

# **The Senses: Classical and Contemporary Philosophical Perspectives**

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## On the Nature of the Senses

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### 1. INTRODUCTION

In his seminal discussion of the senses, H. P. Grice (1962/this volume, chapter 4) suggests that any one of four criteria—the *proper objects* criterion, the *character of experience* criterion, the *physical features* criterion, and the *sensory organ* criterion—might be used to distinguish two senses and therefore to determine whether a sense with which we are not already acquainted constitutes a new sense.<sup>1</sup> It is unclear whether Grice is describing or recommending a procedure for distinguishing the senses.<sup>2</sup> Indeed, it is unclear exactly how these criteria are supposed to be used. Before listing the criteria, he introduces them as “seemingly independent”. After listing the criteria, he comments that they need not be regarded as mutually exclusive and remarks that there is likely to be “a multiplicity of criteria” rather than any one essential criterion for distinguishing the senses. In fact, at this point he suggests that the most desirable approach in difficult cases would be to examine “the applicability of the suggested criteria and their relative weights” (1962, 136/this volume, p. 85). Rather than continue with this suggestion, Grice moves on to the main theme of his discussion, namely, an examination of the

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<sup>1</sup> Familiar proper objects that might be used to distinguish two senses would be the colors and sounds that are seen and heard, respectively. Familiar characters of experiences that might be used to do so would be those that colors and sounds typically cause. Familiar physical features that might be used to distinguish two senses would be the stimuli, such as electromagnetic radiation and sound waves that activate the distinct senses. Familiar sensory organs that might be used to do so would be the eyes and the ears. Unfamiliar proper objects, characters of experience, physical features, and sensory organs that might be used to distinguish a new sense would be novel instances of the kinds to which the preceding belong.

<sup>2</sup> Given that Grice framed the issue in terms of how one might recognize a new sense, it might be thought that he was thereby suggesting the criteria that *should* be employed in distinguishing the senses. He might, however, have been suggesting that we would just extrapolate from the criteria we actually use to distinguish the senses that we possess. For more on the distinction see Nelkin (1990/this volume, chapter 9).

independence of these criteria and in particular of the independence of the first two criteria.<sup>3</sup>

Much of the philosophical literature concerning the senses in the intervening half century has addressed the epistemological issues raised by Grice's suggestions about how we distinguish (or should distinguish) different senses, resulting in corresponding proposals about the nature of particular senses, with the more general question of the metaphysical nature of the senses remaining in the background.<sup>4</sup> However, the failure to satisfactorily resolve the issue of exactly how we identify the different senses has recently resulted in a closer focus on the more general question of the nature of a sense. This question has been thrown into particularly sharp focus by two starkly contrasting approaches to the senses.

On the one hand, Brian Keeley (2002/this volume, chapter 11) has argued that we can provide a better philosophical understanding of the senses if we take a lesson from how scientists, in particular neuroethologists, distinguish them. By looking at the grounds on which neuroethologists seem to identify the senses, Keeley proposes that we replace the common-sense conception of a sense with a scientific one by rejecting two of Grice's criteria (the proper objects criterion and the character of experience criterion) and adopting a set of four criteria drawn from the natural sciences constitutive of neuroethology. His project is, in essence, that of naturalizing the senses.<sup>5</sup> These criteria, Keeley goes on to claim, can be used to provide a set of individually necessary and jointly sufficient conditions for the differentiation of the senses in all animals. Hence, in an effort to resolve the issues surrounding how we identify the senses, Keeley sets out a scientific realist position regarding the nature of the senses.

On the other hand, Matthew Nudds (2003) has argued against the quest for any set of criteria that match the way in which we commonly distinguish our senses, let alone a set of criteria drawn from the natural sciences.<sup>6</sup> Rather, what we should be looking for is an explanation of *why* we ordinarily distinguish the senses in the way that we do. His own

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<sup>3</sup> Grice did point out the difficulty of identifying distinct types of sensory organs or sensory mechanisms without reference to proper objects or physical stimuli, thereby indicating that at least one criterion could not serve as an independent criterion for individuating a novel sense. More controversial was his suggestion that the presence of a novel phenomenal character of experience might be sufficient for the individuation of a new sense. See Coady (1974/this volume, chapter 6) and Ross (2001) for critical responses.

<sup>4</sup> See, for example, Roxbee Cox (1970/this volume, chapter 5) for a defense of the *key features* condition, a more sophisticated version of the *proper objects* condition; Leon (1988/this volume, chapter 8) for a defense of a *phenomenal character* condition, although one distinct from that suggested by Grice; and Nelkin (1990/this volume, chapter 9) for a defense of the view that the senses should be distinguished in terms of the origins of beliefs.

<sup>5</sup> In acknowledging the physical features criterion Grice would seem to accept a role for science, although he does not make use of it in the way that Keeley does.

<sup>6</sup> Nudds comments (2003, 35) that such a revisionary view of the senses bears on our ordinary concept of a sense only when it can be shown that the latter incorporates "the kind of proto-scientific understanding of the senses which is liable to revision".

