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Introduction

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# ***Oxford Handbook of the Philosophy of Perception***

## **Introduction \***

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*Abstract* Perception is the ultimate source of our knowledge about contingent facts. It is an extremely important philosophical development that starting in the last quarter of the twentieth century, philosophers have begun to change how they think of perception. The traditional view of perception focussed on sensory receptors; it has become clear, however, that perceptual systems radically transform the output of these receptors, yielding content concerning objects and events in the external world. Adequate understanding of this process requires that we think of perception in new ways—how it operates, the differences among the modalities, and integration of content provided by the individual senses. Philosophers have developed new analytic tools, and opened themselves up to new ways of thinking about the relationship of perception to knowledge. The *Oxford Handbook of the Philosophy of Perception* is a collection of entries by leading researchers that reviews these new directions in philosophical thought. The Introduction to the *Handbook* reviews the history of the subject from its beginnings in ancient Greece to the nineteenth century, and the way that science and philosophy have together produced new conceptions during the last hundred years. It shows how the new thinking about perception has led to a complex web of theories.

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## *INTRODUCTION*

*Keywords* perception, Plato, Aristotle, scepticism, Stoics, Epicurus, agnosia, evolution of perception, perceptual specialization, sense data, realism.

Perception is the ultimate source of knowledge about contingent facts. We know about our surroundings because we are able to experience them through perception; we know about scientific phenomena because they are observed. Epistemology is therefore very much concerned with the evidential value of perception. Analytic epistemology is concerned with the rational grounding that perception lends belief; empiricist philosophy of science erects the entire edifice of scientific knowledge on the back of perceptual observation. The rationality of perceptual grounding is contested, of course. On one side, it is contested by those, like Hume, who think we never have *reason* to believe in contingencies. According to him, we arrive at contingent beliefs about matters beyond mere sense-impressions by the association of ideas, and not by reason. On the other side, it is impugned by rationalists like Plato and Descartes, who think that perception is incoherent—both complain, for example, that it fails to intimate shape in a way that suffices to ground geometry, the authoritative science of shape—and far too evanescent to offer genuine and secure knowledge. Still: even the opposition focuses on a critique or reinterpretation of observation and its epistemic value.

Given the centrality of perception to epistemology, one would expect that the philosophical study of perception would be a focal philosophical topic. It has not been: neither traditional epistemology nor traditional philosophy of science has been particularly concerned to engage in a determined and scientifically informed investigation of the nature of perception itself. Both articulate puzzles and theories that come out of deep and original thinking about the problem of knowledge yoked to relatively superficial and dogmatic thinking about perception. In the last part of the twentieth century, this situation began to change. Philosophers began to use sensory psychology as a source of new insights about the nature of perception. Thanks to growing interest in perception—how it operates, what it reveals—and the development of new analytic tools, the philosophy of perception is, once again, a vital and vibrant area of philosophical inquiry.

## INTRODUCTION

Taken together, the chapters of this *Handbook* are an introduction to new philosophical thinking about perception. This Introduction presents an overview of some global issues, with the aim of contextualizing perception within broader philosophical concerns. It does not attempt to summarize or discuss individual entries. Without exception, these are intellectually sophisticated introductions to sub-areas and as such they stand alone, requiring no additional exposition here. Accordingly, individual entries are discussed only when they are directly relevant to the more synoptic topics taken up in the Introduction, though each is at least mentioned to show their place in the whole. Thus, the Introduction does not attempt to touch, even very lightly, on all of the many original and often surprising insights that readers will find in each and every individual entry. It also suppresses bibliographical references; these are found in the relevant entries.

### I.

Until very recently, and to an extent even now, the epistemologist's paradigm of perception remains much unchanged since the seventeenth century. According to this view, what we directly perceive—the message given to us by perception unsupplemented by inference from other sources—is a conscious presentation that closely parallels the excitation of sensory receptors. Call this the Receptoral Image Model (RIM). RIM takes slightly different forms in psychology and philosophy, as I shall now explain.

RIM traces back at least as far as Johannes Kepler's theory of the eye. As David Hilbert (III.1) explains, the great astronomer came to realise that the lens of the eye refractively focuses all the light rays arriving from any given external location onto a single retinal place; thus, it creates an image on the retina. According to Kepler, this image is what we directly see. This discovery of the retinal image was greatly impressive to those who followed, though it took more than two hundred years for the realization to dawn that optics is not enough.

It was not until the early nineteenth century that the eminent German physiologist, Johannes Müller, came to realize that the optical image is not directly

the starting point of vision. (It is, rather, the last item in the *external* causal chain that links object to perception.) For the optical image that is focussed on the retina to affect conscious sensation, it must first be converted into a pattern of nerve energy. The retina is packed with neurons that are activated proportionately to the amount of light that falls on each; the activity of these neurons determines visual consciousness, Müller proposed. This is an important advance on Kepler, though it made little, if any, impact on philosophical theory. Philosophers still show little awareness that the conversion into nerve energy destroys much of the wavelength-specific information that is available in the optical image—information that could be extracted by a spectrometer. (See section VI of the Introduction, below.)

Müller's realization is the basis for generalizing Kepler's theory beyond vision. Corresponding patterns of receptor activation could be assumed, and do indeed exist, for the other senses—the senses all have specialized receptors that are differentially activated by environmental energy incident on them. RIM assumes that receptor activations correspond closely to what we perceive in each modality—the activation of auditory neurons corresponds to what we hear; the activation of haptic neurons corresponds to what we feel, and so on. The receptor images in these other senses do not have exactly the same properties as the retinal image—the auditory image in particular is poor in spatial information. Nonetheless, the sensory neurons provide us with what we now call *sensory information*. RIM identifies this information with what philosophers call the *perceptual given*, in other words, with what we perceive directly and non-inferentially.

Psychology and philosophy worked with somewhat different versions of RIM. — Psychologists assumed that *conscious awareness* in each sense modality corresponds to the receptor image, and they tended to assume, though less explicitly, that perception beyond the receptor image is indirect, or inferred by learned association. For example, since the visual receptor image is two-dimensional, they assumed that direct visual awareness must also be of a two dimensional array. Perceptual awareness of depth and of three-dimensional

## INTRODUCTION

objects is inferred. Nineteenth century psychology realized that we possess *two* such retinal images, and they tried to work out how the discrepancies between these images could provide a basis for the inference of depth.

- Philosophers made a convergent assumption. In early modern philosophy, and for a long time after, it was commonly assumed that the perceptual given—what we directly see, or hear, etc.—is that which is *certain* or *indubitable* given our state of sensory awareness. In the case of vision, two coloured regions might be seen side by side, but it is uncertain, given visual evidence, how far away each is. Consequently, philosophers too assumed that depth was not directly given in vision. Berkeley made this inference explicitly, but it is implicit in Descartes and others.

The important difference between philosophers and psychologists is that the former are concerned with rational justification and the latter with physiology and conscious awareness. However, they arrive at comparable conclusions. Both conclude that visual awareness of three-dimensionality is indirect, the result of learned association or (according to some philosophers) rational inference. Psychologists and philosophers use Kepler's theory differently, because philosophy is supposed to be *a priori*, which means that it cannot use a scientific theory as a foundation for knowledge. For this reason, philosophers cannot explicitly appeal to Kepler's optics. Nevertheless, philosophers as diverse as Descartes and Berkeley commonly used the retinal image as a heuristic: it serves for them (though not explicitly) as a model of what we see and as the basis for generalizing to the other senses.

RIM encourages many misconceptions regarding perception; collectively these misconceptions constitute a traditional view of perception that is slowly eroding away. RIM implies, for example, that:

- Perceptual experience is necessarily unimodal (because the receptors and nerve energies are). (See Tim Bayne and Charles Spence, V.3, for a re-evaluation.)
- Objects can be made to look a different colour simply by shining coloured light on them (because this changes the colour of light that reaches the visual receptors).

(Jonathan Cohen discusses the limitations of this notion in V.4, as well as distortions of shape and size in the optical image; Kathleen Akins and Martin Hahn discuss the case of colour in IV.3.) Similar assumptions can be made in other modalities, though it was unusual for them to be explicitly worked out. For example, it could be assumed that since the activation of auditory receptors is changed by new sounds, direct auditory awareness of continuing sounds would be modified by new sounds. Again, it could be assumed (with somewhat greater empirical justification) that gustatory awareness of bacon would be modified by taking vinegar into one's mouth.

