be of broadest interest and philosophical importance insofar as they concern objects. I will talk only about objects.

(2) When psychologists of perception talk about (in)discriminability, they mean the statistical relation studied in experiments on discrimination thresholds or just noticeable differences (“j.n.d.’s”). Here it is most convenient to define indiscriminability in terms of discriminability. Roughly, two stimuli are distinguishable by a subject $S$, in a given observational context, just in case (i) the stimuli are relevantly physically different and (ii) $S$ makes
or would make an unbiased judgment of difference in a same/different comparison, in that context, on some criterial percentage of trials; stimuli are indiscriminable otherwise.\(^3\) (A frequent criterion is 60 percent, but the figure can be set from as low as 50 percent to as high as 80 percent depending upon the relevant task demands.) On the psychological conception, then, stimuli that are indiscriminable may often be judged different, and stimuli that are discriminable may often be judged the same. (More shortly about what I mean by ‘judgment’.)

The requirement of unbiased judgment in clause (ii) above is important. A pair of stimuli may be indiscriminable even though they are correctly (i.e., veridically) judged different, say, 99 percent of the time, if the judgments of difference result from a bias. To eliminate the effects of any bias, psychologists employ an analytical technique called signal detection theory, which in effect subtracts the number of “false alarm” responses from the number of “hits.” Such an adjustment ensures inter alia that physically identical stimuli do not turn out to be discriminable, since any judgments of difference in such a case count as false alarms. Intuitively speaking, the goal is to count as discriminations only those judgments of difference that result (in the right sort of way, barring deviant causal chains, etc.) from genuine detection of a stimulus difference.

Just what philosophers mean when they talk about (in)distinguishability is unclear. Typically they seem to have in mind an invariant relation. Notice for example the passage from Armstrong cited at the beginning; as C. L. Hardin (1988) remarks, it is “plain that Armstrong takes indistinguishability to be an all-or-nothing affair” (179). On the philosophers’ conception, if I understand it, indiscriminable stimuli are always judged different, and indiscriminable ones are always judged the same. (I cannot tell whether the discriminal/indiscriminable distinction is supposed to be exhaustive.) More precisely, two stimuli are discriminable by a subject \(S\), in a given context, just in case (i) they are relevantly physically different, and (ii) \(S\) would make an unbiased judgment of difference in any same/different comparison in that context; and stimuli are indiscriminable by \(S\) just in case \(S\) would make a judgment of sameness in any same/different comparison in that context.\(^4\) On the assumption that physically identical stimuli are indiscriminable, it follows that such stimuli are always judged the same.

This philosophical conception of (in)distinguishability seems to involve an idealization, since there are no stimuli that are either always judged the same or always judged different. On the one hand, the phenomenon of false alarms is familiar; in addition, there may be no positive stimulus difference so small that subjects are never able to detect it.\(^5\) On the other hand, given enough trials, subjects will eventually judge even diametrically different stimuli (e.g., red and green patches) the same. Strictly speaking, then, the
defender of a nontransitivity claim—call her “Nontrans”—is entitled to claim at most something like this: there are or can be triads (and longer series) of physically different stimuli $A, B, C$ such that for some time $t$ and observational context $X$, were a subject to compare $A$ and $B$ in $X$ at $t$ he would judge them the same, and were he to compare $B$ and $C$ in $X$ at $t$ he would judge them the same, and were he to compare $A$ and $C$ in $X$ at $t$ he would make an unbiased judgment of difference. There may be other options, but all will involve restriction to a time.

Despite the idealization, I propose to go along with the philosophers’ invariant conception of (in)distinguishability, for at least three reasons. First, the statistical relation defined by the psychologists seems equally likely to be nontransitive: there are or can be three stimuli $A, B,$ and $C$ such that, e.g., $A$ and $B$ are judged different only 40 percent of the time (hence are indistinguishable), and similarly $B$ and $C$, but $A$ and $C$ are judged different 70 percent of the time (hence are discriminably different). So it’s not as if the philosophical idealization itself is the source of the apparent nontransitivity. Second, the temporally quantified claim expressed above is strictly speaking all that Nontrans needs for her argument. In fact, as it turns out, the scenarios of principal interest to philosophers writing about indistinguishability involve sorites series viewed simultaneously, i.e., together at a single time. Third, the more careful, temporally quantified formulation of the relevant sameness and difference relations among the patches severely complicates—but only complicates, I believe—the statement and defense of the argument for nontransitivity. For ease of discussion, then, I will suppose that objects that are indistinguishable in a given context are always judged the same when compared in that context, and objects that are discriminable in a given context are always judged different when compared in that context.

(3) Thus far I have characterized discrimination as a form of judgment. I adopt this usage while hoping to steer clear of two obvious questions. One is the question whether the same/different judgments at issue involve the application of concepts—concepts of sameness and difference, or of apparent sameness and difference, or of hue, or otherwise; that is, roughly, the question whether such judgments mobilize mental representations that serve to type-identify the stimuli we encounter for purposes of belief fixation, inference, decision making, and so forth. (This question might be posed as one about the contents of the judgments.) The second, related question is whether these same/different judgments tend to engender beliefs to the effect that stimuli are (look?) the same or different. Both questions will need to be addressed in a thorough study of (in)distinguishability, to be sure, but I think nothing terrible will happen if we bracket them for now. What I will say is that the sort of judgment at issue here is whatever it is that subjects do when they perform the same/different comparisons in the psychophysical
tests of just noticeable differences. In calling such a performance a ‘judgment’ I am supposing that whatever its precise nature may be, it is a type of mental act—specifically, an act involving focused perceptual attention to stimuli, as distinct from, say, merely having the stimuli in view.\(^6\) (As we will see, the difference between attending to pairs of adjacent items in a sorites series in the way required to make a discriminatory judgment, on the one hand, and merely having them in view, on the other, is important to an understanding of the (in)discriminability relation.) Indeed, I shall want to distinguish further between the act of attending to a pair of stimuli in the way required to make a discriminatory judgment, on the one hand, and the act of making the judgment itself, on the other—between attentional and judgmental acts, as it were. Intuitively speaking, I will suppose that one can attend to a pair of stimuli without actually making a same/different judgment of them (though not vice versa). Whether drawing such a distinction commits me to a conceptually loaded brand of judgment I am not certain; but as I say, I propose to bracket that question here.\(^7\)

