

# MARTIAN COLOURS

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Imagine a colour-blind individual who cannot see reds and greens in the physical world due to his condition. Does he experience redness or greenness? Given his defective vision, he does not. But suppose that when he is asked whether he experiences any colours he cannot normally see he says “I do experience certain graphemes as having some strange colours. They are Martian colours!” Undoubtedly, this would be surprising. Oddly enough, researchers have come across such a colour-blind individual who experiences synesthetic colours he does not experience by means of seeing objects with that colour (Ramachandran *et al.*, 2003). Such and other cases involving synesthesia seem to support Grice’s (1989) argument that the individualization of sense modalities requires that we take into account the introspective character of experience. Ross (2001), however, argues that Grice’s argument, if sound, threatens (strong externalist) intentionalism, according to which the qualitative character of colour experience is exhausted, or fully determined by, its intentional content, and the relevant intentional content is determined by the relation between physical properties of objects and their effects on the perceiver’s visual system.<sup>1</sup> Henceforth the term ‘intentionalism’ will be used to refer to strong externalist intentionalism unless it is otherwise indicated. In defense of intentionalism, Ross proposes a set of criteria for the individuation of sense modalities without appealing to the introspective character of experience. However, I shall argue that recent studies on synesthesia present difficulties for Ross’

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<sup>1</sup> This version of intentionalism is relevant to my argument because it is the view that Ross endorses. It is “externalist” because it says that the intentional properties of colour experience can be explained by reference to colour properties of external physical objects (see Ross 2001, p. 495). And it is “strong” (externalist) because it says that the content of a subject’s experience is not entirely fixed by the intrinsic properties of the subject—that is, no content is narrow (see Dretske 1999, Tye 2000). For a further defense of this type of intentionalism see Hilbert and Byrne 2003. For arguments against it see Wright 2003 and Pautz 2006.

account on the one hand, and intentionalism on the other. To see this, let us begin with Grice's account.

Grice (1989) formulates the following criteria for distinguishing one sense modality from another, e.g., *x-ing* and *y-ing*:

- i. *x-ing* and *y-ing* are characterized by directly perceiving (or seeming to perceive) things as having certain properties such as colours, sounds, smells, etc. (*The property condition*)
- ii. *x-ing* and *y-ing*, e.g., seeing and smelling, have distinct introspective character. (*The introspective-character condition*)
- iii. *x-ing* and *y-ing* are responsive to a distinct sort of stimulus such as wavelengths, sound waves, etc. (*The stimulus condition*)
- iv. *x-ing* and *y-ing* are associated with a distinct sort of internal mechanism. (*The sensory-organ condition*)<sup>2</sup>

Grice argues that (i) and (ii) are distinct conditions even though it might initially appear that the former is incorporated in the latter. Moreover, (ii) cannot be replaced by one or a combination of the other conditions. In support of this claim Grice invokes the following thought experiment: Friendly Martians have landed on earth. It turns out that no verb in their language unquestionably corresponds to the verb "see" used on Earth.

Instead we find two verbs which we decide to render as "x" and "y": we find that (in their tongue) they speak of themselves as *x-ing*, and also *y-ing*, things to be of this or that color. (1989, p. 261)

Do the Martians have two distinct senses *x-ing* and *y-ing* or do they have one sense which involves two distinct organs? Grice argues that without condition (ii) the answer to this question would be that "both *x-ing* and *y-ing* are seeing, with different pair of organs" (ibid). Grice, however, thinks that the issue cannot be settled "so easily" (ibid). He argues that to know whether *x-ing* is distinct from *y-ing* we must ask the Martians whether *x-ing* something to be blue *is like y-ing* it to be blue. If the Martians were to say "Oh no, there's all the difference in the world!" the right conclusion to draw would be that *x-ing* and *y-ing* *are* distinct senses even though both *x-ing* and *y-ing* are characterized by directly perceiving the same property, e.g.

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<sup>2</sup> The names attributed with each condition (seen in italics) are taken from Ross 2001.

blueness (ibid). Grice concludes that (ii) cannot be replaced by one or a combination of the other conditions since the difference between *x*-ing something to be blue and *y*-ing it to be blue cannot be captured without reference to the introspective-character of the Martian's experience.