	ORDINARY CONCEPT	CRITERIAL APPROACH	REALISM
GRICE	✓	✓	
KEELEY	×	✓	✓
NUDDS	✓	×	×

Figure 12.1 Contrasting views on the individuation of the senses

answer is that we want to know not merely *that* someone perceived something but also *how* they perceived it (i.e., we want to know not merely that someone perceived something but whether they saw it or touched it or otherwise perceived it). It is the usefulness of this additional information that explains the significance of our ordinarily distinguishing the senses in the way that we do. Such a story should precede any debate about criteria. Indeed, it should pre-empt it. For Nudds goes on to claim that our reasons for distinguishing the senses in the way that we do is, in large part, a conventional matter rather than a reflection of any real divisions in nature. Hence, in responding to the difficulty of articulating an account of how exactly we distinguish the senses, Nudds develops an anti-realist position regarding them.

Both of these proposals incorporate a number of interesting suggestions for thinking about the senses, all the more so in that they are in several significant respects diametrically opposed to each other. The former advocates the support of science; the latter eschews it. The latter rejects a criterial approach; the former reinforces it. However, most significantly for present purposes, the one leads to a robustly realist conclusion concerning the senses, while the other leads to an anti-realist conclusion concerning the senses. These various ways of thinking about the senses are summarized in figure 12.1.<sup>7</sup>

It is my view that one way of moving the discussion about the senses forward is to construe the issue of the senses in terms of a debate between realists and anti-realists. Here I mediate between the two positions. In the next section I set out Keeley's case for realism; I point out some problems that face his criterial approach to the individuation of the senses and that also face a criterial approach of a more minimal kind. In the subsequent section I outline Nudds's case for anti-realism; I argue that our intuitions regarding three test cases that he cites in support of it (novel senses, counterfactual cases, and non-paradigm sensory processes) can be equally well explained by realists and that his anti-realism regarding the paradigm senses is based on a controversial assumption of what a sense is. The view I advocate is what you arrive at when you

<sup>7</sup> Grice appears to assume a form of realism about the senses, as do most of those who have discussed them, but the commitment is seldom clarified.

acknowledge that an explanation is required for why we distinguish the senses in the way that we do and that our conception of a sense applies to the senses beyond those that we possess.

## 2. SCIENTIFIC REALISM AND THE SENSES

In providing accounts of how we distinguish the senses, Grice and others have drawn attention to some of the features that constitute a distinct sense. However, providing an account of how we distinguish one type of sense from another need not account for all the features that make a token sense an instance of a particular type of sense. The point should be uncontentious. The features that are discriminated when two types of things are discriminated are seldom sufficient to provide a full account of the constitution of those types of things. In as much, one might justifiably differentiate two tasks. There is the task of ascertaining what is required for us to distinguish between tokens of two types of sense, and then there is the task of ascertaining all that is required for a token sense to be a member of the type of sense of which it is a member.<sup>8</sup> However, putting matters this way assumes the independent reality of the senses. So one should distinguish a further task, namely that of ascertaining the general metaphysical nature of the senses. It is to that task that the present essay is primarily addressed. Nonetheless, it can be addressed only via the attempts to tackle the other two tasks.

Grice suggests criteria that we might use to distinguish a new type of sense. As such he is addressing the first issue noted above. Were such an account to be successful, it would have set out the conditions that are necessary and/or sufficient for distinguishing two senses. It would thereby have also provided at least a partial account of the constitution of the senses. As the subsequent literature testifies, Grice failed to provide an adequate account of what is required for us to be able to distinguish two types of senses, hence opening the door to the question of the metaphysical nature of the senses.<sup>9</sup> In the rest of this section, I set out and contest two of the most recent attempts to finesse a criterial account by drawing upon the resources of science.

### 2.1. Scientific Criteria

Keeley attempts to fill in some of the gaps in Grice's story. His proposal is explicitly stated in terms of individually necessary and jointly

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<sup>8</sup> Nudds (2003, 33) similarly notes that an account has to be given not only of how the senses are distinguished from each other but also of what all of the perceptions of a single sense have in common.

<sup>9</sup> In the introduction to his article Grice provides some remarks about what constitutes a sense.

sufficient conditions for distinguishing the senses. If successful, it should enable us to distinguish between any two types of senses. However, it would be able to do more than this; it would also be able to tell us what is required for any putative instance of a sense to be a member of a particular type of sense and hence provide justification for the presupposition that there really are senses. In proposing such conditions Keeley defers to the way in which scientists distinguish the senses. The problem with his proposal is that it is not true with regard to the way scientists in fact distinguish the senses. It thereby fails to provide an adequate account of the constitution of the senses and vindication for realism.