To claim neutrality on the question whether discrimination \textit{per se} mobilizes concepts need not be to claim neutrality on the question whether the discriminatory judgments at issue are made by creatures possessed of concepts \textit{at all}. To the extent that it is implausible to ascribe concepts at all to a system, it may be implausible to ascribe experience to it, in which case the nontransitivity of indiscriminability becomes that much less mysterious. What makes the apparent nontransitivity so weird is the assumption that indiscriminable stimuli \textit{look the same}, are \textit{phenomenally the same}. Thus while discrimination \textit{per se} may or may not mobilize concepts, the cases of interest to philosophers involve discrimination by a subject whose psychology is sufficiently fancy, probably sufficiently cognitive, to justify the claim that indiscriminable stimuli look the same to him. Discriminatory judgment and phenomenology do sometimes come apart even in organisms possessed of concepts, as for instance in certain types of achromatopsia,\(^8\) and then there are the much disputed thought-experiments involving zombies and inverted qualia. But I will not worry about these unusual or hypothetical cases here; in the (unlikely, I think) event that such subjects differ from normal human subjects in ways relevant to the present discussion, the view I propose does not yet apply to them.

For present purposes, then, I will assume that discriminatory judgment and phenomenology go hand in hand: stimuli look the same (different) to a subject in a context just in case the subject would make a judgment of sameness (difference) were he to compare the stimuli in that context.\(^9\) In fact, for ease of discussion I will speak more or less interchangeably of stimuli looking the same (different) to a subject in a context and of their being such that the subject would judge them the same (different) were he to compare them
in that context. In addition, intuition suggests that the relation of looking the same (different) can obtain across viewing contexts. For instance, we sometimes say that an object looks different in different kinds of light, or from different angles or distances. In keeping with what we have said so far, we may say that an object $o$ looks different to a subject $S$ in different viewing contexts, say in infrared and incandescent lights, just in case $S$ would make a judgment of difference were he to compare $o$ viewed in infrared light with $o$ viewed in incandescent light. We can imagine that $o$ is presented to $S$ in infrared light, and then, immediately thereafter so that $o$ remains in view continuously, the light is changed to incandescent light; $S$ makes a same/different judgment of $o$ in the two cases. (No doubt practical problems would arise in many cases, as where the relevant comparison is to be made between, say, $o$ in incandescent light and $o$ under three feet of salt water; but I will suppose that the difficulties would be only practical.) In general, we can say that an object looks different under different viewing conditions, i.e., in different viewing contexts, insofar as it would receive a judgment of difference in a cross-contextual same/different comparison of the sort just described.  

Except where I indicate otherwise in what follows, when I say that stimuli look the same (different), I will mean that they look the same (different) within a single context; but the idea of cross-contextual comparison too will play an important role in our understanding of the (in)discriminability relation, and we will hear more about it as we go along. Also, I should acknowledge that I have been helping myself to the notion of a visual context more or less unexamined. It is a nice question just what constitutes a context of the sort here at issue, but for present purposes I think we can manage with an intuitive grasp of the idea. I will suppose that whatever precisely its composition may be, the visual context in which stimuli are viewed and judged is defined at least in part by those factors—the light, angle of view, size and position of the stimuli, and the subject’s visual state, among others—that determine how the stimuli look in respect of, e.g., hue.

(4) Since we will make use of the term ‘look the same (different)’ in our discussion of (in)discriminability, we had better keep in mind the distinction between what I will call its dispositional and occurrent senses. What I have discussed so far is the dispositional sense: two stimuli look the same (different) to $S$ in the dispositional sense, in a given context, just in case $S$ would make a judgment of sameness (difference) were he to compare the stimuli in that context. In contrast, two stimuli look the same (different) to $S$ in the occurrent sense, at a time $t$, just in case $S$ is making a judgment of sameness (difference) of the stimuli at $t$. Crudely: stimuli look the same dispositionally just in case they would look the same occurrently were the subject to be comparing them. Most of the time it will be clear which of
these two senses I have in mind (usually I will mean the dispositional sense), but where clarification is needed, I will express the claim that stimuli look the same (different) in the occurrent sense by saying that they are looking the same (different).

It is worth emphasizing that stimuli neither look the same nor look different, in the occurrent sense, to a subject who merely has them in view (or even is attending to them but not judging them same or different); in other words, such stimuli neither are looking the same nor are looking different. This is not to deny that, when merely had in view, a pair of stimuli either look the same or look different; but that is just to say that they look the same (different) in the dispositional sense, i.e., that they would be judged (would be looking) the same (different) were they to be compared. I think I should say that again: stimuli look the same or look different to a subject who merely has them in view, but that is just to say that they would receive a judgment of sameness (difference) were he to compare them. That they look the same (different) is one thing, that they are looking the same (different) quite another. 12 (Indeed, as we are using these terms, looking the same in the dispositional sense is just the same thing as being indiscriminable, a rather stronger relation than looking the same occurrently.) It seems to me that certain confusions in the literature on (in)discriminability have resulted from a failure to observe this distinction, so I will do my best to keep an eye on it.