Ross takes Grice's argument to constitute an argument against intentionalism because it suggests that there is "a qualitative aspect of perceptual experience which cannot be identified with the physical properties of physical objects that experience represents" (Ross 2001, p. 498). To avoid this conclusion, Ross proposes an alternative account that is consistent with intentionalism:

- (i.) *x*-ing and *y*-ing specialise in directly perceiving some range of properties of physical objects such as colours or sounds (This is the *modified property condition*)
- (ii.) *x*-ing and *y*-ing are receptive to a distinct sort of stimulus such as wavelengths, sound waves, etc. (the *stimulus condition*)
- (iii.) *x*-ing is associated with the workings of a different sort of sensory organ than *y*-ing (the *sensory-organ condition*)<sup>3</sup>

The main difference between the two accounts is that Grice's conditions (i) and (ii) have been replaced by (i'). In this view, *x*-ing is distinct from *y*-ing just in case conditions (i') through (iii') are satisfied. More generally, according to Ross' account, sense modalities are individuated by the *range* of properties of external objects they specialise in perceiving. For example, vision can be distinguished from smell in virtue of the range of properties each specialises in perceiving; the former specialises in perceiving colour while the latter specialises in perceiving scent or odour.

Before evaluating Ross' account it is worth stating the reasons that lead him to claim that Grice's Martian thought experiment threatens intentionalism. Recall that intentionalism says that the qualitative character of colour experience is exhausted, or fully determined, by its intentional content; and the relevant intentional content is determined by the relation between physical properties of objects and their effects on the perceiver's visual system.<sup>4</sup> Suppose that both senses, e.g., *x*-ing and *y*-ing, represent the same colour property, e.g., blueness. According to Ross, the intentional

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<sup>3</sup> See Ross 2001, p. 500.

<sup>4</sup> For simplicity, I will henceforth focus primarily on colour properties.

content of the Martian's experience of *x*-ing something to be blue can be identified with the physical property her experience represents the object as having.<sup>5</sup> Similarly, the intentional content of the Martian's experience of *y*-ing something to be blue can be identified with the physical property her experience represents the object as having. Since the qualitative character of colour experience is exhausted, or fully determined by, its intentional content, *x*-ing something to be blue would be like *y*-ing something to be blue. But, by hypothesis, *x*-ing something to be blue *is not like* *y*-ing it to be blue. The experiences produced by *x*-ing something to be blue and *y*-ing it to be blue have different qualitative character. It follows that the qualitative character of colour experience is not exhausted, or fully determined by, its intentional content. Thus, intentionalism is false.<sup>6</sup> If this argument is cogent, Grice's introspective-character condition, i.e., (ii), cannot be replaced by (i) (or a combination of (i), (iii), and (iv)).

To avoid this conclusion, Ross eliminates Grice's introspective-character condition (ii) and replaces Grice's property condition (i) with the modified-property condition (i'). The only difference between (i) and (i') is that the latter allows that a sense modality specialises in directly perceiving *a range* of properties while the former requires only that it specialises in directly perceiving (or seeming to perceive) things as having *certain* properties. This is important because Ross wants to deny that *x*-ing and *y*-ing are instances of directly perceiving the same property. Ross maintains that his account can individuate *x*-ing and *y*-ing on the basis of the range of properties each perceives. Thus, contrary to Grice, sense modalities can be individuated without reference to the qualitative character of experience. In particular, Ross maintains that if both *x*-ing and *y*-ing are specialised in perceiving the same range of properties, then *x*-ing is not distinct from *y*-ing. On the other hand, if *x*-ing and *y*-ing are not specialised in perceiving the same range of properties, then *x*-ing is distinct from *y*-ing. This, however, misses Grice's point that the matter cannot be settled so easily given their qualitative differences. But there is a further complication,

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<sup>5</sup> Provided, of course, that the experience is veridical.