Keeley's proposal, in brief, is that "to possess a genuine sensory modality is to possess an appropriately wired up sense organ that is historically dedicated to facilitating behavior with respect to an identifiable physical class of energy" (2002, 6/this volume, p. 221). He explicates this proposal by providing an ordered set of four independently necessary and jointly sufficient conditions drawn from the four sciences that compose neuroethology, which he claims can be used to distinguish the senses. They are in order as follows: (1) physics, (2) neurobiology, (3) the behavioral sciences, and (4) evolutionary biology. Physics, first and independently of the other sciences, identifies the classes of physical energy (*possible sensory spaces*, as Keeley calls them); neurobiology then ascertains which of the possible sensory spaces are actualized by identifying the appropriately wired-up sense organs that are sensitive to these classes of energy; the behavioral sciences are then required to confirm that the sense organs actually facilitate behavior (ruling out vestigial senses), and evolutionary biology bears out the fact that this stimulus is the one to which the sensory system was designed to respond (avoiding the unnecessary multiplication of senses). Keeley's procedure is intended to identify both the possible and the actual senses. In this respect, the senses are taken to exist prior to and independently of our classification of them. It is this that marks it out as a realist account of the senses and, since it employs the sciences constitutive of neuroethology, a scientific realist account. Using these four conditions in this way, Keeley claims, we will be able to individuate the senses that any creature possesses. However, there are two complementary counterexamples that demonstrate that his proposal is flawed.<sup>10</sup>

The *pit viper problem* is derived from the pit viper, which possesses two sets of sense organs (the pit viper has, below each of its eyes, a small pit) that are each receptive to non-overlapping ranges of electromagnetic radiation. On Keeley's proposal one should count only a single type of sense; a difference in the type of physical stimulus is necessary for a difference in the type of sense; therefore, sameness in the type of physical stimulus is sufficient for sameness of the type of sense. Yet

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<sup>10</sup> See Gray (2005) for a fuller discussion of the two problems outlined here.

neuroethologists themselves standardly distinguish two senses: eyes are involved in seeing; pits are involved in thermal imaging. Hence, the pit viper problem demonstrates that scientists do not always start out by employing the physics condition, nor, more importantly, does the physics condition act as an independently necessary condition for differentiating the senses.

The *vampire bat problem* is the converse case. The vampire bat problem is derived from the vampire bat, which has an appropriately wired-up sense organ that is historically dedicated to facilitating behavior with respect to two identifiable physical classes of energy: kinetic energy and radiant energy.<sup>11</sup> On Keeley's proposal, if there are two types of physical stimulus, then there are two possible sensory spaces. There might be distinct senses, one of which is appropriately related only to kinetic energy and the other of which is appropriately related to radiant energy. Indeed, the thermal imaging sense of the pit viper seems to be an example of the latter. Thermoregulation might be an example of the former. However, the vampire bat problem demonstrates that this is not always the case. Here scientists do not distinguish two senses despite the presence of distinct physical stimuli. Yet, if the neurobiological condition is required to play a role in our individuating the senses, it is again unclear how the physics condition is supposed to act as an independently necessary condition for sensory differentiation.

The two problems arise with Keeley's proposal because of the particular role he gives to the physics condition in his treatment of the senses. He holds that this condition provides a starting point and an independently necessary condition for the "differentiation" of the senses. It is clear how the physics condition could be necessary yet insufficient for the *constitution* of a sense. A sense is not merely constituted by the physical stimuli to which it is sensitive; a sensory organ also has to have evolved to detect that type of stimuli. It is also clear why one should require some sort of external constraint in order to individuate the senses; as others have noted, how otherwise would one classify a sensory organ? However, on Keeley's account, if the physics condition is *independently* necessary, it should be all that is required for the *individuation* of one type of sense from another. Yet, as the two cases show, on certain occasions it is clearly the case that the physics condition does not play this role.

Both problems indicate that reference to the physics condition may be necessary but insufficient for the individuation of a sense. However, now that we have switched from regarding the neurobiological condition as a merely constitutive condition for a sense to regarding it as an individuation condition for certain types of senses, it is no longer clear

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<sup>11</sup> I say that this *may* be the case because current research, as far as I am aware, has not determined what the vampire bat is receptive to. Nevertheless, many mammals, including humans, have heat receptors that are sensitive to both forms of energy. So the example needs to be addressed.

how we should regard Keeley's idea of possible sensory spaces as a strong constraint on the individuation of the senses, nor is it clear when exactly the neurobiological condition should play such an additional role. Hence, a realist view of the senses remains less than fully vindicated.

## 2.2. Minimal Criteria

In another recent response, Peter Ross (2008) provides a different challenge to Keeley's account. Ross argues that the behavioral condition (that for something to be a sensory system it has to facilitate behavioral responses with respect to a class of physical stimuli) can be made to work only if qualitative properties are presupposed. Therefore, qualitative properties cannot be eliminated from an account of the senses in the way in which Keeley proposes. Ross favors a common-sense conception of the senses that can nevertheless be informed by scientific data, whereby a distinct sense enables perceptual states characterizable by means of a distinctive qualitative determinable. Indeed, Ross claims that a *qualitative determinables* criterion (another descendent of Grice's proper objects criterion) is the only criterion the satisfaction of which is necessary for our distinguishing two senses (i.e., tokens of any two types of senses must differ with respect to the qualitative determinables they determine) and hence is sufficient for the identification of two token senses as members of the same type of sense (i.e., token senses determining the same qualitative determinable would be enough to qualify them as belonging to the same kind of sense). He thinks that the prospects for other necessary conditions or for providing sufficient conditions for our distinguishing a sense are poor. He cites the case of touch; even though touch is associated with a number of qualitative determinables, Ross notes that they have all been grouped together as the determinables determined by the sense of touch. In the case of touch, some further feature seems to be required for us to distinguish more than one sense.