(5) A final prefatory remark before we turn to the argument for non-transitivity. My talk of stimuli looking the same or looking different is meant to make no commitment to the existence of determinate hue qualities or shades (‘looks’) which the stimuli share or fail to share. In other words, it makes no commitment to the existence of hue types that are tokened by the objects we see. Though the idea that objects have determinate shades is rooted deep in common sense, and though my argument against Nontrans would be helped along in various ways by the availability of a notion of determinate shade, we cannot make use of it here without begging the question against those who believe that the existence of shades and even colors generally, as these are ordinarily conceived, is threatened by the nontransitivity of indiscriminability. Michael Dummett (1975), for example, having discussed the role of a nontransitive indiscriminability relation in the sorites paradox, writes the following:

What, then, of phenomenal qualities? . . . [W]e cannot take ‘phenomenal quality’ in a strict sense, as constituting the satisfaction of an observational predicate, that is, a predicate whose application can be decided merely by the employment of our sense-organs: at least, not in any area in which non-discriminable difference is not transitive. . . . [T]here are no phenomenal qualities, as these have been traditionally understood; and, while our language certainly contains observational predicates as well as relational expressions, the former (though not the latter) infect it with inconsistency (324).
The proper account of determinate shades ("phenomenal qualities") is a vexed and difficult matter about which a great deal would need to be said. Since I cannot go into it here, and since I am not aware of any proposed identity or individuation conditions for determinate shades that do justice to our intuitive conception of them. I am going to err on the side of caution. I will often appeal to a relation of looking the same (different), as I have characterized it above, and will assume that looking the same (different) and receiving a judgment of sameness (difference) go hand in hand. But I will not suppose that objects have determinate hue qualities or shades.

II

Consider, then, three cloth patches $A$, $B$, and $C$, which are homogenously colored and identical in size and shape but slightly different in the wavelengths of light they reflect. Suppose you were told that $A$ is indiscernible from $B$ in infrared light, $B$ is indiscernible from $C$ in incandescent light, and $A$ is discernible from $C$ in the noonday sun. That is, $A$ and $B$ would be judged the same were they to be compared in infrared light, $B$ and $C$ would be judged the same, in incandescent light, and $A$ and $C$ would be judged different, in the sun. Thus, $A$ and $B$ look the same in infrared light, $B$ and $C$ look the same in incandescent light, and $A$ and $C$ look different in the sun. Would you be persuaded that you had found a counterexample to transitivity? Presumably not. You would want to know how the three pairs look, how they would be judged, under (some) uniform viewing conditions: in the same light, from the same angle of sight, and so forth. A uniform viewing context will also include, among other things, restriction to a single observer with a relevantly consistent visual system: transitivity is not threatened by the fact that, say, $A$ and $B$ look the same to Tom, $B$ and $C$ look the same to Dick, and $A$ and $C$ look different to Harry; nor by the fact that $A$ and $B$ look the same to me during a migraine headache, and $B$ and $C$ look the same, but $A$ and $C$ look different when the headache goes away.

What exactly is wrong with allowing the viewing conditions to vary among the three hypothetical comparisons $A/B$, $B/C$, and $A/C$? Various concerns come to mind, but a principal worry must be that the patches look different in their different comparisons; for example, that patch $B$ looks different in infrared light than in incandescent light, and so Nontrans will be barred from "carrying over the middle term" in her argument for nontransitivity. Drawing upon the idea of a cross-contextual comparison introduced above, we can say that $B$ looks different in its comparisons with $A$ and $C$, in virtue of the difference in lighting conditions, just in case we would make a
judgment of difference were we to compare $B$ viewed in infrared light with $B$ viewed in incandescent light (in immediate succession so that $B$ remains in view continuously). If the argument for nontransitivity is to succeed, viewing conditions or contexts must be uniform across the three hypothetical comparisons so that such differences are precluded; each patch must look the same in both of its comparisons.

Perhaps it will be objected that a cross-contextual comparison has the effect of introducing a new viewing context—a sort of hybrid context. one might suppose—and so shows little or nothing about whether $B$ looks different in the two original contexts (infrared and incandescent). The trouble with this objection, it seems to me, is that it then becomes difficult to see what $B$’s looking different in the two contexts could amount to, other than its having different shades or looks; in other words, saying that $B$ might look different in its two hypothetical comparisons amounts to saying that the shade $B$ has in infrared light might be different from the shade it has in incandescent light. I would make two points in response. First, I have promised to eschew talk of determinate shades in order to avoid begging the question against those opponents who believe that the nontransitivity of indiscriminability threatens the existence (even the very idea) of such qualities. But in fact, as I remarked above, the case I will make against Nontrans would only be helped along by the availability of a notion of determinate shade. For example, if instead of speaking of stimuli as looking the same (different) in different contexts, I could speak of them as having the same (different) shade in different contexts, my task would only be made easier in ways that will become clear (see, e.g., n. 21).