- Like the retinal array, the visual image is a two-dimensional “colour mosaic”—i.e., it consists of a two-dimensional matrix of minimally sized coloured dots—that does not contain depth information. (How do “coloured dots” match up with the representation of colour in the system? See Akins and Hahn, IV.3, for discussion.) Analogously, audition offers us a confused melange of sound that does not directly inform us of spatially separated sources of sound. (Roberto Casati, IV.1, Jérôme Dokic, IV.4, and Matthew Nudds, III.2, have relevant discussions.)
- Flavour is sensed through the tongue alone, for the only receptors that are specialized for flavour perception reside in the tongue. (Barry Smith, III.4, reconceptualises flavour as a multisensory quality, and recounts, in particular, how wrong it is to think that it is restricted to taste receptors on the tongue—olfactory receptors are involved too, but in an unusual way.)
- Because sensory receptors can in principle be excited without any external stimulus, perception must be subjectively indistinguishable from hallucination. Since hallucination is not about external events, perception cannot be so either. Thus, RIM encourages the idea that ordinary perceptual experience is of sensory events internal to consciousness, not of the world beyond. (See Baron Reed, I.3, and Paul Snowdon, I.6, for critical discussion.)

Additionally, philosophers have often assumed that since the receptor image is constantly in flux, *perception* is momentary; temporally extended experience is a

## INTRODUCTION

fusion of successive receptor images, and involves *memory*, which is epistemically on a different footing. Consequently, they assume that:

- Experience of change and movement are due to fused temporal sequences of momentary experiences of positions or qualities. (See Robin Le Poidevin, IV.5, about temporally extended perception.)
- By the same token, insofar as speech and music are perceived, it is by fusing experience of a stream of momentary tones. (See Casey O’Callaghan, IV.6, on speech perception, and Charles Nussbaum, IV.7, on music perception.)

These assumptions are, for the most part, gross oversimplifications; some (such as those concerning the colour mosaic, flavour, and speech) are completely false.

### II.

What explains the dominance and long persistence of momentary RIM in philosophical theorizing? In large part, the answer is historical. RIM, in particular the claims (a) that certain aspects of perception, such as depth, are fallibly inferred, and (b) that hallucination is subjectively indistinguishable from ordinary perceptual experience (Snowdon, I.6), leads quite naturally to the problem of scepticism (Reed, I.3). Scepticism is one of the central problems of epistemology, with proponents vying with opponents who quest for theories of justification and of knowledge that can withstand the sceptical threat. Philosophers concentrated over the years on the ins and outs of the sceptical threat to knowledge, leaving unexamined the route by which they arrived at this dangerous place.

Scepticism is a real philosophical problem, but it does not necessarily rest on RIM. In fact, as explained earlier, the explicit basis for this and other epistemological theories is a consideration of the role of inference in situations of uncertainty; preconceptions regarding sensory receptors play a merely heuristic role. Nevertheless, theoretical progress in epistemological conceptions of perception was retarded by RIM, because this framework provided a familiar context for motivating scepticism in relation to perception. The philosophy of perception has long been

dominated by the so-called “problem of perception,” the problem of how perception, which is often misleading about the external world, can nonetheless be a foundation for knowledge about the external world. Much less effort has gone into figuring out the *nature* of perception. To wit: is it really true that direct awareness is as RIM would have it?

Traditionally, epistemologists took their main problem with regard to perception to be the uncertainty of beliefs that are based on perception. One might think, however, that epistemologists should be at least as vitally concerned to understand how we arrive at ordinary perceptual beliefs—how we get to a belief is, after all, at least partially independent of why it might be mistaken. Take this very simple question. Do we recognize a musical beat by internally timing successive pulses, or do we feel the beat more holistically? This is a clear question about how we arrive at a belief; it is relevant to whether the perception of musical rhythm depends entirely on a sense of temporal duration, and whether, if it does, this would show that it rests on memory. This question is independent of the sceptical question of whether what we hear is real or merely an illusion, and of the question whether we can ever be absolutely certain that a piece of music has a particular time signature. It is a question about the perceptual basis for the belief that a piece of music is a waltz. Is this belief directly delivered to us by perception, or does it rely on a more complex calculation?

Considered in this context, the problem regarding the traditional RIM paradigm of perception is not that it encourages scepticism—there is nothing wrong with this—but rather that it offers an incomplete and often misleading account of quotidian perceptual belief and knowledge. It is true that colour mosaics sometimes simulate ordinary visual perception. This is precisely how object perception and motion perception is simulated on TV. Nevertheless, RIM is uninformative about the *normal* process of forming rational beliefs about objects and their movements in three-dimensional space. And here it is relevant that the psychological heuristic of momentary receptor activation is based on false assumptions. For instance, it turns out to be *false* that the visual experience of movement is created by a post-perceptual

## INTRODUCTION

summation of momentary experiences of objects in successive positions. The fact is rather that a specialized part of the visual brain detects distal motion (differentiating it from shifts of the retinal displays that are due to the subject's own motion) without the intervention of the subject's rational acuity in inference. It is also not true that we perceive objects by summing up retinal colour pixels; the brain has specialized pattern-detecting mechanisms for this (Roberto Casati, IV.1). As it turns out, our perception of movement and of objects does *not* depend on perceiving all of the temporal or spatial parts of these entities.

The philosophical theory about the uncertainty of inference from perception to belief could have been, should have been, and was maintained even after the psychological theory of sensory receptor images had been long abandoned. This divergence, however, makes it all the more urgent to give a theory of the formation of ordinary perceptual beliefs. The best psychological theories of sensory awareness urge that consciousness presents us with something more substantial than receptor arrays. At the same time, it is acknowledged that this sensory given is uncertain. (In fact, one important way of probing the perceptual given is to study the illusions that occur in normal perceptual situations.) This gives epistemologists strong motivation to offer better theories of how we ordinarily justify perceptual beliefs. (Susanna Siegel and Nicholas Silins, VII.1, discuss reason giving for fallible perceptual belief; Michael Rescorla, VI. 2, E. Samuel Winer and Michael Snodgrass, VI.3, and John Kulvicki, VI.4, explain frameworks relevant for posing the problem of the perceptual given.)

In a similar vein, the model of speech perception implicit in the music-analogy mentioned earlier gives us a false idea of how we come to know what people around us are saying (O'Callaghan, chapter IV.6). Phoneme perception is not a summation of temporally punctate auditory experience; phonemes are temporally extended (though very brief) sound *patterns*—phonemes are minimal meaning-bearing units of spoken language; no part of a phoneme is heard as a speech sound, yet they are so heard as a whole. By itself, this is proof that perceptual experience is not merely a summation of temporally punctate sensations.

As far as music is concerned, rhythm and phrasing is temporally extended (and of relatively long duration, compared to phonemes) but these too are perceived as wholes, not as units that the perceiver has to put together by her own agency (Nussbaum, IV.7). As well, vision is involved in speech perception; perception of speakers' facial gestures modifies what we seem to hear. Speech and musical perception thus contradict the notion that intermodal and cross-temporal integration are always extra-perceptual mental operations. Auditory perception, in general, is experience of temporally extended objects—sounds—that often appear to change (Matthew Nudds, III.2), or at least to have a non-uniform temporal profile. For instance, we might experience a single voiced melody as ululating; or a siren as rising in pitch. (These questions about speech and music perception are illuminated by the considerations about time discussed in Le Poidevin, IV.5.)

Something like this is true of flavour too: when we savour food or wine, there is an early attack followed by extended finish. Think of spearmint gum: it might start sweet, then become cool, and finish with a slightly bitter “aftertaste.” This has to do in part with the dissipation of sugar, and it could be argued that spearmint offers us a progression of flavour experiences, rather than perception of one temporally extended flavour. However that might be, such progressions are predictable; they are, moreover, repeatable, and therefore important in the identification and evaluation of food and wine. In short, they are ecologically salient. (Barry Smith, III.4, discusses.) Expert tasters become able to use such temporal profiles to refine expert discriminations by perceptual learning. (Rob Goldstone and Lisa Byrge, VII.2, provide a general introduction to perceptual learning.)

The scientific study of perception was, until early in the twentieth century, rooted in many of the same philosophical assumptions that led to the wrong assumptions recounted in the preceding section (and many others). For example, visual perception was thought, in the nineteenth century, to consist first in the transference of retinal images to the primary visual cortex, and then the extraction of information from this so-called “cortical retina” by exploiting associations between retinal stimulations and distal features. This is a model that applies to the brain a not

## INTRODUCTION

very much modified version of Berkeley's theory of vision. This model has two fatal weaknesses. First, it misconstrues the nature of the retinal image: the relevant entity is not the image thrown by the lens, but the firing of sensory neurons caused by this pattern of light. Secondly, the model does not transfer smoothly to other modalities. For example, the auditory cortex is a frequency-intensity mapping, not a spatial image. That is, the activation-level of different regions of this cortex corresponds to energy levels associated with a particular frequency, not with energy levels coming from a particular spatial direction.