One benefit of his view, according to Ross, is that the two problems that challenge Keeley's proposal can be resolved. In the case of the vampire bat problem, there is plausibly only a single qualitative determinable; therefore, there is only one sense. In the case of the pit viper problem, there are plausibly two qualitative determinables to which the pit viper could be perceptually sensitive: hotness and brightness. We do not know to which of the two qualitative determinables the pit viper is sensitive. However, if it is sensitive to brightness, then its sense would qualify as a visual sense, whereas if the pit viper is sensitive to hotness, then its sense would qualify as a touch sense. It all depends on what it is like to be a pit viper (in the relevant respect).

Ross claims that multidimensional scaling, which is used to explore the sensory spaces constituted by the determination of qualitative determinables, might be able to tell us whether the pit viper's sense is related to vision or to touch. This seems to me to be highly optimistic. However,



even if it could provide a clue, it is arguable whether it would be enough. For Ross assumes a reductive externalist representationalist theory of perceptual experience in which the character of experience can be fully explained in terms of the properties (determinates of the qualitative determinables) represented by experience. Ross's reasoning is that if we can determine the character of thermal imaging, we can determine its content and thereby the sensory modality. However, unless a version of representationalism can provide an independently plausible explanation of which of the two properties is the one that the pit viper's sense represents, it remains unclear whether the character of the pit viper's experience is indeed constituted by the properties it represents. If we cannot ascertain independently which properties thermal imaging represents, we have no justification for identifying the sense in one way or another. None of the versions of content determination presently on offer seem obviously up to the job.<sup>12</sup>

Even were a plausible account of content determination to be provided that supported the view that the thermal-imaging sense determines brightness, it is not indisputable that the sense should be classified as a visual one. Should we not also take into account the way the pit viper's sense detects the emission of radiation from warm bodies in a way that vision does not? Similarly, were a plausible account of content determination to be provided that supports the view that the thermal-imaging sense determines heat, should we not also want to take into account the way the pit viper's sense detects the size, shape, and movement of objects in a way unlike that in which we sense heat by touch?

One might here suggest that it would be useful to draw a distinction between species and genera of senses. One might claim that the present case shows that there are two species of the genus vision or two species of the genus touch. However, saying that we might have two different species of visual senses here would significantly modify our understanding of what vision is. Similarly, saying that we might have two different species of touch here would significantly modify our understanding of what touch is. Besides, Ross notes the way in which we include a number

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<sup>12</sup> See Gray (forthcoming) for further discussion. This case, it seems to me, provides a more realist and more serious challenge to representationalism than Grice's Martian thought experiment. Ross (2001) argues that Grice's Martian thought experiment, which involves a creature that has two sets of sensory organs sensitive to similar ranges of electromagnetic radiation and sees colors with both systems but has different characters of experience, can be explained without introducing qualia (intrinsic properties of experiences). Ross claims that the difference could be explained by the Martian's being sensitive to other qualitative properties to which we humans are perceptually insensitive. Let us grant that the phenomenology could be explained in both these ways. The matter comes down to whether additional qualitative properties are involved, a matter that would presumably be empirically ascertainable. Both alternatives seem possible (although both seem somewhat far fetched). Whether we would regard a sense that either determined color via a different character of experience or determined it along with other qualitative determinables as being distinct from vision is unclear, just as it is with other counterfactual and non-paradigm cases (see sections 3.2 and 3.3).

of qualitative determinables as those that are determined by the sense of touch; why should we not think of the visual perception of brightness and the imaging of hotness as being related in the same way? In general it is difficult to know just how to respond to Ross's suggestion until the broader metaphysical issue of the nature of the senses, upon which a minimalist approach is, by its own nature, silent, has been resolved.

### 3. ANTI-REALISM AND THE SENSES

The problems facing criterial accounts suggest the need for an alternative approach to the senses. Nudds (2003) provides such an approach: what is required is an *explanation* of why we ordinarily distinguish five senses in the first place, not a list of the criteria that might be used to identify them given that we have already made the distinctions that we have. What is most significant about his approach, in the present context, is that it leads to an anti-realist view of the senses.

For Nudds, it is significant that, when asked how many senses there are, ordinary folk will typically say five, but, when asked why they say this, they are unable to provide a good reason for saying so apart from the fact that they have been taught to. It is common knowledge that we have five senses, but, according to Nudds, this is only a piece of conventional wisdom.<sup>13</sup> In support of this, Nudds notes that "it is surprising, given the obviousness of the fact that we have five senses, that there should be so little agreement as to what account should be given of them" (2003, 31).

Following a rehearsal of the principal criterial accounts and the main objections to them, Nudds turns to what he takes to be the more fundamental issue.<sup>14</sup> Even if one could formulate an extensionally correct account of the way in which we distinguish the five senses in terms of

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<sup>13</sup> The obviousness of the fact that we have five senses, even the possibility of this being a universal distinction among humans, might seem to be equally well explained by natural features. However, it would not decide the philosophical issue. Perhaps early proto-scientific theories, such as the Aristotelian view, were really based on conventional distinctions.