Second, such an objector would owe us a specification of identity conditions for determinate shades, and as I remarked a moment ago, I know of no proposed identity conditions that do justice to common sense. (Among other things, most proposals seem to involve one or another form of denial that we can see by direct comparison whether two objects have the same shade.) As Dummett (1975) says of Nelson Goodman’s proposed identity conditions, “there is, of course, nothing wrong with [this] definition of ‘phenomenal quality’. . . . considered merely as a definition; but what it defines is surely not anything which we have ever taken a phenomenal quality to be” (268). Again, the proper specification of identity conditions for shades is a difficult matter that lies beyond the scope of this paper, but I think we can say that however strongly their failure to honor common sense counts against the identity conditions that have been proposed, such failure counts against the thought that they identify qualities which must remain constant across the three comparisons of our patches $A/B$, $B/C$ and $A/C$. I don’t suppose it is impossible to specify coherent and intuitively plausible identity conditions for shades as ordinarily conceived (see again note 13 below), but
until we have a better idea of what these might be. I think we can fairly set the present objection aside. In what follows I will suppose that a patch looks different in its different hypothetical comparisons, e.g., that $B$ looks different in infrared and incandescent lights, just in case it looks different in a cross-contextual comparison of the sort described.

Suppose then that our three pairs of patches are viewed under uniform viewing conditions as so far characterized—same lighting, same subject, same angle of sight, etc.—and that $A$ and $B$ look the same, and $B$ and $C$ look the same, but $A$ and $C$ look different. Does this much now show that indiscriminability is nontransitive? I don’t think so. For consider that our judgments of hue and hue relations (e.g., sameness and difference) vary with the constitution of the visual field; as psychologist David Hubel (1988) explains, “the sensation produced in one part of the visual field depends on the light coming from that place and on the light coming from everywhere else in the visual field” (177). Trivially, the composition of the visual field in each of the three comparisons $A/B$, $B/C$, and $A/C$ is different. As a result, it seems possible that one or more of the patches looks different in its two hypothetical comparisons; for example, maybe $B$ looks slightly different in its comparison with $A$ than in its comparison with $C$. (I mean ‘epistemically possible’: for all we know, things actually are as I suggest. For her claim of nontransitivity to be justified, Nontrans will need to show, or at least provide compelling reason to believe, that things are not in fact as I propose.) Again we may appeal to the idea of a cross-contextual comparison. We can say that $B$ looks different in its comparisons with $A$ and $C$, in virtue of this difference in the visual field, insofar as a subject would make a judgment of difference were he to compare $B$ viewed with $A$, to $B$ viewed with $C$. (We can imagine that he is presented first with $A$ and $B$; then while $B$ remains in view, $A$ disappears and $C$ appears immediately on the other side of $B$.) Thus, in order to guarantee that the patches look the same throughout, Nontrans would need to provide evidence indicating that such small (viz., just noticeable) differences in the visual field do not cause the patches to look different. I know of no reason to think, indeed I very much doubt, that she will be able to do this.

The obvious response here is to stipulate that the three patches be viewed simultaneously. In other words, Nontrans will claim that there are or could be three patches $A$, $B$, and $C$ such that $A$ and $B$ look the same (would be judged the same in a same/different comparison), and $B$ and $C$ look the same, but $A$ and $C$ look different, even in case they are viewed simultaneously or “threewise.” (To preserve parity of interstimulus distance in the three comparisons, the patches might be arranged in order as wedges of a pie, for example; see note 15 below.) Does this further requirement of simultaneous viewing finally ensure that each patch looks the same in both
of its hypothetical comparisons? Perhaps so, but now the problem is that, so far as I know, we have no reason to believe that there is or even could be such a stimulus triad. I have neither seen one nor heard report of seeing one by any philosopher or psychologist. For all we know, given human perceptual design, any three stimuli so related that $A$ and $B$ look the same when viewed pairwise, and $B$ and $C$ look the same when viewed pairwise, but $A$ and $C$ look different when viewed pairwise, must look the same when all three are viewed simultaneously. (I am not familiar with any experimental work addressing this question in particular, but the vision scientists I’ve queried tell me that, in all likelihood, three such patches viewed simultaneously would look identical. Such a perceptual collapse might result from the fact that the j.n.d. between $A$ and $C$ would be relatively small and hence easily swamped by the physical similarity of $B$ to $A$ and $C$.)

It may seem inevitable that a “nontransitive triad” can be constructed even in the simultaneous (threewise) condition. Suppose we begin with $A$, $B$, and $C$ which sustain the specified relations of apparent sameness and difference when viewed pairwise but look the same when viewed simultaneously. Can’t we bring about a nontransitive state of affairs in the simultaneous condition simply by increasing the stimulus difference between $A$ and $C$ until $A$ differs discriminably from $C$ but not from $B$? Philosophers tend to assume such an operation is possible, but there is no reason to expect that perception will comply. For all we know, our visual system would refuse to allow such a result, avoiding an apparently nontransitive state of affairs by making it the case that any discriminable difference between $C$ and $A$ is also a discriminable difference between $C$ and $B$. The JND is labile, and other avoidance tactics are possible too.

Happily, we needn’t resolve the case of the triad, since nothing essential to the argument for nontransitivity rests on it. A moment’s reflection shows that the argument is easily resurrected with respect to a longer series of patches. Even if $A$, $B$, and $C$ look the same when viewed simultaneously, we know that if we keep adding physically different patches ($D$, $E$, $F$, etc.) to the series, each indiscernible from its predecessor, we will eventually see a difference between the first and the last. Has Nontrans then finally secured her claim of nontransitivity? Still I think the answer is “no.” I am going to suggest that, oddly enough, even simultaneous viewing does not guarantee that each patch in the series looks the same in both of its hypothetical comparisons with adjacent patches. The critical point will be that having a series of patches in view simultaneously is importantly different from attending to them simultaneously in the way required to make a same/different judgment.
III