<sup>6</sup> This argument targets strong externalist intentionalism. A Fregean intentionalist, for example, could perhaps explain such qualitative differences since she maintains that qualitative properties are identical to Fregean representational properties. Qualitative (or phenomenal) blueness, in this case, is identical to the property of having a certain Fregean content which involves a mode of presentation "such as *the property that normally causes experiences of phenomenal [blueness]*" (see Chalmers 2004, p. 174).

namely recorded interactions between sense modalities. Ross acknowledges such occurrences and argues that even if, say, taste interacts with smell, the sense modalities can nevertheless be individuated by reference to the range of distinct properties they specialise in perceiving, i.e., flavour and odour respectively. Alternatively, one could admit that taste and smell cannot be characterized independently and “conclude that flavour and odour are not distinct properties” (Ross 2001, p. 502). Which response is best will depend on the “answer to the question whether or not flavour and odour are distinct properties” (ibid). This then suggests that the success of Ross’ account depends on whether perceptual properties *can* be individuated independently of the senses. If they cannot, his account will be circular: it would individuate sense modalities by reference to distinct perceptual properties and it would individuate perceptual properties by reference to distinct sense modalities. But if they can, we could first individuate perceptual properties by identifying them with physical properties of external objects and then use these physical properties to individuate sense modalities. Many philosophers and vision scientists, however, deny that perceptual properties, including colours, can be identified with physical properties of external objects.<sup>7</sup> If they are right, the qualitative character of experience cannot be explained by reference to the properties a sense modality specialises in perceiving. But even if it is assumed that perceptual properties *can* be identified with physical properties of objects, Ross’ account faces a further difficulty.

Ross admits that cases of extreme interaction between different sense modalities seem to undermine his account. If the Martian case involves such an extreme interaction between *x*-ing and *y*-ing, Ross’ modified property condition (i’) would be insufficient to distinguish *x*-ing from *y*-ing since both are associated with the same range of properties. Those who think that such epistemic matters cannot be settled *a priori* will be reluctant to draw any conclusions from Grice’s thought experiment. However, Ross acknowledges that synesthesia, an actual phenomenon which involves extreme interactions among the senses, seems to undermine his account:

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<sup>7</sup> The nature and existence of colours are especially controversial issues in philosophy and vision science. This is a serious threat to Ross’ account since many philosophers and colour scientists offer compelling arguments for the claim that perceived colours cannot be identified with physical properties of objects, e.g., wavelengths, spectral reflectance profiles, and so on. See, for example, Hering 1964, Hardin 1998, Maund 1995, Gouras and Zrenner 1981, as well as Werner and Webster 2002.

However, a rare condition called synaesthesia suggests an interaction among senses which is so extreme as to undermine use of the modified property condition. For those with synaesthesia, a property characteristic of one modality produces experiences in more than one modality –so, for example, a sound produces a colour image as well as an auditory experience. (2001, p. 502)

Developmental synesthesia typically involves either (a) the stimulation of one sensory modality giving rise to an experience in a different modality (when a sound, for example, gives rise to a colour experience) or (b) the stimulation of a single sensory modality giving rise to different qualitative aspects of experience (when the sight of a number, for example, gives rise to a colour experience). Henceforth I shall refer to (a) as ‘type-a’ and to (b) as ‘type-b’ synesthesia. Such cases threaten Ross’ account because they undermine his claim that each sense specialises in perceiving a range of properties.

Ross quickly dismisses synesthesia as a possible counterexample to his claim on the basis that it involves experiences which are merely *associative* rather than *perceptual* in nature. Ross argues that synesthetic experiences are not perceptual because they do not involve *direct* perception. A perception of a certain property is direct if it is “non-inferential” in the sense that it is not epistemically mediated by another property:

Perception of property  $P_1$  is direct so long as it is not epistemically mediated by perception of some other property  $P_2$ , i.e., if we do not infer that something has  $P_1$  on the basis of its having  $P_2$ . (Ross 2001, p. 501)

Ross notes that although we often say things like the “couch looks soft or a flower looks sweet smelling” such experiences do not involve direct perception because we infer that the couch is soft from the visual properties we associate with softness, e.g., the texture of its textile. Similarly, he argues, in synesthetic experiences one property such as colour is inferred from another such as sound. Ross cites Cytowic (1995) who claims that individuals who have the same sensory pairings tend to have different synesthetic responses. Indeed, there are numerous “individual differences in the specific mapping between the senses involved” as well as “remarkable

variability of the nature of the experience (e.g., vividness, spatial, extent, affective components)” (Sagiv 2005, p. 7). For example, one synesthete might experience a grapheme such as the letter A as red while another might experience it as brown; beef might taste dark blue to one synesthete but yellow to another; the smell of almonds can be pale orange to one but blue to another, and so on. Ross infers that synesthetic experiences are a “mere association rather than direct perception” from the idiosyncratic nature of synesthetic experience (2001, p. 503). This inference, however, is invalid. It does not follow from the idiosyncratic nature of synesthetic experiences that synesthesia is not a genuine perceptual phenomenon. Non-synesthetic colour experiences are equally idiosyncratic in nature. There are, for example, well established intrasubjective and intersubjective colour variations among normal subjects.<sup>8</sup> But this is hardly a reason for denying that colour experiences are a genuine perceptual phenomenon. Similarly, the idiosyncratic nature of synesthetic experiences is hardly a reason for denying that synesthetic experiences are a genuine perceptual phenomenon.