<sup>14</sup> Those who adopt the criterial approach might be uneasy at Nudds's quick rejection of it. In my view his objection to the proper objects criterion is unsatisfactory. He raises two difficulties: that of telling whether a property is perceived by one rather than another sense when it is simultaneously doubly determined and that of explaining how perception by a particular sense can occur without the key features that are supposed to individuate that sense. One response, as Grice seems to suggest in the case of seeing and feeling shape, is that we can tell that a property is perceived by a particular sense—without the presence of key features—when the spatial properties have different appearances due to the way in which they are differently positioned with respect to the distinct sense organs. Nevertheless, this does not challenge Nudds's main point about the significance of distinguishing the senses. Nor does it resolve the metaphysical issue, for simply endorsing a criterial account does not entail endorsing realism. One might even argue that one criterial account is the best way to identify the senses without endorsing their reality independently of our identification of them.

appropriate criteria, this would still not tell us why we make (or should make) the distinctions we do. Hence, so Nudds claims, a condition on any satisfactory account of the senses is that it should be able to tell us why we distinguish the five senses as we do.<sup>15</sup>

According to Nudds, our concepts of the five senses are core folk psychological concepts that are of use to us for our understanding of each other. It is of explanatory significance to us to know that someone is in a folk psychological state related to one sense rather than another because their being so will have consequences for their judgments and actions. We want to know not merely that someone perceives an object but also how they perceive that object—whether they are seeing it or touching it, for instance—because knowing that will produce a difference in our potential explanations and predictions. The basic idea here is that if people perceive an object in a certain way (i.e., via a certain sense), then they have information that they would not have were they to have perceived the object in another way. Hence, we can make inferences about their judgments and future behavior. In other words, the ways in which we distinguish between the senses should be spelled out in terms of the consequences of our so doing rather than in terms of pre-existing criteria. So the explanation for our distinguishing the senses is that it has explanatory significance.<sup>16</sup>

Nevertheless, this only seems to postpone the question of why we distinguish the number of senses that we do. Perhaps we distinguish the senses for the explanatory reasons suggested because distinct senses, which are to be characterized by certain properties, really exist. Ultimately, according to Nudds, the distinctions we make are conventional (2003, 48) and, to some degree, arbitrary. This claim has already received some motivation from the prior rebuttal of criterial accounts. However, central to the claim is the argument that our distinguishing five senses is only partly a consequence of the fact that we have the sensory mechanisms that we do. Although sensory mechanisms contribute to the differentiation of the senses, they do not play the role of criteria, nor can they be regarded as constituting the relevant type of natural kinds. None of this is to say that conventional divisions are not somehow constrained. There are pragmatic reasons for distinguishing

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<sup>15</sup> Given that Nudds focuses on our five senses, an appraisal of the various criterial approaches in their own terms would be restricted to whether they are *de facto* accurate. However, some criterial accounts propose a view about the criteria that *should* be adopted, implying that there are reasons for distinguishing the senses in the way that they recommend. No doubt, such accounts are often not as explicit about their reasons as Nudds would like. Nevertheless, the criterial approach is not always a matter of fitting the theory to the data as Nudds seems to be suggesting. Indeed, to my mind, the main force of Nudds's position lies in his claim that criterial accounts invariably come up short.

<sup>16</sup> Roxbee Cox (1970/*this volume*, chapter 5) draws attention to the usefulness of our dividing up the senses, in particular touch, in the way that we do without explicating the metaphysical implications in this way.

the senses in the way that we do; the information thus provided is of benefit to us. Furthermore, once we have established the distinction in folk psychology, we can consolidate it by mutually acting on it. Nudds holds that the senses are, if anything, social psychological kinds. In this respect he endorses a form of anti-realism.

Nudds concludes that his approach to the individuation of the senses is not only able to explain why we distinguish the five senses that we ordinarily distinguish but also has the advantage of being able to explain our intuitions about three other types of cases: new senses, counterfactual cases, and non-paradigm sensory processes. In the rest of this section I argue that the realist can provide equally satisfactory explanations of our intuitions about all three cases. As it turns out, the case for anti-realism is best supported by the paradigm senses, but here Nudds assumes a model of what a sense would be that realists should reject.

### 3.1. Novel Senses

Since the senses that we distinguish depend upon our conventions and we have no conventions for senses that we do not possess, Nudds (2003, 50) holds that his anti-realist account has nothing to say about senses that we might newly possess. One difficulty with this response is that many people accept that other animals have senses that we do not (but could perhaps) possess, and people typically have intuitions about such senses. So any account of the senses should have something to say about new ones.

There seems to be no obvious restriction to our providing new conventions and thus being able to think of something as a new sense. All of the parties to the debate agree that we already possess the general concept of a sense as that which enables a distinctive way of perceiving. What remains at issue is how to construe such a concept and in particular whether such a concept enables us to recognize a new sense that exists prior to and independently of our conceptualization. It is not obvious that a consideration of novel senses speaks in favor of anti-realism without further consideration of putative examples of such novel senses. I return to this in the final section.