Suppose for the sake of argument that the sort of series Nontrans needs, viz., a series in which adjacent members are indiscriminable but the endpoints are discriminably different even when all are in view simultaneously, can be constructed from five colored patches. And let’s continue to suppose that the patches are arranged in order as wedges of a pie. (For convenience I will distinguish between adjacent members of the series and its endpoints, as in the opening sentence of this paragraph, though of course a pie has no endpoints spatially speaking.) Were the subject to compare patches #1 and #2, he would judge them the same, and were he to compare #2 and #3, he would judge them the same, and so forth, but he would judge #5 and #1 different, even in case he has all five patches in view. Indiscriminability is shown to be non-transitive only if each patch looks the same in both of its hypothetical comparisons. At first blush, the latter requirement would seem to be met insofar as all five patches are in view throughout. Nevertheless, I want to suggest that there is a way in which one or more of the patches may look different in its two comparisons. Even simultaneous viewing of all five patches does not guarantee that viewing context remains constant from comparison to comparison. As I indicated at the start, the suggestion I am going to make is speculative and often sketchy. Its goal is really just to pose a question: isn’t it possible that things are like this? Though it is unlikely to be correct as it stands, if the view I suggest is coherent and at least credible, it will tend to call into question the assumption that indiscriminability is non-transitive.

To begin, consider an elegant example borrowed from David Sanford (1981). In the course of challenging Frank Jackson’s sense-datum theory of perception, Sanford asks us to reflect upon the following arrangement of colored papers:

![Diagram of colored patches]

\[FIG. 1\]

Sanford writes:

Imagine that [things] are set up so that the surrounding areas C and D can be removed without the subject’s losing sight of A and B. The dotted line in the previous figure indicates where two sheets of paper fit together. As these two sheets slide apart, A and B are revealed as parts of adjacent colored areas on the sheet underneath.
The smaller areas A and B are respectively indistinguishable from the uniform surrounding areas A’ and B’ in all cases. In some cases, where A and B previously looked to be of the same color, A’ and B’ can now be seen to be of definitely different colors. In other cases, where A and B previously looked to be of different colors, A’ and B’ can now be seen to be of the same color: there is no boundary visible between A’ and B’ since the sheet underneath is of one uniform color. . . . [W]hile both A and B are under continuous observation, there is never a time when either appears to change in color. Strictly, at every time during the process, each appears not to change in color (379–80).

(Color plate 2 of Hardin 1988 provides an excellent example of the kind of simultaneous chromatic contrast effect that Sanford has in mind.19)

In Sanford’s scenario, it seems that at least one of the areas A and B simultaneously looks the same and yet looks different as the covering paper is removed. I want to raise the possibility that something similar occurs in our series of five patches. To see how this could happen, consider a recasting of Sanford’s scenario along the lines of a cross-contextual comparison. Suppose that, in Sanford’s example, it is area A that both looks the same and looks different as the covering sheet is removed. In the new scenario, there are now three patches, arranged as wedges of a pie and colored as are Sanford’s areas C, A, and A’. First A and C are presented together. Then while A remains in view, C disappears and A’ appears immediately. (Perhaps it is easier to imagine that all three patches are present throughout but the two pairings are illuminated, and hence in view, only alternately. A remains in view throughout.) Given what transpires in Sanford’s example, we can plausibly suppose that A looks different in the two viewings: were you to compare A viewed with C, to A viewed with A’, you would make a judgment of difference. At the same time, since A is in view continuously, there is also a sense in which A looks the same (would be judged the same) in both pairings.

Now isn’t it possible that a similar effect—not a contrast effect, exactly, but something like one—should occur among stimuli that differ only slightly? Consider next a cross-contextual comparison involving our pie of five patches. Suppose, just for example, that while patch #4 remains in view,
patches #1–#3 and patch #5 appear alternately on either side of it; in other words, you are presented alternately with #1–#4 and #4–#5. Isn’t it possible that #4 should look different in the two cases, that it should look different when viewed with #1–#3 than when viewed with #5? (Remember that #1 and #5 look different whenever they are compared.) In other words, isn’t it possible that if you compared #4 viewed with #1–#3, to #4 viewed with #5, you would make a judgment of difference? At the same time, since #4 is in view continuously, there is also a sense in which it looks the same throughout. I am not aware of any reason to think that such diminutive hue shifts are impossible.

Of course, even if such hue shifts are possible, the real challenge is to show how they could occur when all five patches are stationary and in view simultaneously. To set the stage, imagine that you are asked to make same/different comparisons of #1–#5 serially with all five patches in view; in other words, you are to compare #1 and #2, then #2 and #3, then #3 and #4, #4 and #5, and finally #5 and #1. It seems plausible to suppose that each of these five comparisons will involve a distinct act of focused attention: the same/different judgment of each pair will require focused attention to that pair only, though all five patches are in view throughout. (Here we begin to see the significance of the distinction, drawn earlier, between attending to a pair of stimuli in the way required to make a discriminatory judgment, on the one hand, and merely having the stimuli in view, on the other.) Now, forget about the serial judgments; the idea of distinct attentional acts is what interests me. Suppose that you are given a new task, involving just the pairs #3/#4 and #4/#5, with all five patches in view: you are to attend first to #3 and #4, then to #4 and #5, this time with the aim of judging whether #4 looks the same or different in the two pairings—in the two attendings, one might say. In other words, rather than making two comparisons, #3/#4 and #4/#5 as in the serial scenario, your new task is to perform a single, cross-contextual comparison. As I will put it, your task is to compare #4 viewed in an act of focused attention to #3 and #4, with #4 viewed in an act of focused attention to #4 and #5. First you attend to the pair #3/#4, then you shift your attention to the pair #4/#5, keeping #4 in view continuously, and you make a same/different judgment of #4. Isn’t it possible that #4 should look different? Recall that your assignment in the previous cross-contextual comparison was to compare #4 viewed with #1–#3, to #4 viewed with #5. The possibility now envisioned is that the effect of those alternate viewings of #4 is recreated by your visual system in the present instance in the form of distinct attentional acts or episodes. (I assume that although you attend solely to the pairs #3/#4 and #4/#5 in this case, the presence of #1 and #2 nearby in the visual field is essential to the occurrence of a hue shift in #4 as your attention moves from the first pair to the second. We are supposing.
remember, that no difference in hue can be seen in a series containing only three patches.) In effect, a distinction between acts of focused attention constitutes a distinction between visual contexts, thereby allowing #4 to look different in the two attendings. At the same time, since #4 remains in view continuously, there is also a sense in which it looks the same in both attendings.