There are further reasons for resisting Ross’ claim. Studies show that subjects with developmental synesthesia have experiences which are “involuntarily and simultaneously perceived as if by one or more... senses” such as sight and hearing or smell and sound (Day 2005, p. 12). Such synesthetic subjects do not infer that something has  $P_1$  on the basis of its having  $P_2$ . For example Day, who is a type-a synesthete studying synesthesia, experiences an extreme interaction between taste and vision. He reports that for him “the taste of beef is dark blue” while “the smell of almonds is pale orange” (2005, p. 11). Another synesthete reports that she “smells music” (Day 2005, p. 15). Ramachandran *et al.* (2005) encountered a type-a synesthete who “experienced the sound of a French tenor’s voice as being simultaneously red and green” (2005, p. 161). Another bilingual type-a synesthete experienced synesthetic colours in only one of the languages she spoke while another experienced numbers, but not roman numerals, as having synesthetic colours (*ibid*). In a separate experiment, Blake *et al.* asked type-b synesthetic subjects to name the synesthetic colour they saw a specific grapheme as having when placed in two distinct contexts, an approximation of which is seen here:

[A 13 C]

[12 13 14]

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<sup>8</sup> See Webster *et al.* 2000, Kuehni 2004, and Malkoc *et al.* 2005.

Surprisingly, the subjects described the same character (13) as having one colour when seen in one context – being among the letters – but as having another or no synesthetic colour when seen in the other context – being among the numbers (Blake *et al.* 2005). Another synesthetic subject experienced an afterimage induced by an achromatic grapheme as having the synesthetic colour she normally sees it as having. Since the synesthetic colour she normally sees the letter A as having is red, she reported having experienced the induced afterimage of the letter A as being red (Blake *et al.* 2005).<sup>9</sup> Although some synesthetes report to only imagine or associate one property with another, many report that they simultaneously experience these properties “in [their] head” (Ramachandran *et al.* 2005, p. 162). Moreover, type-b synesthetes “describe seeing their colors upon the achromatic letters themselves, not simply in their mind’s eye” (Blake *et al.* 2005, p. 48). As Blake *et al.* note, “this description would place them in the category of “projective” synesthetes as opposed to “associative”” (ibid). Ramachandran *et al.* also found that type-b synesthetes saw synesthetic colours “spatially in the same location as the grapheme and insisted that ‘it is not just memory’” (2001, p. 979). Even when presented with graphemes matching their synesthetic colours, synesthetes reported that the graphemes remained “synesthetically visible” (Blake *et al.* 2005, p. 49). Ramachandran *et al.* argue that “[t]aken collectively these results strongly suggest that synaesthesia is a genuine perceptual effect” (2001, p. 982).

Ross could argue that these findings do not establish that synesthetic experiences are not merely associative because the evidence presented thus far is based on verbal testimony. The reason we think that these subjects have synesthetic experiences which are not merely associative, he might argue, is that they report that they have them. But this is insufficient to establish that they are in fact having such experiences since their reports could be at best mistaken and at worse misleading.<sup>10</sup> In order to rule out the possibility that these reports are based on either mistaken or misleading

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<sup>9</sup> This is an especially interesting finding since afterimages arise from processes in the neural stage (as opposed to the retinal stage) of the visual system, which processes and encodes information about the stimuli the photoreceptors (in the retinal stage) collect. If perceived colours are produced by neural connections, and not by directly perceiving physical properties of objects, intentionalism is unmotivated.