### III.

The laboratory study of perception began in the middle of the nineteenth century. (See Gary Hatfield, I.5.) At first, it was dominated by the RIM paradigm: Müller held that the retinal image was transmitted to consciousness by the physical action of nerves. One of the great controversies of the late nineteenth century was the battle between Ewald Hering and Hermann von Helmholtz about the extraction of depth information from the disparity of the two retinal images. Helmholtz thought that the perception of three-dimensional space was learned by the association of ideas; Hering was more of a nativist.

Science does not stand still. Gradually new discoveries began to widen the research focus.

— In the Russo-Japanese war and the First World War, surgery had progressed to the point where soldiers who had been shot in the head could survive; often they survived with severe but localized brain lesions along the path of the bullet that penetrated their skulls. Starting in the early part of the twentieth century, many specialized perceptual deficits were discovered in patients with such lesions, some produced by injury, others by other adverse events, such as strokes or prolonged hypoxia. It was found, for example, that some people with normal visual acuity with respect to colours and lines were nonetheless unable to recognize forms that are composed of the lines they could see normally: familiar objects, such as shapes, faces, places, motion, speech, and alphanumeric symbols.

These deficits are specialized—for example, the inability to recognize faces does not predict the inability to recognize shapes, and vice versa.

- The perceptual deficits just mentioned are known as “agnosias”—they are recognitional failures with regard to a restricted domain of “higher-level” (or composed) objects and features sitting on top of normal acuity with regard to their “lower-level” components. The agnosias directly contradict the Receptoral Image Theory. They indicate *perceptual* deficits in the absence of *receptoral* defects. The existence of agnosia shows that awareness of objects is not entirely dependent on awareness of the parts out of which these objects are constructed. Agnosia cannot be a failure of *inference* as such, at least not if inference is construed as a general purpose capacity, since each agnosia is domain specific—a patient who fails to recognize faces may have no difficulty discerning motion and vice versa. Each agnosia is associated with a brain lesion in a specific area; each highlights a part of the brain that is specialized to extract from receptoral images content about a particular kind of higher-level perceptual object.
- The agnosias indicate what is known as *modular* function in perception—separated processes for the extraction of distinct perceptual features (Ophelia Deroy, VI.5). As time passed, it became clear that there are separate processes for the extraction of even the lowest level features, for example colour and form in vision.
- Psychological evidence for awareness of higher-level perceptual objects was accumulated by the Gestalt psychologists, who articulated principles of object awareness (Hatfield, I.5 and Casati, IV.1). They demonstrated that certain types of displays result in seeming awareness of objects, while others, though very similar, either do not or result in awareness of very differently shaped or configured objects. It can be inferred that object-awareness is not learned by relations of association among receptoral arrays.
- Along similar lines, Albert Michotte demonstrated that certain very simple types of temporal sequence have the look of causal connectedness—for example, one in which a simple shape (such as a square) approaches another simple shape, stops

## INTRODUCTION

when the two touch, at which point the second shape starts moving. Perceivers typically find it hard to resist the appearance of causation (and even of animacy) in such displays. This shows that Hume was wrong to say we have no impression of “power,” and that the appearance of causality is nothing but a projection onto displays of the mind’s propensity to infer one event from another. There is a primitive impression of causal connection.

- Single neuronal-cell electrical recordings and fMRI imaging demonstrated that certain brain areas are active when certain types of higher-level object are presented to perceivers: for example, colour (the fusiform gyrus), motion (visual area 5), faces (the fusiform face area), places (the parahippocampal place area), speech (Wernicke’s area), etc. This bolsters the conclusions drawn from agnosias above, inasmuch as it shows that specialized neuroanatomical structures are dedicated to extracting content about higher-level objects of specific kinds. (Deroy, VI.1 discusses the significance of the anatomical localization of this kind of function; see also Hilbert, III.1.)
- Starting in the last two decades of the twentieth century, greater attention has been paid to multisensory integration (Bayne and Spence, V.1; Smith, III.4, O’Callaghan, IV.6). For example, when two simple shapes move along straight intersecting lines, they are seen as passing each other, describing an X. However, when a sound such as a pop or beep is played at the moment of intersection, the two shapes are seen as bouncing off one another (rather than as continuing on along their own prior trajectories undisturbed). (This is as a multisensory version of Michotte’s experiments on the perception of causation.) Again, when a subject’s hand is hidden from view and stroked with a brush, while a clearly visible rubber toy hand is synchronously stroked with a brush, the *feeling* of stroking is spatially shifted to the visible rubber hand. This is, again, an integration of sensory stimulations in two modalities resulting in a single unified percept. Additionally, subjects report feeling that the rubber hand is their own, so there is also an involvement of interoception. (See Frédérique de Vignemont and Olivier Massin,

III.3; Alisa Mandrigin and Evan Thompson, IV.8; Brendan Ritchie and Peter Carruthers, III.5 for discussion of the rubber hand illusion.)

These findings indicate that perception is not simply a matter of receiving external influences, but is rather a process which filters and analyses incoming data in a search for indications of significant external occurrences and states of affairs. Moreover, they indicate that consciousness can be *perceptual*; it is awareness of external objects and processes, not merely a reproduction of the state of our receptors within our bodies. Thus, RIM is increasingly giving way to the idea that perception presents us with a rich scene: objects of many sorts with properties that do not directly affect the sensory receptors. We literally and *directly* see objects, faces, places, and shapes; we hear melodies, voices, and phonemes, once again *directly* and not by painstakingly piecing them together by the use of learned experiential associations. We sense the location of events by both touch and sight working together; the modalities are not correlated just by learned associations.

Neuroscience and psychology are not the only sources of models for perception. Functional models treat perceptual systems as performing a “task” without being specific about the physical means by which the task is performed. One particularly fruitful idea in this arena has been to treat of sensory receptor response as *data*, and the task as data processing with the aim of providing the organism with the means to respond productively to a changing environment. Note that *data* here are abstractly conceived. New analytic tools have also come to the forefront in the last few years to substantiate this conception. The models that are employed to understand perception have a significant constraint. Sensory data processing is “analogue,” in the sense that the system (a) has states that causally respond to sensory inputs, and (b) vary in a roughly continuous way with firing rates of neurons etc. Consequently, digital models that are widely used to model thought processes are of limited utility in the perceptual domain.

The following have become entrenched in philosophical thinking:

## INTRODUCTION

- Bayesian reasoning from probabilities, which neural sensory processing is found widely to implement. (Michael Rescorla writes about this in VI.2)
- Signal detection theory, which provides a framework for understanding how conscious perception is influenced by the context of inquiry, and perhaps by voluntary attention. (E. Samuel Winer and Michael Snodgrass, VI.3)
- Information theory, which gives an account of what kind of use can be made of environmental signals to adjust to the events from which they emanate (John Kulvicki, VI.4)

Other analytic tools either are emerging or have receded from prominence—predictive coding is a candidate for future prominence, while connectionism seems to have faded; the current status of dynamic systems theory is clouded. The philosophy of perception tends to be conservatively selective in its attention to such structures, being more in tune with cognitive neuroscience, broadly speaking, than with the abstract mathematics of data processing. No doubt, this has a lot to do with the history of the subject; there are established problem areas in the field that arise from thinking about psychological function and neurological implementation. Abstract modelling has been slower to yield fruitful approaches to established philosophical problem areas—this could be the fault of philosophers, of course—the above-mentioned tools being exceptions. This could well change in the next few decades.

### IV.

In Europe, the very idea of perception emerged relatively late. Victor Caston contends in his entry on Ancient Theories (I.1) that the early Greek thinkers did not clearly distinguish perception from cognition, possessing only the verb ‘perceive’ to carve out the category—in Greek as in English, this verb does not necessarily connote *sense* perception. It was perhaps Plato who first attempted an analysis, saying that perception is passive, related specifically to certain bodily organs, and outside of rationality and thus shared with animals. This initiates a very long tradition of distinguishing between sense-perception and discursive rationality: even today, it is

not entirely clear what part of our awareness should be attributed to the senses, and what to learning and rational inference. It is this distinction, precisely, that is at issue for when we speak of literally and directly seeing faces, hearing melodies, and, (following Michotte) of apprehending causality perceptually. The developments related above tend to shift such entities from the realm of rational inference or learned association to that of perception.

How does perception inform us of our surroundings? Two issues dominated the ancient debate and continue to have considerable importance today.<sup>1</sup>

The first concerns the causal influence of the object. For though it has always been agreed that objects make themselves known by causally influencing the sense-organs and (further downstream) the mind, the exact nature of this influence has been hotly debated. A bright light makes me blink; a sudden loud sound startles me. This is perception. On the other hand, the Sun makes my skin get darker; it also makes heliotropic flowers change their orientation. It seems that these organic responses are not perception. Why not? Like the bright light, the Sun causally evokes an organic response. Aristotle charged his predecessors with being insufficiently mindful of the distinction between perception and changes of the latter sort.