That the idea of such a hue shift in #4 is not entirely incredible is suggested by the example of Gestalt shifts such as those seen in the famous duck-rabbit and Necker cube figures. The analogy is imperfect—among other things, Gestalt shifts probably involve a mix of perceptual and cognitive factors, whereas the hypothesized diminutive hue shift by #4 may be wholly sensory—but the Gestalt figures provide at least one example of a class of sensory stimuli that can look the same while yet looking different in the absence of any physical motion, alternating presentations, or other stimulus manipulations. In other words, they show how a stimulus can simultaneously look the same and look different even when all relevant stimulus elements are stationary and in view throughout. The duck-rabbit, for example, is a stationary pattern of marks on the page before you, and to that extent looks the same throughout, yet it also looks different as its species switches back and forth. Interestingly, some people report that the apparent species of the duck-rabbit at any given time depends upon the direction in which they visually scan the figure. If true, such reports suggest that attentional factors may partly determine which “aspect” a Gestalt figure appears to have at any given time.21 (It is also worth pointing out that the idea of a very small hue shift by one of the patches helps to explain how your same/different judgments in the serial scenario described above manage to be coherent. How is it possible that you are able to judge #5 and #1 different after having judged all of the preceding adjacent pairs the same? Given that the series looks continuous in hue, and adjacent patches look the same, how and where does the difference between #5 and #1 enter in? The idea of a hue shift helps to dispel some of the mystery, a fact which ought to count in its favor.)

What import does this last cross-contextual comparison, of #4 in distinct attendings to #3/#4 and #4/#5, have for the argument for nontransitivity? Consider again what Nontrans claims: #1 and #2 would be judged the same in a same/different comparison, #2 and #3 would be judged the same, and so forth, but #5 and #1 would be judged different, even where all five patches are in view simultaneously; therefore, indiscriminability is nontransitive. As always, a claim of nontransitivity follows only if each patch looks the same in both of its hypothetical comparisons. I suggest that even where all five patches are viewed simultaneously, the latter requirement may not be met. Here I appeal to the cross-contextual comparison: for example, it is possible that #4 looks different in its hypothetical comparisons with #3 and
#5, even when all five patches are in view simultaneously, insofar as it is possible that we would make a judgment of difference were we to make a cross-contextual comparison of #4 viewed in an act of focused attention to #3 and #4, with #4 viewed in an act of focused attention to #4 and #5. Generally speaking, it may be that in any series whose adjacent members are indiscriminable (would be judged the same in a same/different comparison) but whose endpoints look different (would be judged different in a same/different comparison), at any given time at least one member looks different in its two hypothetical comparisons with adjacent items, even in case the entire series is viewed simultaneously.

Where have we gotten to? What prompted these speculations about Gestalt-like hue differences in a sorites series was the claim, by Nontrans, that simultaneous viewing of all five patches would rule out the possibility of their looking different in different hypothetical comparisons. I have suggested that this claim may be mistaken. Specifically, I have suggested a way in which the patches might look different in their different comparisons even if all five are in view continuously. The idea is that they might look different because their hypothetical comparisons to different patches would be made in different contexts, defined by distinct attentional acts, and this distinctness of attentional acts might allow for Gestalt-like hue differences of the sort described above. If that is right, then even if #1 is indiscriminable from #2 (would be judged the same as #2 in a same/different comparison), #2 is indiscriminable from #3, #3 from #4, and #4 from #5, while #5 and #1 are discriminably different, when all five are in view simultaneously, still it is possible that, e.g., #4 looks different in those hypothetical comparisons to #3 and #5.

Our last cross-contextual scenario raises the possibility that even simultaneous viewing of all five patches does not guarantee uniformity of viewing conditions across their five comparisons. The thought is that contextual differences may obtain in the series even if all five patches are viewed simultaneously. Intuitively speaking, just as variation in the lighting conditions (infrared? incandescent?) or the subject’s visual system (does he have a migraine? is he on drugs? has he gone blind?) from comparison to comparison can alter how the patches look, so too can variation in something as fine-grained as what the subject is attending to. Just as the light, the size and spatial arrangement of the patches, and the subject inter alia must be consistent across the five comparisons, so must the subject’s focus of attention.

At this point, perhaps Nontrans will bite the bullet and impose the further requirement that all five patches be attended to simultaneously and equally—in a single attentional act, as it were. In other words, perhaps Nontrans will concede that uniformity of viewing context requires a single attentional focus, but insist that patches #1–#5 can stand in the relevant (i.e.,
apparently nontransitive) sameness and difference relations even where all five are focused upon simultaneously. Insofar as this further requirement is met, the possibility of Gestalt-like hue differences between different comparisons is ruled out. By their nature such hue differences could not obtain where each of the five hypothetical comparisons is made in the context of the same attentional act, any more than the duck-rabbit could look simultaneously like a duck and like a rabbit, or the Necker cube look simultaneously to be facing in both directions. In this way, one might think, uniformity of viewing conditions would be guaranteed and all five patches would look the same throughout.