<sup>10</sup> The claim here is not that synesthetes do not have first-person knowledge about their experiences but rather an expression of doubt about the accuracy of their reports.



reports scientists have devised experiments whose results do not depend on verbal testimony, but rather on the ability to perform tasks. Blake *et al.* asked type-b synesthetes to match their synesthetic colours using “one of the color palettes from Adobe Photoshop” (2005, p. 49). He found that they “typically spend considerable time getting each color just right” when performing the matches (*ibid.*). As a result, their colour matches were remarkably reliable. Blake *et al.* argue that this shows that “their experiences are subtle and not simply categorical in nature” (*ibid.*). In a separate experiment, Blake *et al.* showed one synesthete an array of black graphemes, e.g., 5s, surrounding similarly looking graphemes, e.g., 2s, (similar to the arrangement seen in figure 1) and asked him to describe what he saw. “Without hesitation, he exclaimed that the 2 stood out conspicuously from the 5s because it was a different color” (p. 52). In a series of similar experiments, synesthetes were presented with a matrix of graphemes, e.g., 2s, forming a triangle embedded in a display of similarly looking graphemes, e.g., 5s (as seen in figure 1) and asked to describe what they saw. Unlike non-synesthetes, synesthetes were able to identify the triangle with far greater speed and accuracy than non-synesthetes. Ramachandran *et al.* (2005) constructed similar experiments that “show that even the detection of symmetry (normally thought to be preattentive<sup>11</sup>) can be based on synesthetically induced splotches of color” (p. 151). These findings suggest that synesthetic experiences are not merely associative.

Ross might insist that showing that synesthesia is a genuine perceptual phenomenon requires showing that the synesthetic subjects *correctly* represent the colours of objects.<sup>12</sup> In support of this claim, Ross could cite the colour-blind synesthete who is able to see “numbers tinged with hues he otherwise could not perceive” due to his defective visual system (Ramachandran *et al.* 2005, p. 165.) He “quite charmingly” referred to these colours as “‘Martian Colors’ [because they] were ‘weird’ and seemed quite ‘unreal’” (Ramachandran *et al.* 2005, p. 165). Although “his retinal color receptors cannot process certain wavelengths,” Ramachandran *et al.* maintain that “his brain color area is working just fine” (2003, p. 57).

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<sup>11</sup> Smilek *et al.* also argue that “attention is not a necessary condition for the binding of synesthetic colors and graphemes” (2005, p. 83). This is important because it strengthens the hypothesis that, at least some, synesthetic experiences are not merely associative.

<sup>12</sup> Ross made this argument in his commentary at the American Philosophical Association, Central Division, 2009.

The same explanation, i.e., that synesthetic experiences arise due to abnormalities in their visual system, Ross might argue, applies more generally to all synesthetic experiences. This explanation, if correct, would be particularly helpful to Ross. It would not only establish that synesthesia is not a counterexample to his account but it would also safeguard intentionalism. For, if synesthetic colour experiences are the result of abnormal vision, these experiences cannot count as veridical. Although this claim would be of great help to Ross, it is problematic. Unlike the colour-blind synesthete, most synesthetes do have normal vision. As Blake *et al.* note, “[b]oth of our adult synesthetes (one male one female) have perfectly normal color vision, including excellent trichromatic color perception as assessed by the modified version of the Munsell 100-Hue test and the Ichihara color plates” (2005, p. 48). This suggests that synesthetic experiences cannot be ruled out as illusory on the basis of abnormal vision.

Perhaps Ross could argue that although synesthetes have normal vision, their experiences are nevertheless illusory because they *do* misrepresent the colours of things. The notion of veridicality Ross would have to employ to rule out that synesthetic experiences are veridical is based on the idea that objects have certain properties such as colours and these properties are represented in visual experience when that experience is veridical.<sup>13</sup> Synesthetic experiences would be illusory in this sense since they would not be produced in the *right way*. For example, they might be produced by cross-activation between different sense modalities. Indeed, Sagiv notes that “synesthesia is often seen as representing a sort of dysfunction” and that “these ideas assume cross-activation between otherwise normally developed modules, either via disinhibition of normally present connections or through abnormal connectivity” (2005, p. 6). But he cautions that this belief, although widely held, is not based on “direct demonstration of abnormal connectivity in synesthetes” (*ibid*). The fact that researchers were able to induce synesthesia in non-synesthetic subjects through hypnosis adds support to the claim that there synesthesia is not produced by cross-activation or, if it is, it is not unique to synesthetes (Kadosh-Cohen *et al.* 2009). But there is a further worry with this notion of veridicality.