### 3.2. Perceiving and Possibility

Try to imagine a possible world in which sounds cause experiences that in the actual world are caused by colors. How would we classify such a sensory process?<sup>17</sup>

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<sup>17</sup> I am not here describing a case of colored hearing synesthesia, in which additional experiences as of color are caused by sounds. That occurs in the actual world. Whether it is appropriately so named is another issue. I think that it is a case of hearing and that a construal of the use of the term *colored* can be provided.

Nudds explains our lack of any secure intuitions about how we would think about the counterfactual example by pointing out that the distinctions we make are governed by conventions that are meant to apply only to the actual world. This, however, hardly decides the issue. For the criterial approach also has a readily available explanation for why we should not have any secure intuitions about such cases. Drawing on Grice's common-sense criteria, one could say that the reason we would have no firm intuitions about how to classify the aforementioned case is that the criteria are here combined that might actually be used to distinguish two different senses (hearing and vision). The reason we have no firm intuitions about this and similar counterfactual cases is that the way we actually distinguish the senses with which we are familiar precludes it.

Keeley's criterial approach might seem to offer a different response. On his proposal we individuate the senses by reference to the physics condition since physics delimits all possible sensory spaces. So the present example would be a case of hearing. Intuitively, there seems to be something problematic about this. However, this is not all that Keeley's account requires; we also need to add a specification of the neurobiological condition if this is to be a case of a genuine sense. Now do we really have clear intuitions about the kind of sensory system that would have to have evolved so as to enable the possessors of such a system to respond experientially to the relevant stimuli in the stipulated fashion? If we do not, as seems plausible to me, we would have another explanation available, based on a realist standpoint, for why we have no secure intuitions about how we should think of the counterfactual case.

Other criterial views that give pre-eminence to a single criterion over the other criteria can be similarly problematic. Leon (1988/this volume, chapter 8) claims that distinguishing between the senses requires reference to the character of experience. He cites several modal examples in favor of this. For instance, he claims that the presence of light is not necessary for seeing: another phenomenon (e.g., sound) might enable us to see (have experiences with the appropriate *visual* phenomenal character) in the absence of light. Such modal intuitions are, to say the least, controversial, especially since we are given no indication of how they are supposed to be realized.<sup>18</sup>

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<sup>18</sup> Kripke (1980, 130) raises precisely this possibility. There are a number of reasons to doubt that it is a genuine possibility. Could sound waves cause the appropriate events in the eye? Alternatively, could sounds cause events in the ear and brain that resulted in experiences qualitatively identical to actual visual experiences? Could the brain be wired in the appropriate way? Or would the character of experience in such a world still be constituted by the external sound properties? Perhaps all of these worries contribute to our uncertainty about what to make of these cases and thus make it hard to extend Kripke's account of natural kinds and natural kind terms to the senses and terms for the sensory modalities.

### 3.3. Non-Paradigm Sensory Processes

By way of further support for anti-realism, Nudds (2003, 50) explains the vagueness in our judgments about non-paradigm cases by claiming that our conventions do not provide us with clearly determined ways of thinking about them. Given that he distinguishes non-paradigm processes from both new senses and counterfactual cases (*ibid.*) and that he accepts the common-sense view that we possess five paradigm senses, what he might have in mind as an example of the way in which perceptions are produced in non-paradigmatic ways is the tactile-visual substitution system (TVSS).<sup>19</sup> One might well waver over classifying TVSS as a tactile or a visual sense because of the difficulty of deciding whether further explanation is to be gained by thinking of TVSS in one way or the other. Some advocates of a criterial approach have not seen any difficulties here; some hold this to be a clear case of touch, while others regard this as a case of vision.<sup>20</sup> Nevertheless, the presence of disagreement can itself be regarded as providing some support for the anti-realist view that there is no mind-independent fact of the matter about the case.

However, an alternative response might be made on behalf of the realist: a case such as TVSS, in which perceptions are produced in a non-paradigmatic manner, gives rise to a certain vagueness in our judgments because our concepts of distinct senses concern only normal sensory processes. Indeed, Keeley's realist account of the senses explicitly recognizes the way in which sensory systems have evolved to respond to specific stimuli.

### 3.4. Paradigm Senses

A better place to look for support for anti-realism, contrary to what one might have expected, turns out to be the putatively paradigm senses. By accepting the common-sense view that we have five senses, Nudds seems to be suggesting that they are all cases of paradigm senses; we have conventions that provide us with clearly determined ways of thinking about five senses. However, one might well differentiate between the five senses in this respect.

Distinguishing the senses, on Nudds's account, assumes the double determinacy of an object (*ibid.*, 46).<sup>21</sup> Nudds holds that a folk psychological account of the senses assumes that there are distinct ways of

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<sup>19</sup> See Bach-y-Rita et al. (1969).

<sup>20</sup> See Leon (1988/*this volume*, chapter 8) for a defense of the former view. See Heil (1983/*this volume*, chapter 7) for a defense of the latter view. Noë (2004, 106–17) claims that reference to sensorimotor contingencies should be used to distinguish the senses. Therefore, this should be regarded as visual-like given certain similarities of sensorimotor contingencies with visual perception.