In making this bold response, Nontrans would face at least two serious difficulties, it seems to me. First is the extreme likelihood that subjects could perform such an attentional feat. There is no coincidence, I suspect, in the fact that the scientific tests of hue discrimination employ only two stimuli at a time. Also it is familiar that observers cannot recognize the number of objects visually presented to them, cannot see how many objects are present without explicitly counting them, beyond six or seven (see, e.g., Mandler & Shebo 1982). Hence, given the kind of close attention involved in making a hue discrimination, it seems implausible to suppose that observers can attend in that way to more than two or perhaps three stimuli at a time. Thus the requirement that all five patches be attended to simultaneously is unlikely to be satisfiable, at least by human subjects. If that is right, then we have no reason to believe that there is or could be a series of five patches in which adjacent members look the same but the endpoints look different, where all five patches are attended to simultaneously.

Second, suppose for the sake of argument that we can attend in the requisite way to all five patches simultaneously. We have said that in that case, each patch looks the same throughout—specifically that it looks the same in both of its hypothetical comparisons with adjacent patches. But then is it obviously coherent to suppose that #1 and #2 look the same (would be judged the same), #2 and #3 look the same, etc., while #5 and #1 look different? I for one do not understand how these sameness and difference relations could obtain if all five patches look the same throughout. Such a state of affairs seems to me nearly as incomprehensible as that of a single object having more than one shade at the same time. Rather, it may be that insofar as we are able to attend simultaneously to all members of a series in which adjacent items are indiscriminable, all must look the same. In order to present the appearance of continuous phenomenal change, a series must contain more members than can be attended to simultaneously. If there are creatures whose attentional capacity exceeds our own, creatures who can attend to, say, ten patches at a time, then their phenomenal sorites series will need to be that much longer.
On this tentative view, a sorites series or “phenomenal continuum” emerges as a series in which adjacent members are indiscriminable (look the same) while the endpoints are discriminable (look different), even when all members are viewed simultaneously. (N.B. Not: a series in which adjacent members are looking the same while the endpoints are looking different. That really would be incoherent I think, every bit as incoherent as supposing that an object could have more than one shade at a single time. Such a state of affairs would also require that the subject be making all five comparative judgments of the patches simultaneously, a feat even less feasible than attending to them all at once.) Even if, as I suggest, such a series does not show that indiscriminability is nontransitive, still it generates a paradox: even if the items in a sorites series sustain Gestalt-like perceptual differences in their different hypothetical comparisons, those differences will be marginal in Wright’s sense: they will be “insufficient to alter the justice with which [a vague predicate] is applied.” (Wright 1976: 229). For example, even if patch #4 looks marginally different in its comparisons to #3 and #5, still it looks red in both cases if in either. If that is right, then contrary to what is often supposed, the source of a “phenomenal” sorites paradox lies elsewhere than in the nontransitivity of indiscriminability.

Of course, adding the further requirement of simultaneous attention to all five patches, over and above mere simultaneous viewing of them, is not the only response open to Nontrans at this juncture. Perhaps empirical investigation would reveal independent evidence counting against the idea of Gestalt-like hue differences, or perhaps there are constraints other than simultaneous attention that could be put in place to ensure the desired uniformity of viewing conditions; I do not claim to have canvassed all of her options. Moreover, there must be numerous variations on the story I have just told—its details are doubtless mistaken, even if the idea of Gestalt-like hue differences is basically right—and I have left as many questions unasked as unanswered. My point at present is simply that if the idea of Gestalt-like hue differences is at least coherent and empirically non-incredible, then some work must be done, by way of either philosophical argument or scientific experiment, to show that a claim of nontransitivity is warranted nonetheless.

What I have offered here is little more than a gesture in a certain direction. I have discussed only a single, limited case of a sorites series, and have generally speculated as if there were no tomorrow. That much goes without saying, really. My hope is that these sins will be forgiven in light of my modest objective. I don’t know how the relation of perceptual (in)discriminability works. What I do know is that it is a perceptual relation, and as such it is subject to all the wily pliability of human vision, audition, and the rest. My goal in this paper has been simply to provide an example of the
kinds of effects that can occur in human perception, that might occur in a sorites series, and that must, I think, be further investigated before a claim of nontransitivity can be secured.

NOTES

I thank Robert Brateman, Mari Riess Jones, George Pappas, George Schumm, Tommie Shelby, and William Taschek for extremely helpful commentary.

1. I am currently running two experiments, with my colleagues Del Lindsey and Angela Brown in psychology, to test some of the proposals I make here.


3. I will use the terms ‘comparison’, ‘comparative judgment’, ‘discriminatory judgment’, and ‘same/different comparison’ to mean the same.

4. The species of perceptual indiscriminability that interests us, which might be called ‘direct indiscriminability’, is to be distinguished from an ‘indirect’ and stronger (indeed, undisputedly transitive) relation often discussed in the literature: objects A and B are indirectly indiscernible just in case for every object x, A is (directly) indiscernible from x if and only if B is. See, for example, Williamson (1990: 82–87). I will not discuss the stronger relation here.

5. See, for example, Swets (1986): 181–98.

6. Williamson (1990) goes a good deal further: “To discriminate is to do something. That is not, of course, to say that discrimination is a bodily (rather than mental) act. Still less that it is whatever falls under a certain behavioural (rather than intentional) description. Discrimination has at the very least a cognitive component” (5). Roughly, on Williamson’s view, to discriminate between stimuli is to activate the knowledge that they are distinct (1–9).