If it turns out that perceptual properties cannot be identified with some range of physical properties of objects, then all colour experiences,

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<sup>13</sup> This allows that normal subjects can, and often do, misrepresent the colours of things.

not just synesthetic ones, would turn out to be illusory. This would be fatal for Ross' account which attempts to individuate sense modalities by reference to such a range of properties. Thus, a great deal hangs on whether colours are, in fact, physical properties of objects. More importantly, this notion of veridicality seems to leave out one important fact, namely that perceptual experiences affect one's ability to perform certain tasks. Synesthetic experiences often improve one's performance. A synesthetic subject's typing speed doubled, for example, after replacing the graphemes on her keyboard to match her synesthetic colours (Day, 2005). But they can also hinder one's performance. Smilek *et al.* (2005) found that type-b synesthetes made more errors locating a grapheme presented against a coloured background when the synesthetic colour of the grapheme matched the (real) colour of the background. Blake *et al.* also found that type-b synesthetes made more errors identifying the colour of words when the colour of the word did not match the subject's synesthetic colour. When the words did not match his synesthetic colours, he took longer to identify the colour and even "stumbled over many words" (2005, p. 51). But when the word matched the subject's synesthetic colour, he responded quickly without compromising his accuracy. Similar difficulties arise for non-synesthetes who often find it difficult to quickly and accurately identify the colour of colour terms such as 'red' when their letters have different colours such as blue (i.e., RED). Despite the fact that synesthetic experiences enhance, and in some cases inhibit, one's ability to perform certain tasks, the intentionalist maintains that they cannot be veridical unless they directly represent the colours of things which are to be identified with physical properties or objects instantiated in one's environment.<sup>14</sup> However, as Sagiv rightly points out, synesthesia "reminds us that whatever is represented cannot merely be a copy of the corresponding object, event," property, and so on (2005, p. 7).

I have argued that dismissing synesthesia as a possible counterexample to Ross' account requires establishing either that synesthetic experiences are not perceptual or, if they are, that they are illusory. Studies, however, show that neither of these claims is plausible. If Grice is right that the introspective-character condition (ii) cannot be eliminated, Ross' proposal fails and along with it his defense of

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<sup>14</sup> I thank Wayne Wright for bringing this to my attention.

intentionalism.<sup>15</sup>

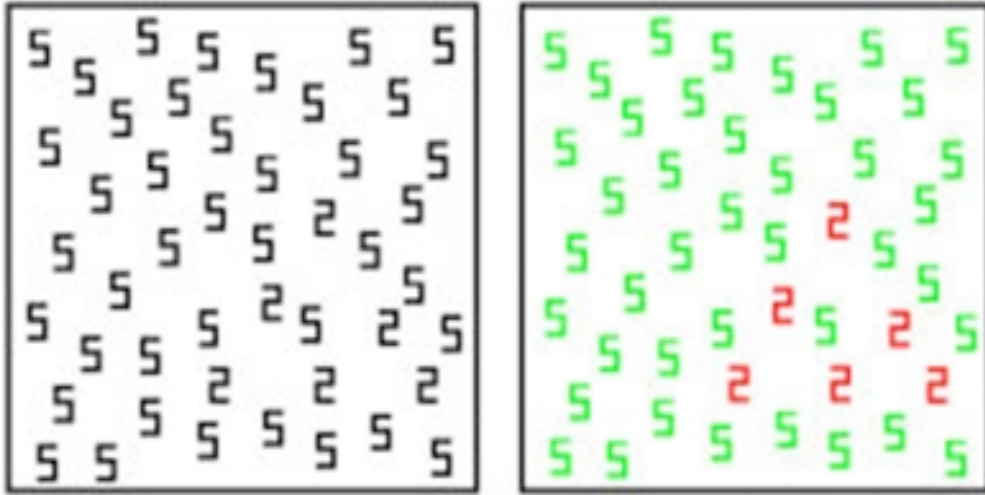


Figure 1

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<sup>15</sup> I thank the panel at the American Philosophical Association, Central Division 2009, for discussion and Peter Ross for commentary; the RSSS faculty and students at the Australia National University; and the participants at the panel at the Australasian Association of Philosophy in New Zealand in 2008. I also thank L. C. Hardin and an anonymous referee for helpful comments on previous drafts.

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