Aristotle himself considered perception to be the transference of *form* to the sense organ without matter: for example, when we see a coloured object, the colour is transferred to the sense organ, but without the physical substrate in which it resides. The sense organ has, according to this view, a neutral state that is disturbed by the reception of sensory form; when the organ is no longer in contact with the object, it returns to its neutral state. It ceases to reflect the form of the object with which it is causally connected, and returns to a state of receptivity to a fresh object of perception. Perception is a state of a specific kind, which must be maintained by the on-going causal influence of the object.

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<sup>1</sup> Brad Inwood contributed a great deal, including stretches of text, to my discussion of ancient theories. His help was indispensable because there is no separate entry on the Epicureans and Stoics in this *Handbook*, and the Introduction serves partially to fill the gap.

## INTRODUCTION

Aristotle's form-without-matter theory appears to be modelled on the so-called *telic* senses, vision and audition, which record the presence and characteristics of distant objects and events. When we see or hear them, Aristotle wants to say something within us takes on the colour and sound of distant objects. It is unclear how this is meant to apply to the *contact* senses of touch, smell, and taste. Aristotle posits a medium for these, and presumably he thought that form is transmitted through the medium; in effect, this seems to subsume the contact senses to a *telic* model—just as colour is transmitted through “the transparent” to the eye, so the fuzziness of a peach is transferred to the tactile sense organ by flesh.

What could it mean to say that we receive the form of fuzziness when we feel a peach? Is there supposed to be something in us that becomes fuzzy, though without taking in the matter of the peach? This is implausible—even more so than to hold that the eye takes on the colour of the peach without its matter. (As noted earlier, the doctrine about colour is mistaken because, while it is true that the peach throws an orange image on the retina, the only thing relevant to perception is the neural activation caused by the image of the peach. Neural activation has no colour.)

However this may be, why is the Sun's influence on my skin *not* perception in Aristotle's system? Perhaps, because my skin does not take on the Sun's *form* in this causal transaction, but takes on a different form, a dark colour. This in turn means that the skin, by contrast with the sense organs, lacks the right sort of responsiveness. Perhaps more importantly, skin does not have a neutral state or ‘perceptual mean,’ to which it immediately returns when it is not under the influence of the Sun. We perceive *colour* when the visual organ is pulled off its naturally colourless state by receiving an object's form of colour. When the coloured object goes out of sight, its effect disappears; the visual organ immediately returns to the mean, and is then ready to take on the colour of whatever else comes into view. This is not true of my skin's darkness when the Sun sets. Plausibly, though, my skin might perceive the Sun's warmth. When it is warmed by the Sun, it *does* take on the Sun's form, warmth; at night when the Sun has gone down, my skin ceases to register its warmth.

Epicureans and Stoics, causal theorists along broadly similar lines, also built their theories of perception on the basis of their distinctive physical theories—atomic films shed by objects entering the sense organs for the Epicureans, qualitative changes in the organs of perception transmitted through a continuous physical medium for the Stoics. These philosophers do not use the distinctively Aristotelian apparatus of form and matter, but they echo Aristotle, nevertheless, by adopting a causal model based on the telic senses.

A second issue in the ancient debate concerns the mental significance of perception from the point of view of the perceiver. According to Plato, perception *competes* with reason; according to Aristotle, it complements it. The senses “tell” us that certain states of affairs obtain; reason and memory can equally well “tell” us that perception is mistaken, or that it is correct. In short, perception delivers a message that can be evaluated as true or false. Both Plato and Aristotle are thereby committed to the view that just as reason delivers propositions for our consideration, so also does perception—what they disagree about is the reliability and coherence of the propositions delivered.

Supposing that perception carries propositional content, what is the nature of the content? Both Plato and Aristotle restricted the features of which we are perceptually aware to those that the senses are especially attuned. *Colour, shape, and pitch* are properties to which the senses are peculiarly attuned; *being* and *unity* are not. Colour, then, is a (or rather the) “proper sensible” for vision. Both Plato and Aristotle insist, however, that the sensible qualities must come together in a central cognitive faculty. I apprehend the pale woman singing, her hand on my shoulder: this is a synthesis of what vision, audition, and touch tell me, a synthesis that cannot be performed by the individual senses since, for instance, colour is not special to touch and pressure not special to vision. It must, therefore, be performed by some facility for sensory confluence. I recognize, moreover, that the woman’s pallor is different from the pitch of the notes she emits. This is an act of rational differentiation.

## INTRODUCTION

Epicurus disagreed with Plato and Aristotle about the first point; he did not think that perception could be false. Provided that we properly focus our thoughts, he held, perception always leads us to the truth; “falsehood and error are always located in the opinion we add.” It is likely that he blamed the faculty of judgement for false propositional content: if we form judgements in an appropriately receptive way, we will not err, but if we add something to “impression,” then we risk error. (It would have been odd for Epicurus to think that falsity, but not truth, was “located in the opinion we add.” Most likely, this *is* what he thought—error is due to wrongful insistence. It was also open to him to take the position that perception is *neither* true nor false. Propositional content comes with judgement, or opinion.)

Like Plato and Aristotle, the Stoics held that, in humans, perceptual states (which they called *phantasiai*, or “impressions”) convey articulable propositional content that leads to perceptual belief when accepted or rejected. They held, in addition, that these impressions “reveal themselves and their cause,” but here their position is nuanced. They hold that perception is generally reliable, but acknowledge that some impressions bring misinformation about the world. Sceptics conclude that this impugns the entire class of impressions. The Stoics disagree. For them, an important subset of perceptual impressions is marked by a self-validating clarity and reliability. When I look at something attentively in good light, for example, I can be certain that I see it as it actually is. Such “apprehensive impressions” (*katalēptikai phantasiai*) are the foundation and touchstone by reference to which they believe that we can achieve certainty about the physical world. On the other hand, a square tower viewed from the distance looks round—this impression carries on its face its failure to be apprehensive, because the tower looks far away and shimmery.

By taking this position, it should be noted, the Stoics align themselves with the idea that rational belief requires certainty. They both underestimate how illusions can take place even in the best conditions, and are also myopic with regard to the efficacy of probable reasoning, which was recognized by the Academic sceptic, Arcesilaus. On the other hand, they were prescient, as it turns out, in suggesting that the perceptual given includes self-regarding reliability estimates—vision doesn’t just

tell you that a shape is concave; in many instances, it also includes an estimate of the reliability of this attribution, depending on the goodness of the illumination, the sharpness of resolution, and so on. RIM might suggest that estimates of reliability are necessarily post-perceptual, but there is reason to doubt this. (Rescorla, VI.2, discusses Bayesian models of perceptual processing, in which such estimates play a role.)

The thinkers we have considered so far evaluate perception as true or as false. (I suggested that Epicurus had a bit of wiggle room here.) One could deny this; one could hold that perception, or rather *sensation*, is simply an effect created in consciousness by the outside world. We draw inferences about the external world from these effects, it could be held, but the accuracy or error of these inferences is not to be attributed to perception itself. This attitude becomes more prominent in the early modern period, when (as Alison Simmons notes in I.4) Descartes distinguished between physical motions in the sense organs, the sensations occasioned by these, and judgements that we make on the back of these sensations. Only the last of these has propositional content. Descartes' position on the issue of propositional content is thus importantly different from both Epicureanism and Stoicism, though his focus on clarity and distinctness is something he shares with both Hellenistic schools.

These questions continue into medieval philosophy as Dominik Perler recounts in chapter I.2. He focuses on three key problems, each of which continues and draws on ancient philosophical discussion: What is the object of perception? What is the nature of the cognitive faculties that we need in order to apprehend these objects? And how trustworthy are the perceptual faculties with respect to what they reveal?

## V.

Aristotle and Epicurus are in the same camp about the reliability of the senses. As we noted above, Epicurus is the more optimistic—he does not think that there is false perception—but Aristotle too thinks that perception leads to rational knowledge (see especially *Posterior Analytics* II, 19). The Stoics too held that perception could be the

## INTRODUCTION

foundation for knowledge, since for them, the “apprehensive impression” is, once successfully identified, a reliable foundation for all further cognition. Plato was much more pessimistic on this matter. According to him, the senses deliver constantly shifting and contradictory information. They deliver a vague and confused message, which cannot be a foundation for knowledge even where they serve as a rough and ready guide to ordinary talk and action.