7. Though see n. 9 for some further remarks.

8. See, for example, Stoerig and Cowey (1992: n. 2, 225–28).

9. This need not be to endorse a so-called epistemic or doxastic notion of ‘look’. Roughly, to say that two stimuli look the same in an epistemic sense is to say that certain visually acquired evidence supports the belief that the stimuli are the same (e.g., the same in color). See, for example, Jackson (1975: 30). Epistemic looking is usually thought to entail that the subject possesses certain concepts: as Fred Dretske (1995) explains, “Describing the dog as looking [in the epistemic sense] like a poodle to S implies that S has the concept POODLE...” (68). In contrast, it is not obvious to me that the notion of looking the same at issue in the present discussion involves anything that deserves to be called a concept, though as I observed above, it does involve some sort of mental (‘judgmental’) act. Even Dretske, a vocal proponent of a non-doxastic or phenomenal sense of ‘looks’, defines the latter notion in terms of (possible) discriminatory judgments (67–69). See also Dretske (1969: chap. 2).

10. Of course, if an object looks, say, green in infrared light and brown in incandescent light, then no same/different comparison is needed to reveal the difference. However, we shall be interested primarily in cases involving an object that looks only slightly or just noticeably different in different contexts, and given the limited nature of hue memory, such a fine-grained difference can be revealed only by a comparative or same/different (as opposed to identifying or recognitional) judgment. See Raffman (1995) for discussion.

11. We should probably refrain from saying that stimuli that look different in a cross-contextual comparison are discriminable. A single object can look different in different con-
texts, and physically identical objects can look different from one another in different contexts, but discriminable stimuli are supposed to be physically different. Insofar as the contexts in a cross-contextual comparison are physically different, one might argue that a claim of discriminability is appropriate, but I will not try to resolve the question here.

12. One might well ask, “But how are the stimuli looking when he merely has them in view? They must be looking some way or other: they don’t become invisible just because he isn’t judging them, after all.” Here I think the right response is an ostensive one: when, e.g., the colored patches are merely had in view, they are looking like this (pointing to the patches). Or perhaps: they are looking the way patches are looking when they are in view and are such that they would be judged (would be looking) the same (different) were they to be compared, etc. I will leave it at that for now, but of course the proper analysis of the terms ‘look’ and ‘look the same’ is a matter which needs careful treatment; see note 20 for some further remarks.

13. The proposals of Goodman (1951), Peacocke (1992), and Linsky (1984), for instance, seem simply to change the subject. (Of course if, as seems to me likely, the indiscriminability relation turns out to be transitive, then identity conditions for shades can be stated in terms of it in the natural way Peacocke mentions; see again the quotation from Peacocke on p. 154.)

14. Among other things, I will do my best to avoid such locutions as ‘the shade of an object’, ‘the same object looks’, ‘the appearance of the object’, and so forth.

15. I say “a principal worry” because other sorts of inconstancies might also pose problems. Consider, for example, that transitivity is unaffected if A and B are indiscriminable when presented six inches apart, and similarly B and C, but A and C are indiscriminable when presented contiguously. In such a case the danger is not so much that a given patch will look different from pairing to pairing (though that too may be a problem) but rather that the ease of discrimination itself will vary.

16. Goodman’s identity conditions are for qualia, but they are easily recast for shades.

17. Goodman (1951: 276) seems to miss this point.

18. Here I vary only slightly a point made by Frank Jackson (1975: 112–14).

19. For another fine illustration, see the color plate in Boynton (1979: 37).

20. It is perhaps helpful to iterate that unless the patches are being judged (e.g., if they are merely being viewed or being attended to without being judged), they are neither looking the same nor looking different; that is, they do not stand in relations of apparent sameness or difference, to each other or anything else, in the occurrent sense. For example, when you are making your same/different comparison of #3 and #4, patches #1, #2, and #5 are neither looking the same as, nor looking different from, one another or any other objects (including #3 and #4). They do stand in myriad relations of apparent sameness and difference to other objects at all times, i.e., they look the same or different, even when they are merely had in view, but these relations are purely dispositional: the patches would be judged the same (different) were they to be compared, etc. See again note 12.

21. This is a good example of a place where my task would be easier were I able to invoke the notion of a determinate shade. The claim that, e.g., patch #4 is seen as having different shades in different attentional episodes seems rather analogous to the claim that, e.g., the duck-rabbit is seen as having different aspects.

22. Crispin Wright has argued that the possibility of continuous phenomenal change (a “phenomenal continuum”), as exemplified by a sorites series, entails that indiscriminability is nontransitive:

Suppose that we are to construct a series of colour patches, ranging from red through to orange, among which indiscriminability is to behave transitively. . . . Each successive patch must . . . match its predecessor.
Under these conditions it is plain that we cannot generate any change in colour by selecting successive matching patches: if indiscriminability is to be transitive, then if each patch in the first \( n \) selections matches its predecessor, the \( n \)th selection must match the first patch. . . . When the series is complete . . . we shall have lost . . . the appearance of continuous change from red to orange. . . . It thus appears that, were our judgements of indiscriminability to be universally transitive among samples of homogeneous colour, no field of colour patches could be ordered . . . so as to give the impression of a perfectly smooth change of colour. (1975: 344–45)

Wright goes on to provide a detailed argument designed to show that a nontransitive relation of indiscriminability is a necessary condition also of phenomenal continua that are not segmented into finite series of discrete stages (e.g., patches). I cannot give Wright’s discussion its due here; for present purposes, let me observe simply that both the reasoning just cited, and the more detailed argument that follows in Wright’s text, appear to rely on the assumption that each patch in the series looks the same in its two “successive matches.” I would question that assumption.

REFERENCES