<sup>21</sup> One assumes that the term *object* is used to cover more than just middle sized dry goods in the case of, for instance, taste.

determining the one object because this explains how different information about that object can be acquired. The most persuasive cases of distinct senses occur when double dissociation is manifested between the senses that doubly determine the same object. We can both see and hear the same object, but we can also see objects without hearing them and hear objects without seeing them. This, presumably, is one reason that it is so obvious to us that sight and hearing are distinct senses. Similarly, we can both see and touch the same object, but we can also see objects without touching them and touch objects without seeing them. Hence, it is uncontroversial that we distinguish vision, hearing, and touch.<sup>22</sup>

But does the same apply as obviously to smell and taste? Ordinary folk sometimes have more trouble responding to the question of whether taste and smell are really instances of distinct senses than they do when asked whether vision, hearing, and touch are instances of distinct senses. First, in knowing that someone tasted as opposed to smelled an object, how obvious is it that there is a difference in the information acquired? Second, taste and smell do not display double dissociation in such an obvious way; while it seems clear that we can smell things without tasting them, it is less clear whether the sense of taste does not depend in some way on the sense of smell.<sup>23</sup> Taste seems to be less paradigmatic than the other four senses. However, it is precisely this that lends some support to a conventionalist view. Despite the fact that the difference between taste and smell is less clear cut than that between the other senses, it is nonetheless sufficiently useful for us to draw a distinction between two senses. Perhaps it is useful for us to know that someone tasted something rather than smelled it because we would then also know that they would have learned how it felt. Conversely, perhaps it is useful for us to know that someone smelled something rather than tasted it because then they would not have the additional information. These, so it might be claimed, are the reasons that we distinguish two senses here.

This line of argument receives support from another case, that of heat perception, where, despite certain similarities to the preceding example, a distinction is not ordinarily drawn between touch and a heat sense. Smell and taste are, respectively, distal and proximal senses. We smell objects that can be at various distances from us, whereas objects can be tasted only if we are in contact with them. Similarly, objects can be

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<sup>22</sup> No doubt such senses influence each other; vision contributes to the perception of the location of sounds. My point concerns the contribution to what is putatively distinctive about each sense. I view synesthesia, which involves additional characters of experience, as evidence for the distinction between the senses rather than evidence for the joining of the senses, as some have suggested. This is because the character of such experience is dependent on the distinct contents of normal experience.

<sup>23</sup> Interestingly, no cases of smell/taste synesthesia have been reported, suggesting that taste and smell are not such as to be suitable for synesthetic cross-modal associations in the way that hearing and vision are (e.g., colored hearing synesthesia).

touched only if we are in contact with them, yet we can sense the heat of objects at a distance from us. Despite this similarity between the cases and other reasons to distinguish two senses (i.e., the different objects of and characters of heat sensations), we do not ordinarily draw a distinction between touch and a heat sense. That is because there remains a significant difference between the two cases: it is of no explanatory use for us to draw a distinction between two senses in the case of touch and heat perception because we do not automatically learn anything extra in knowing that someone perceived something by means of heat perception as opposed to by touch. When we touch something, we can feel its heat, but when we feel the heat of something, we may or may not have perceived its tactile properties. Of course, there may be some use in drawing a distinction between feeling the heat of something with or without touching it. Nonetheless, this does not provide a reason for ordinarily drawing a distinction between heat perception and touch.<sup>24</sup>

Although one might draw a distinction between the five paradigm senses as a way of motivating anti-realism, this then leaves the anti-realist with the problem of accounting for the other paradigm senses. The way to deal with this is to draw a parallel between the five senses. Touch seems to be distinctive among the senses because it involves a number of distinct types of mechanisms (sensory receptors) that put us into contact with different properties (pressure and heat) and enable different kinds of sensations. For these reasons we seem to have some basis on which to think that there is no single, independently existing sensory modality in the case of touch. Since ordinarily we do not distinguish more than one sense, we should therefore conclude that the sense of touch, as we understand it, does not exist independently of our conceptualization of it. However, as Nudds argues (this volume, chapter 16), similar reasoning can be applied to vision and hearing. Psychologists have discovered that sight and audition, as we ordinarily think of them, both incorporate distinct sub-systems. According to Nudds, if realism were the correct view of the senses, then senses would be natural kinds, and the senses would be natural kinds only if they were each realized by one kind of system. Since sight and hearing are realized by a number of distinct sub-systems, Nudds concludes that not even the archetypical senses can be natural kinds.

However, this model of a sense is one that the realist should reject. To begin with, it is inappropriate to think of a sense in the way in which

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<sup>24</sup> Roxbee Cox (1970/this volume, chapter 5) discusses the contrast in detail. Despite there being no obvious key feature that can be used to group together tactile and heat sensations, Roxbee Cox argues that all such cases involve feeling and essentially involve a part of the body with which we sense the world by feeling how the world affects the part of the body. He notes that we do not have separate sense verbs because our current linguistic practice (the way we employ the term *feel*) can adequately serve two functions that are elsewhere served by the use of separate sense verbs: it allows us to indicate properties of what is perceived that we may expect other perceivers to be able to notice and what another would have to do to perceive the same features.



one might think of a chemical natural kind (e.g., water or gold) or even a biological natural kind (e.g., tiger), where some item belongs to that kind only if it has a certain intrinsic nature. If a sense is to be regarded as a psychological natural kind, then it is more plausible to individuate it by reference to a broad function rather than a specific realization.<sup>25</sup> We do not withhold the attribution of vision to reptiles, fish, and even insects, for whom the underlying mechanisms that realize vision are without doubt different from those of human vision. Relatedly, it does not seem right to think of senses as first-order kinds; it would be better to think of them as higher-order kinds. It seems intuitively correct that particular senses come in a variety of forms. Human vision is just one kind of vision, and human hearing is just one kind of hearing.