The ancient sceptics (Reed, I.3) took Plato’s pessimism to an extreme. Reacting against Stoics, Epicureans and Aristotle alike, they sought to show that the senses are not to be trusted. Up until now, they say—that is, up until the moment of speaking—they have never been convinced of anything, neither by the senses nor by rational argument. Perhaps some day they will encounter an apprehensive impression that is so clear and distinct that it is self-validating, as the Stoics claim—but so far they haven’t experienced anything like this. Perhaps they will, sometime in the future, encounter a convincing argument that knowledge can be founded on the senses, but so far all that they have experienced is doubt. The sceptical ideology prevents them from making positive pronouncements about the reliability of the senses—they know nothing, not even that knowledge is impossible. They parade a comprehensive armoury of arguments against all possible claims to knowledge, but they do not affirm the completeness of their armoury against all possible challenge. There is, of course, a certain irony in this show of modesty.

Though scepticism never completely slipped out of view as a philosophical tradition, it grew less important in the medieval period, with its emphasis on religious faith. Even then, the influential Persian Muslim philosopher, al Ghazali, had considerable affinity with scepticism, and sceptical *aperçus* are occasionally to be found in such Christian thinkers as Augustine. But outright scepticism was not an option for these thinkers in their culture. The ancient sceptics held that it was fine to play along with religious practice as a matter of “custom,” but not as a matter of belief. Their attitude could be expressed in this way: “Bend your head to worship: to do otherwise, would be defy society, thereby showing epistemic arrogance. But do not believe in God.” Such prevarication would have gone down as smoothly in medieval

centres of Christianity and Islam as it does in contemporary South Carolina or Qom. Scepticism re-emerged forcefully much later, first in fifteenth century Italy, then when Henri Estienne translated Sextus into Latin in 1562, and shortly thereafter in France with the essays of Montaigne. Descartes' methodological scepticism, which owes much to Sextus, had a profoundly disruptive and revolutionary influence in the early modern period. Allison Simmons says in I.4 that it led to a re-examination of "almost all aspects of perception."

Simmons points out, interestingly enough, that received views of perception came under attack, at this juncture, from science. The Scientific Revolution of the 16<sup>th</sup> and 17<sup>th</sup> centuries posited a world that was in its essence very different from the world that perception reveals. Atoms do not, for example, have colour or smell, not even unperceived colour and smell. If, as was increasingly popular to suppose, atoms are the ultimate stuff of physical reality, how can the larger objects composed of atoms have colour or smell? And what does this say about the veracity of our senses?

This disjuncture between science and perception was addressed by a distinction between primary and secondary qualities discussed by Simmons and by Peter Ross (in IV.2). The idea traces back to Democritus: "by convention sweet and by convention bitter, by convention hot, by convention cold, by convention color; but in reality atoms and void.' The term 'by convention' is meant here to contrast with 'by nature.' The idea is that things are not sweet, hot, or coloured *in themselves*, or by nature. Rather, they are so *relative to the perceptual response of the observer*. As Ross shows, Democritus's idea and its successor, Locke's distinction between primary and secondary qualities, has many different incarnations. Ontologically, some such distinction is needed to bridge the divide between the physical world as posited by science, and the "manifest image" by which we initially know it.

Perhaps the most enduring legacy of scepticism is the notion of a "veil of ideas." Why should we refrain from accepting the evidence of our senses? One major reason is that this evidence is held to be equivocal, much more so than it appears to the naïve observer. Objects of different sizes or colours can create the same sense perception if

## INTRODUCTION

they are at different distances or in different conditions of illumination; the same thing can sound loud close up and faint further away; touch is modulated by pressure exerted; and so on (but see Cohen, V.4, on Perceptual Constancy). According to the sceptic, this implies that any given perceptual state betokens many different real world situations, and thus fails to validate inference to any one of these. What is the similarity that defines *sameness* of perceptual state? The standard view in both medieval and early modern philosophy was that sameness was determined by the *ideas* entertained by the perceiver. These ideas constitute an intermediary or “veil” through which we observe the world; perception offers us certainty with regard to the ideas, but not with regard to the world that lies beyond. The power of this doctrine is attested to by discussions in Perler (I.2), Simmons (I.4), Paul Snowdon (I.6), Bence Nanay (II.1), and Heather Logue (II.4). Siegel and Silins (VII.1) discuss how perception is reason-giving with respect to belief, and the implications for scepticism.

### VI.

It has now become almost commonplace to note that the philosophy of perception suffered, until recently, from an excessive concentration on vision, which was taken as the proxy for all of the other senses. The result is, as David Hilbert puts it, that “vision itself, with its own peculiarities and distinctive features has a tendency to fade from view and what we are left with is a generic sense” (III.1). As Aristotle urged, it is necessary to bring the senses under a unified rubric. Otherwise, we will be unable to differentiate them from other information-gathering facilities such as the immune system. (Matthen, V.1, and Ritchie and Carruthers, III.5, take different approaches to this problem.) However, this unified rubric is insufficiently informative about the “peculiarities and distinctive features” of individual sense modalities. Aristotle was aware of this. He gave a comprehensive characterization of sense perception (form without matter, neutral state of sense organs), but he also discusses the medium, special objects, and limitations of the individual senses separately.

In actual fact, the senses are very diverse in character.<sup>2</sup> It helps to remember that they are biological systems that evolved to give organisms an advantage by providing them with the means by which to respond effectively to the challenges of living and reproducing in surroundings that are constantly in flux. Thought of in this way, the senses are not simply information-sinks—organs that happen to receive ambient information at their sensory receptors, leaving their possessors to determine how to use this information. Nor are they engineered to seek information optimal for the organism's pre-existing needs. Rather, they are evolved systems, with all of the random fit to the environment that such systems display.

The evolution of sensory systems usually begins modestly with an ecologically sensitive receptor that allows an organism to modify its behaviour to suit circumstances. The evolution of vision, for example, begins with molecules known as *opsins*, possibly derived from molecules involved in photosynthesis. These molecules afforded primitive organisms access to information carried by light; at first, the information available from this source is minimal—perhaps just enough to regulate circadian rhythms. In the case of audition, evolution starts from a fluid filled chamber that picks up vibrations from bones and other rigid structures; again, an organism would benefit from this, miniscule though the *quantity* of available information would have been. In both cases, evolution needs to add nerves that can communicate the state of these receptors to behaviour controllers. In time, it adds facilities to refine information collection. Given that each such step is a small advantage that a particular population of organisms manages to gain in its local environment, it is path dependent and unpredictable in advance how these systems evolve. The complex utilization of information carried by light and sound that we find in more recently evolved animals, such as mammals, is the outcome of a historically contingent evolutionary pathway from a starting point that could have presaged different outcomes if chance had played differently.

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<sup>2</sup> I am grateful to Jonathan Cohen, Yasmina Jraissati, and Diana Raffman for critical discussion of this section.

## INTRODUCTION

Vision and audition illustrate the path-dependency and contingency of these developments. Vision receives information from light, audition from sound. The wavelength of light closely matches the size of the molecules that make up the everyday objects light bounces off. Consequently, light interacts with the molecules of things that it encounters and is modified when it is reflected; reflected light is informative about enduring characteristics of the objects. Moreover, light can be, and is, focussed by a lens; the resulting image recapitulates the spatial distribution of environmental sources of light (including self-luminous objects and reflecting objects). Combining these, vision extracts from light a “map” or image of luminous and reflecting objects together with informational content concerning certain characteristics of these objects.

Sound is very different. First, daylight is constant and enveloping; it is a background condition of the information that arrives at the eye. Sound, on the other hand, comes from myriad local events, and is highly variable. (Right now, I am looking at a calm blue sky that illuminates everything outside my window and, more diffusely, everything inside. Sonically, however, I hear only the banging of a garbage truck, which will shortly be replaced by silence.) Secondly, reflection scarcely (if at all) modifies sound, so reflected sound carries information about its ultimate source, *not* about the objects off which it is reflected. Finally, biology (and also, for that matter, human engineering) has not succeeded in constructing a lens that would produce a spatial image of the objects from which sound is reflected. (Ultrasound machines produce such images, but they have to *produce* sound, or ultrasound, and capture the returning echo. Ambient sound, which is unpredictable in direction and amplitude, will not do. Bats, of course, do the same, as do some blind people who produce a stream of sonic clicks, which affords them very rough echo-location.) Put all of this together, and the result is that sound carries information about events that produce it, but hardly any about objects off which it is reflected.

Turning now to the receptors, the frequency composition of light cannot be exactly analysed by any biological system, while frequency composition of sound is much more easily analysed, using mechanical resonators. The basilar membrane in

the inner ear consists of fibres, each of which has a different resonance frequency. To exaggerate just a little, it incorporates a dedicated receptor for each and every acoustic frequency. The analogue for light—specialized receptors for every frequency in the visible spectrum—is not biologically feasible. The visual system computes colour from the responses of just a few types of cells (three in the case of most humans), each of which responds to a broad visible-frequency range. Colour vision does little more than register total energy in these broad ranges. (More precisely, it registers normalized *differences* between energy levels in these ranges. For more about colour vision, particularly about the extraction of information from cone cells, and the derivative character of colour perception in many situations, see Kathleen Akins and Martin Hahn, IV.3.)