#### 4. THE REALITY OF THE SENSES

Insofar as Keeley's account of the senses is sensitive both to the essentially relational nature of the senses and to the variety of forms that we think distinct senses can take, his proposal seems to me to be closer to the mark. What is problematic about it, however, is the way in which it employs criteria to differentiate the senses. Here Nudds offers an appropriate corrective. Anyone seeking to account for the senses must explain why we distinguish the senses in the way that we do. For the realist, the explanation will have to lie not in how we may benefit by drawing the distinctions between the senses in the way that we do but in how the creature that possesses the putative senses is benefited by possessing them. All of the ingredients for such an explanation are already available in Keeley's account. Rather than applying them in the way that he does, my suggestion is that they should be used as the elements of an explanation of how and why the different senses have evolved.

Consider the case of thermal imaging. Following Keeley's proposal, since vision and thermal imaging both involve the detection of electromagnetic energy, we would not distinguish a different type of sense in this case but another species of visual perception. Yet scientists do distinguish thermal imaging from visual perception. Scientists typically regard this as a kind of sense that we do not possess. But why do they do so? Employing the kind of considerations that Nudds suggests, it might be useful for us to posit another sense because we might learn something about a pit viper by knowing that it detects an object by thermal imaging rather than by sight. For instance, we might learn that it is more likely to have detected a warm-blooded animal if it perceives it by thermal imaging rather than vision, for if it were using sight, it might have mistaken the object for a similarly sized inanimate object. However, scientists do

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<sup>25</sup> An argument can also be given for thinking of modules as relationally individuated, psychological natural kinds. See Gray (2001).

not distinguish thermal imaging merely because it is useful for them to do so. They distinguish thermal imaging from vision because of what the snake itself learns from being able to perceive objects in this new way. The best explanation for snakes' being able to perceive objects in such a way is that they possess a distinct kind of sense, that is, there is a distinctly new way in which they come to learn about the world.

The distinctiveness of thermal imaging has a number of aspects. First, the thermal pits, which constitute apparently distinct sensory organs, turn out to form part of an anatomically distinct sensory system, albeit with connections to the visual system. Second, although thermal imaging functions in combination with visual perception, pit vipers are able to use thermal imaging where visual stimuli are impoverished or lacking altogether. Third, thermal imaging has an evolutionary origin distinct from that of vision. Relative to vision, thermal imaging is a recently evolved capacity in those snakes that possess it. It is not merely an evolutionary modification of an existing visual sense; it is the differentiation of a new kind of sense. Finally, although thermal imaging is sensitive to electromagnetic radiation, what is of more significance for the selection of thermal imaging is that it is thereby sensitive to particular properties and objects in its environment. For, although vision and thermal imaging are both sensitive to ranges of electromagnetic radiation, these non-overlapping ranges of radiation are each related to different properties and objects; vision is sensitive to the solar radiation that is reflected from objects, while thermal imaging is sensitive to the radiation that is emitted from certain terrestrial sources. All of these considerations contribute to differentiate thermal imaging from vision. However, thermal imaging is not distinguished from vision by applying a set of criteria. Rather, the considerations that Keeley notes are employed to explain how and why thermal imaging has evolved in distinction from visual perception. To conflate thermal imaging with vision would be to neglect these significant features that explain the presence of thermal imaging.

Explaining the evolutionary differentiation of the senses provides additional justification for the reality of paradigm senses, such as vision and hearing, and more unusual senses such as thermal imaging.<sup>26</sup> In my view, evolutionary considerations provide some support for the view that we also have a heat sense that has evolved independently from a tactile (or pressure) sense. However, it would be rash to claim that reference

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<sup>26</sup> A sticking point should be noted here. Suppose vision has evolved independently on a number of occasions. I am suggesting that the evolution of thermal imaging is distinct from all of these instances of visual senses and their descendants. However, if thermal imaging in fact determined the emission of electromagnetic radiation, some might argue that it should be classified along with the other visual senses (recall Ross's suggestion). Given that how one classifies thermal imaging would seem to depend on what one's classificatory interests are, such considerations might be developed into another argument for anti-realism: scientific anti-realism. Of course, this worry would be alleviated somewhat if the case were to be made for the unique origin of the visual sense.

to evolutionary explanations resolves debate in all cases. For instance, consider how the tongue of the pit viper has evolved to capture airborne chemicals, which it then detects by means of an organ (Jacobson's organ) in the roof of its mouth. It is unclear to me whether this way of perceiving the world is by smell or by taste, but then I am still unsure whether smell and taste are really different senses in our own case.<sup>27</sup>

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