Audition extracts information about material objects by analysing the frequency composition of the sounds they produce. It identifies voices by timbre in speech; it identifies musical instruments and materials by the sounds they emit when struck, plucked, or bowed. This is event based: we recognize humans by their timbre of their voices, but only when they speak. The quality of *this* act of speech—somebody reciting “Mary had a little lamb”—reveals something about the voice—that it is a rich baritone from Lancashire—and enables us to recognize the voice when it sings something entirely different. Vision is different; the shape and colour of the face is directly revealed when light falls on it—these characteristics are not computed via the character of events.

Light yields up only crude information about frequency composition—colour is subjectively one of the more salient characteristics of vision, but frequency (colour) information is actually surprisingly sparse by comparison to sound, and surprisingly little used by the visual system by comparison with brightness contrasts. Primates and birds—animals that have “good” colour vision—share many perceptual discriminatory capacities with animals that do not possess equally good colour vision, and typically do not use colour information in exercising these capacities. In particular, visual perception of depth, three-dimensional shape, movement, and

## INTRODUCTION

spatial layout are all available in black-and-white, as one can tell by looking at a black-and-white movie.

To summarize: audition is concerned primarily with sound-producing events (Nudds, III.2), the *temporal order* of these events, and properties of material objects that can be computed from the acoustic frequency-composition of the sounds they produce. Light, on the other hand, yields to the visual system information primarily about the *spatial configuration and distribution* of objects, and their brightness relative to other things seen at the same time. (See Jérôme Dokic, IV.4, for a rich account of the structure of the visual representation of space.) Because vision is dependent on constant ambient illumination, and not so much on events involving objects, it engages more directly with the place and character of objects. The spatial character of both vision and touch give these senses dominant roles in our identification of particular objects. They are associated with demonstratives and pointing—“that object,” we say, pointing with our fingers or our eyes, and this attracts the gaze of our auditors. (How do vision and touch enable us to think about individual objects? Imogen Dickie poses the question in VII.3.)

Vision and audition go in different directions in their engagement with the environment because they have different information-gathering resources available to them. Within their respective parameters, they target specialized objects, depending on the interests of species. Both birds and humans are specialized for identifying others of their species both visually and auditorily—humans are adept at recognizing human faces and voices, and at understanding human speech; birds tend to be specialized for producing and recognizing identifying song. These are “higher level” capacities. Let’s suppose, for the sake of argument, that humans and birds are equally good at discriminating lines and colours. It would not follow that they are equally good at recognizing *birds* and *humans*. Birds recognize bird song, not human speech; humans have it the other way around.

This kind of specialization holds true for other sense modalities. Consider de Vignemont and Massin, III.3, who argue that the proper object of touch is pressure.

(They exclude temperature perception as a separate modality, as do Ritchie and Carruthers, III.5.) Superficially, this conforms to the Aristotelian framework of proper sensibles. Their point is that the tactile perceptions of “texture, vibration, weight, contact, hardness, solidity” etc. “depend on the perception of pressure and tension.” “There is no *sui generis* sense of texture distinct from the sense of pressure,” they write, “for we feel the texture of a surface by feeling a spatio-temporal pattern of pressure when stroking it.” However, de Vignemont and Massin do not think that we go from experience of pressure to awareness of texture by *inference*. They are fully aware that the sense of touch delivers such haptic properties as texture and weight to sensory experience.

This marks a departure from the traditional articulation of the special object view as proposed by philosophers as diverse as Aristotle and Hume—these traditional philosophers imply that we have sensory consciousness *only* of the proper sensibles such as pressure, and inferred knowledge of other properties such as texture. What scientists began to understand with the discovery of the agnosias (section II above) was that the ability to recognize certain complex objects of the senses and awareness of these objects is simply provided to us by the perceptual brain. It does not require learning or inference in the classic sense of those terms. The specialized objects of perception are explored in Part IV of this *Handbook*.

Flavour perception is quite a different entity than these senses. (See Smith, III.4, for full discussion.) Whereas vision and audition are shaped by receptors and the kind of energy they receive, flavour is unified by its *object*: food and drink. The tongue has receptors for basic *tastes*—sweet, sour, bitter, salty, etc. These basic tastes differentiate many foods; the bitter warns of unhealthy toxins, and sweetness attracts us toward energy rich foods. *Flavour* comprises a great deal more than these basic tastes. Take two sherbets, one of cherry, one of raspberry. The basic tastes differentiate them, but not by much. And why should they? Both are healthy, at least as far as our savannah dwelling ancestors go. Both are sweet, and that is pretty much all the information the tongue gives us. As far as *flavour* goes, however, the two

## INTRODUCTION

confections are *very* different. They are very easy to tell apart. The puzzle is this: if the tongue and its basic tastes do not differentiate, what does?

The additional qualities come mainly from *olfactory* receptors in the nasal cavity. These receptors provide smell when we breathe and sniff. When we take substances into the mouth, their vapours rise to the nasal cavity and flow over the olfactory receptors. The flow is in the direction opposite to that when we breathe through the nose. Olfaction from the mouth is known as “retronasal” olfaction. “Smells” detected retronasally are experienced not as smells; rather, they contribute to the flavour properties of *food*. They are responsible for the experience of food over and above the basic tastes—but note that they meld in with taste and provide a unitary experience. The “taste” of a cherry . . . no, that is just the sweetness and bit of sourness. The *flavour* of cherry, that’s the whole thing. Though olfaction contributes to the flavour of cherry, we cannot phenomenologically separate out the contribution of the olfactory receptors. We don’t experience a smell plus a taste; we experience a unified percept.

Flavour perception is different from vision and audition in that it does not have information-humble beginnings. It has recruited an evolutionarily well-developed nasal system very late in evolutionary history—humans are almost unique in their use of retronasal olfaction—to work conjointly with another well-developed glottal system. Olfaction is well developed in animals; so is the taste system. Flavour perception in humans is the result of a coalition between the two. Flavour recruits olfactory receptors to enhance a pre-existing system that already has a sophisticated nutrition-regulation function. The result is a system that discriminates food and drink far more finely than we need to discern what is healthy to eat and what is not. It seems as if all possible senses get involved when we put food in our mouths—taste, olfaction, touch (which plays a role in binding taste and olfactory qualities), the trigeminal pain system (Smith, II.4)—and arrive together at a much finer discriminatory ability than even the higher primates can deploy. What is the biological point? Why do we not just make do with the system that the higher primates use? It may well be that, like language, flavour plays a role in the highly creative socio-cultural system in which

only humans participate. Perhaps, humans are more adaptable because of their flavour sense, and this could have contributed to their spread across the planet. Or perhaps flavour does not simply have utility for nutrition, but has as well a social and communicative role.

The bodily senses (Ritchie and Carruthers, III.5) provide another example of heterogeneous sensory processes that are nonetheless highly integrated. Models based on the external senses do not work smoothly with these. For, first, some internal sense events seem to lack a characteristic phenomenology. Consider the vestibular sense, which determines how we are oriented relative to gravitational forces. Ritchie and Carruthers (III.5) suggest (though they do not come to a firm conclusion about this) that this sense may not present us with a direct message (e.g., that we are upright). It may, instead, feed this information to vision, in the form of visual field orientation, and proprioception, in the form of information about the positioning of our bodily parts. In other words, we may sense gravitational orientation only in terms of the orientation of objects, external and bodily. This puts the status of the vestibular sense into question. Is it a sense modality if it does not have a separate phenomenology?

A second source of conceptual cloudiness is that it is difficult to decide whether the internal senses represent objective states of affairs, i.e., events or states of the body, as opposed to presenting us merely with sensations. (Bence Nanay, II.1, offers an overview of questions about perceptual representation.) Is an itch, for example, a perception (or misperception) of a certain type of objective event in the body, or is it merely a feeling? Recall the view (Simmons, I.4, and section IV above) that perception is neither true nor false, but only a conscious event, or sensation, that we use to make judgements about the world outside us. This view, applied to bodily feelings, is thought by many to be unavoidable given the facts about bodily awareness. The question is closely related to another: if pains and other bodily feelings are perceptions of occurrences in the body, then it should be possible for this kind of occurrence to go unperceived, just as it is possible for a sound to occur unheard. Is it possible for me to have a pain in my finger of which I am completely unconscious?

## INTRODUCTION

Many think that this makes no sense—pain is essentially conscious. What does this do to the idea that pain is perception? Valerie Hardcastle discusses these questions in IV.9. Jesse Prinz III.6 has a wide-ranging discussion of further questions about unconscious perception. For example, it is well demonstrated that subjects fail outwardly to respond to or inwardly to notice certain large events in their visual fields. Should we say that they nonetheless see these events? The answer is far from obvious.

One important feature of internal perception is that it carries a certain feeling of ownership—the internal states of our bodies are felt as our own, and moreover our bodies are felt as the subjects of internal states. This intimate connection between ourselves and the things that happen in our bodies can be disrupted, but it has been argued, notably by Wittgenstein, that it is ultimately immune to error. Mandrigin and Thompson review the issue in IV.8, and Christopher Peacocke, II.2, takes us through philosophically vital related issues of the first person perspective on objects of perception.

## VII.

Despite the differences among individual senses discussed in the previous section, commonalities of function and functioning should also be noted.

It is characteristic of all of the senses that they present at least some of their content as a continuously varying quantity. As Diana Raffman writes, VI.1: “one object will look bluer or larger, or darker or brighter, than another, and one tone will be louder than another, or sound more stable or more tonally centered in a given musical key.” Plato was the first explicitly to notice this, in the *Philebus*. He argued that it was an indication of the incoherence of the senses (and also of pleasure) that their content is presented comparatively, in terms of “more and less.” It is a virtue of reason, he argues, that it imposes absolute limits on this indefinite substrate of the more and the less. Syllables and numbers mark well-defined absolute measures on pitch and tone and on indefinite quantity, he claims; they are contributed by the rational mind.

Putting aside the normatively loaded claim about reason, Plato was prescient. In speech, pitch, tone, and timbre are comparative, while phonemes are not. In the realm of phonemes, there is “categorical perception,” by which a phoneme like /b/ or /d/ can be recognized as the same across different speakers, despite differences among them as to how they voice these phonemes—how loud, how high-pitched, whether in a bass or baritone, and so on. There is a somewhat analogous situation in colour perception too, where the named colours (blue, red, green, etc.) seem to be sharply distinguished from one another, despite a continuously graded difference underlying these boundaries. It is for this reason that the rainbow appears banded, though it is actually a continuous wavelength gradient—there is a phenomenological jump between wavelength-adjacent shades of blue and green, but no such jump within blue or within green. Harmony might also be an instance of this: a gradient of gradually less discordant chords abruptly jumps to harmony. Diana Raffman, VI.1, deals with these issues; she also introduces us to the representation of similarity relations as abstract “spaces” in which closeness represents similarity.

Another characteristic of all of the senses is that they display “constancies” (Cohen V.4). Constancy is most apparent and has been most studied in vision. The retinal image is a product not only of characteristics of external objects, but also of the circumstances of viewing. A white cloth will, for example, throw a red image onto the retina when it is bathed in red light. Yet, visual system function is to extract from this image a message about the characteristics of the colour of the object independently of the illumination in which it stands; the white object should look white, and within limits, it usually does. (Akins and Hahn, IV.3, have a nuanced discussion, relevant here, of how we come to see things as being of a colour.) The same sort of thing is true of the other senses. In audition, a voice can be heard as possessing constant qualities despite interfering noise from other sources; the sound of the car is kept separate from that of your passenger’s voice. In touch, a granite countertop is felt to be hard even when it is stroked with a soft polishing cloth, which presents its yielding structure to the hand. Constancy is generally thought of as revealing the orientation of the senses toward detecting properties of a stable

## INTRODUCTION

external environment. As Cohen (V.4) writes: “it seems clear that constancy is an absolutely fundamental aspect of perception, [which] will figure centrally in our ultimate understanding of mind–world interaction.”

*Attention* is a feature of perceptual systems, the facility by means of which we are able consciously to extract information from a perceptual state. There are many forms of attention. In the 1980s, Anne Treisman and co-workers showed that one form enabled “binding.” In the traditional RIM paradigm, form is extracted from colour and brightness, and this view is intuitively plausible because it seems, phenomenologically, that the boundaries of form and shape are in fact colour and brightness boundaries. However, it was becoming increasingly clear by the 1980s that form and colour were separately detected by separate parts of the brain. Treisman’s discovery was that, having been separately detected, colour and form are “bound” together when the subject attends to them. This shows that the fundamental phenomenology of vision—that of the coincidence of colour and form boundaries—is in fact a product of attention, not just of simple perception. Attention and perception work together to produce characteristic visual appearances. John Campbell, V.2, is on the trail of analogous synergies between perception (mainly vision) and attention. He explores how it makes knowledge possible and how it modifies perceptual experience.

Though, as we saw in the previous section, the senses are very different from one another in how they process information and how they present the world around us, there are clear communicative channels between them. Earlier we noticed that the perception of speech and of flavour are multimodal; some say that touch is multimodal as well. In V.3, Bayne and Spence discuss forms of multimodal perception. (Their view is nuanced, as they argue that we might never be conscious of more than one modality at any given time. Barry Smith also discusses multimodal perception in III.4.) One consequence of multimodal interactions is that the modalities can sometimes get mixed up. One such confusion is synesthesia. In a significant number of people, perception in one modality gets expressed in another. For example, some experience a particular colour whenever a particular musical note is played. There is

also within-modality synaesthesia: some associate individual alphanumeric characters with individual colour, always experiencing, for instance, red when they read '6'. Malika Auvray and Ophelia Deroy discuss the varieties of the phenomenon and its proper philosophical description in V.5.

Another cross-modal "confusion," often constructively employed, is the ability to use one modality in place of another—for instance, to retrieve visual information from specially arranged tactile stimulation. The phenomenon was discovered by Paul Bach-y-Rita in the 1970s. He converted the brightness levels in a scene into a vibratory field projected onto subjects' backs. (Small vibrators were set to respond proportionally to the brightness of their field positions.) The result was astonishing. The subjects began to discern characteristically visual phenomena such as perspective and occlusion in the scenes before them, and were able to do so using just the tactile image projected onto their backs. This is the phenomenon called "sensory substitution." Can we say that Bach-y-Rita's patients *saw* the scenes in front of them? Julian Kiverstein, Mirko Farina and Andy Clark explore the ramifications of this and other questions in V.6.

One particularly interesting feature about perception is that we are not all equally good at it. Some wine consumers cannot tell the difference between white and red wine; expert tasters can make fine distinctions regarding the origin and the age of wine. (There has been a good deal of scepticism evinced on this topic lately; some of it should be quashed by watching the documentary film "Somm," which follows the trials of six candidates vying for the designation of master sommelier. However that might be, my point is quite simple—there are some who cannot make even the simplest distinctions in this domain; others can make quite a few more.) Some recognize in a glance the provenance of an old painting; others can barely tell whether it is Indonesian or French. Rob Goldstone and Lisa Byrge, VII.2, argue that at least some of these differences in discernment arise from "perceptual learning." Perceptual discrimination is sharpened by repeated practice and exposure. Or, as Goldstone and Byrge write, "Perception can be learned. Experience shapes the way people see and hear."

## INTRODUCTION

To end this section, a word about pictures. What is it about visual perception that allows us to see three-dimensional scenes in two-dimensional arrays of pigment? What is it about auditory perception that makes a musical sequence of tones bear emotional content? Why do we find value in these seemingly ephemeral exercises of our perceptual capacity. Dom Lopes explores these questions in VII.5.

### VIII.

The two preceding sections took up questions about sensory processes. For instance, we asked about visual processing and whether it is property based or event based; we asked about the vestibular sense and whether it has a distinctive phenomenology. Philosophers of perception also ask, more broadly, about the nature of perception as a general faculty. We have touched on some aspects of this question earlier, especially in connection with the history of the subject in sections IV and V above. Further questions remain. What is the nature of the connection between perceiver and world they perceive? How does perception relate to belief and the rational justification of belief?

Let us put idealism to one side—the position that there is nothing outside minds—and also scepticism—the position that we have no reason to believe anything about the external world. On neither of these views, does the question arise of how perception rationally grounds belief about the external world: for the idealist we do not perceive an external world; for the sceptic, beliefs about the external world are not justified by perception. The question then is this. Suppose we take it for granted that we have, or can have, rational beliefs about the external world. How would perception justify such a belief?

The standard view in the seventeenth century up until the beginning of the twentieth, and among empiricists, for much longer, was that perception was directly of a realm of ideas, or sense data, that come between us and the external world, and only indirectly of the latter. As we saw in our earlier discussion of scepticism (section V), indirect realism is motivated by the argument from illusion—the idea that perception can fail. If two perceptual states are the same—say a mirage and a

veridical perception of a distant body of water—then they must have the same object. Since the mirage fails, then, and by definition lacks an external object, the veridical perception must lack an external object too. Both lack an external object. They must both be directed to their common *apparent* object, which is internal. They are both directed toward a sense-datum; the difference is that the veridical perception happens to be validated by the actual presence of water on the horizon.

As Paul Snowdon relates in his entry, I.6, this seems to posit an unanalysed psychological act-object relation and a realm of immaterial objects, sense-data. Sense-data are decidedly queer: when I see something blue, sense-datum theorists say, my visual state is directed at something in the mind. Things in the mind don't have extension or colour. They are not literally blue, or literally any other colour. This rather mystical approach to the objects of perception did not sit well with the increasingly dominant mid-century ethos of naturalism and materialism. A. J. Ayer tried to wriggle out of the quandary by saying that the sense datum theory was just a way of talking, an "alternative language," as he put it, not a substantive ontological proposal. Coming from a strong partisan of the theory, this seemed like a desperate stratagem, for it is unclear how exactly the phenomenal sameness of two divergent perceptual states can be accommodated by a simple terminological shift away from ordinary object talk. Sense-datum theory passed out of fashion after Ayer; by 1980, despite some revisionary attempts to revive it by two Australians, Frank Jackson and Brian O'Shaughnessy, it was essentially gone from the scene. Some credit J. L. Austin and Ludwig Wittgenstein for the defeat of sense-datum theory. It is equally plausible to lay the blame at the feet of its last great proponent.

Another view of the perceptual relation originates from the works of Franz Brentano and Edmund Husserl, treated together with the philosophy of Maurice Merleau-Ponty by Charles Siewert in his entry on Phenomenological Approaches, I.7. At some level, Brentano's approach is similar to that of sense-datum theory. He proposes that, in a way, the "referent" of perceptual states exists in the mind, and this is just the sense-datum view. However, Brentano introduced an important analogy between perception and linguistic affirmation. When I judge that there is a body of

## INTRODUCTION

water on the horizon, I affirm something. There is something that I affirm, regardless of whether it is true or false. Something of the sort holds also for perception. The mirage of water on the horizon and the veridical perception of an actual *wadi* both “affirm” the presence of water—that is what they have in common. The mirage is false; that is how it differs from the veridical perception.

Husserl brought a sophisticated theory of meaning to Brentano’s basic insight and was thus able to evade the idea that the sameness of perceptual states must consist in the sameness of their “referent.” According to him, perceptual states have a *noêma* in much the same way as sentences have a meaning or Fregean sense. (Nanay II.1 shows how this approach is elaborated in contemporary analytic philosophy of perception, which deals with perceptual *representation* in terms taken from analytic philosophy of language.) This enabled him to show how two different perceptual states could have the same *noêma*, but, when external circumstances change, different external referents. According to this way of thinking, the situation of the mirage and the *wadi* is analogous to the following: “Versailles is where the King of France lives,” had the same meaning in the 18<sup>th</sup> century as it does now, but it was true then (the circumstances made it so) but false now. This provided Husserl with a new approach to defusing failures of perception. Perceptual states can also have different meanings but the same external referent. This is something that both Brentano and sense-datum theorists are unable to accommodate, but crucial to showing how perceptual states can have external referents. Husserl rids himself of intermediate entities in between the mind and the external world. He is a *direct* realist who has no need for an intermediate realm of immaterial entities.

As Siewert tells us, there is an anti-scientistic strain in phenomenology, though this is later much tempered by Merleau-Ponty. Brentano and Husserl both insist that the meaning of perceptual states is directly available to perceivers. This attitude is the underpinning of Husserl’s later notion of a *Lebenswelt* or “life-world”: a socially constructed but deeply entrenched way of understanding the world given in perception. Scientific concepts, such as those that were employed by the psychologists of the time, were out of place in the psychological description of

perceptual states. We do not, for example, perceive ordinary things as possessing reflectance or as emitting compression waves; rather we perceive them as *coloured* and as *noisy*. This aspect of phenomenology has received less attention in analytic circles than it deserves.

Two new approaches to the relationship between perception and world have entered the field in the last few decades: “naïve realism,” or disjunctivism, which Heather Logue writes about in II.4 and “enactive” accounts, which are dealt with in Pierre Jacob’s entry, II.6. Disjunctivism is a return to a reference-only account of the sort that Husserl tried to escape with his notion of *noêma*. A perceptual state is, on this view, partially constituted by its object (or referent). As a consequence, a perceptual relation that I bear to one thing is *as such* different from the same perceptual relation borne to another, or to nothing. It follows that a hallucination, which has no object, is *as such* different from a veridical perception, which has an object. Perceivers may not be able to discern this difference, but it exists nonetheless. (Hallucinations and veridical perceptions may be indiscernible, but still they share no specific commonality; thus, they can be united only by a disjunction—hence the name, “disjunctivism.”) Logue details four different contexts in which this position has been advanced. John Campbell, in his entry on attention, V.2, argues that this phenomenon can be properly understood only on a disjunctive approach.

Pierre Jacob introduces “action based accounts” in II.5—accounts which have also been called “sensorimotor” and “enactivist.” Unlike disjunctivism, the primary motivation for these approaches is empirical; the idea is that enactivism best makes sense of certain experimentally determined facts about perception. This line of thought goes back to the work of J. J. Gibson, who claimed that we perceive “affordances,” or the possibilities for action that objects “afford” us. For example, birds perceive branches of trees as possible places to perch; we perceive chairs and stools in an analogous way. An even earlier antecedent is Jakob von Uexküll’s influential notion that animals perceive the world in terms only of how it affects their actions, which is faintly echoed in Husserl’s notion of the life-world.

## INTRODUCTION

Enactivism is sometimes applied to specific sorts of perception, rather than across the board. Jacob illustrates this with the perception of the actions of others. According to one important paradigm, we observe action by covertly simulating it. For instance, Giacomo Rizzolati and co-workers at the University of Parma have developed a paradigm in which perceiving somebody else reaching for an object is inwardly re-enacting oneself reaching for an object. They found, for example, that when a monkey looked at somebody reaching for an object or grasping it, the corresponding motor neuron, i.e., the one by which the monkey would control the same action, is activated. By extension, we might perceive speech by inwardly mimicking it, attribute thoughts to others by rehearsing how we would ourselves think in their situation, and so on. Perceiving action is intimately tied up with performing it.

### IX.

How we talk about perception—how we use verbs like ‘see,’ for example—offers us some clues about how we use it. Berit Brogaard writes about perceptual reports in II.6. She observes that the verb ‘seem,’ which we often use non-perceptually, is an etymological cousin of ‘see,’ and that the other perceptual verbs similarly have non-perceptual uses. These perceptual verbs are often used “epistemically,” that is, they are used to report beliefs, usually (but not always) beliefs that are perceptually supported—for example, “It looks as if the lecturer is late.” (This, interestingly enough, reports an absence—Roy Sorensen, IV.10, discusses ways of approaching “Perceiving Nothings.”)

As we noted earlier, perception was probably not recognized as a distinct faculty in early Greek philosophy; it was not clearly marked off in linguistic terms then, and it still is not in modern languages. As well, we use learned associations to describe beliefs, as Roderick Chisholm’s “comparative use” shows: “The cliff looked like a dried-out body,” to repeat a slightly macabre example of Brogaard’s. It seems plausible, then, to say that perception and belief are not clearly distinguished in ordinary talk. The philosophical question of how perception relates to and rationally

supports belief is of relatively recent origin, and should be regarded not as intuitively founded, but the product of science and philosophical analysis. Ordinary speech does not make a clear distinction.

If there is a rational connection between perception and belief, what does this tell us about perception? Some say that since belief is conceptually articulated, perception must be so as well. If my perceptual state is to rationalize the belief that this ball is white and smooth, and if *white* and *smooth* are concepts applied to the ball, then the perceptual state must contain these concepts too. How else would it rationalize the belief? John McDowell affirms this connection in a particularly strong form, holding (after Kant) that perception itself would not be possible if concepts were not drawn upon in the “receptivity” that leads to perceptual experience. There are doubts. Some point out that animals would not be capable of perception on this account since they do not possess concepts. It could be argued in response that the explicit possession of concepts may not be needed for the reception of conceptually articulated content—there may be ways of registering the application of perceptual concepts to the ball that do not demand this. It is well to note that McDowell’s version of conceptual content would not be mitigated by this stipulation, since he requires that the concepts be drawn on in receptivity itself. The rest of issues surrounding perception and concepts are fully discussed by Wayne Wright, II.3; animal perception is treated of by Brian Keeley in VII.4, who discusses the comparability of animal perception to that in humans.

Let this suffice as a review of some broad issues about perception and to demonstrate the richness of the study and its utility for philosophical inquiry. The authors of this *Handbook* have produced original and searching, but at the same time introductory, surveys of issues at the forefront. I hope that you, the reader, benefit from their efforts.

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## *INTRODUCTION*

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