1

Introduction

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The philosophy of perception is a microcosm of the metaphysics of mind. Its central problems—*What is perception? What is the nature of perceptual consciousness? How can one fit an account of perceptual experience into a broader account of the nature of the mind and the world?*—are problems at the heart of metaphysics. It is often justifiably said that the theory of perception (and especially vision) is the area of psychology and neuroscience that has made the greatest progress in recent years. Despite this progress, or perhaps because of it, philosophical problems about perception retain a great urgency, both for philosophy and for science.

Beyond these general remarks, however, it is difficult to state precisely what the philosophy of perception comprises, and hence which topics, issues, and viewpoints should be included in a book such as this one. Numerous philosophical problems about perception and many different strands in the philosophy of perception exist. For this reason, we have not tried to make this book a comprehensive collection of philosophical writings on perception. Our aim, instead, has been more focused.

The works collected in this volume target a distinct philosophical and scientific orthodoxy about the nature of perception. Some of the papers defend the orthodoxy; most criticize it; and some set forth positive alternatives to it. Each selection provides, we believe, a crucial moment in the articulation of an important family of problems for contemporary philosophy of perception. Our purpose in this brief introduction is to sketch the philosophical and scientific setting of this family of problems.

1 The Orthodox View

The defining problem of traditional visual theory is that of understanding how we come to enjoy such rich, apparently world-representing visual impressions. You

open your eyes and you take in an environment of meaningful objects and events and of colors, forms, and movements. What makes such perceptual experience so difficult to explain is the fact—if it is a fact—that when we open our eyes and contemplate a scene, we make no *direct contact* with that which we seem to see. What is given to us, one might suppose, is not the world itself, but the pattern of light on the retina, and *that* pattern does not supply enough information to determine how things are in the environment. For example, from the retinal image of a table alone, it may not be possible to tell whether it is large and far away, or small and nearby.

Visual scientists are quick to add that the problem is really even more baffling than we have indicated. The eye is in nearly constant motion; the resolving power (spatial and chromatic) of the retina is limited and nonuniform; passage to the retina is blocked by blood vessels and nerve fibers; there is a large "blind spot" on the retina where there are no photoreceptors; there are two retinal images, each of which is upside down. Given this impoverished basis, how do we manage to enjoy such richly detailed visual experiences of the environment? The central puzzle for traditional visual science has been to explain how the brain bridges the gap between what is given to the visual system and what is actually experienced by the perceiver.

In the face of this puzzle, an orthodox or "Establishment View" of perception (Fodor and Pylyshyn, chapter 10) has taken shape over the last fifty years. According to this orthodoxy, perception is a process whereby the brain, or a functionally dedicated subsystem of the brain, builds up representations of relevant features of the environment on the basis of information encoded by the sensory receptors. As David Marr (chapter 11) surmises: "Vision is the *process* of discovering from images what is present in the world, and where it is." Because the patterns on the retina are not sufficient by themselves to determine the layout of the surrounding environment, perception must be thought of as a process of inductive inference. Perceptions are, as Richard L. Gregory (chapter 7) suggests, hypotheses concerning the distal causes of proximal stimulation. In the famous phrase of Helmholtz, perception is unconscious inference.

The orthodox view, in its modern computational form, treats perception as a "subpersonal" process carried out by functional subsystems or modules instantiated in the person's or animal's brain. For this reason, among others, it is often held that much of perception—specifically "early vision," in which a model of the surface layout is supposed to be produced—is "cognitively impenetrable," that is, impervious to the direct influence of cognition or thought. In other words, the beliefs and expectations of the perceiver are thought to have no influence on the character of

the subpersonal computations that constitute perception. Thus, on the orthodox approach, perception is thought-independent (see Pylyshyn 1999 for a recent statement of this position).

Most adherents of the orthodox view also believe that for every conscious perceptual state of the subject, a particular set of neurons exists whose activities are sufficient, as a matter of scientific law, for the occurrence of that state. Davida Teller (chapter 13) calls such neurons "the bridge locus" of visual perception; others, like David J. Chalmers (chapter 22), call them the "neural correlate of consciousness" (NCC) for visual perception. According to this viewpoint, to suppose that there is no bridge locus or neural correlate of consciousness would be to give up all hope of securing a scientific explanation of perceptual experience.

2 Heterodox Views

Although the orthodox view has dominated perceptual psychology, visual neuroscience, and artificial vision and robotics, important alternative research programs have existed for many decades. Collectively these alternatives constitute a significant heterodoxy in visual science (and cognitive science more generally), one whose influence seems to be felt increasingly in mainstream cognitive science and philosophy. Important differences exist among these alternative research programs, but what unites them is their convergence on certain fundamental criticisms of the orthodox view and their insistence on the inseparability of perception and action.

The Ecological Approach

The theoretical and empirical research on vision undertaken by the perceptual psychologist James J. Gibson (1966; 1979; chapter 5) marks an important break with the orthodox view. Perception, Gibson argues, is not an occurrence that takes place in the brain of the perceiver, but rather is an act of the whole animal, the act of perceptually guided exploration of the environment. One misdescribes vision if one thinks of it as a subpersonal process whereby the brain builds up an internal model of the environment on the basis of impoverished sensory images. Such a conception of vision is pitched at the wrong level, namely, that of the internal enabling conditions for vision rather than that of vision itself as an achievement of the whole animal. Put another way, the function of vision is to keep the perceiver in touch with the environment and to guide action, not to produce inner experiences and representations.

According to this animal-level account, the information directly available to the perceiver in vision is not to be found in the pattern of irradiation on the retinal surface, but rather in the world or environment that the animal itself explores. In other words, Gibson denies the assumption of the orthodox view—and of representational theories in general—that one makes no direct contact with that which one sees. For Gibson, perception is direct: It is not mediated by sensations or images that serve as the basis for reconstructing a representation of the things that we see. Perception, one might say, is direct inspection, not *re*-presentation.

If perception does not operate according to mechanisms of inferential reconstruction on the basis of internal representations, then how does it operate, according to Gibson? The central working hypothesis of this *ecological* approach is that the perceiver makes direct contact with the environment thanks to the animal's sensitivity to invariant structures in the ambient light. Two points are important here. First, perception is active: the animal moves its eyes, head, and body to scan the layout visually, while simultaneously moving through the environment. Thus visual perception occurs not as a series of snapshots corresponding to stationary retinal images, but as a dynamic visual flow. Second, there are lawful correlations between the structure of this flow and visible properties of the environment. Because perceivers are implicitly familiar with these lawful correlations, they are able to "pick up" content from the environment as specified in the light without having to reconstruct the environment from impoverished images through information processing.

The ecological approach remains highly controversial. Perhaps the most well-known criticism is that of Jerry A. Fodor and Zenon W. Pylyshyn (chapter 10). They defend the Establishment View, and they insist that Gibson failed to make a serious break with this view. At the end of the day, they suggest, the only significant contact one makes with the world in perception is through the stimulation of one's sensory receptors by patterns of energy. Perception, therefore, must be indirect: It must be a process of representation on the basis of that peripheral sensory contact. According to this way of thinking, perception remains, from a scientific viewpoint, a subpersonal process of computational representation, and accordingly is not usefully thought of as an animal-level achievement. On the other hand, John McDowell (chapter 17) scrutinizes the conceptual and epistemological coherence of this Establishment position in the context of philosophical issues about the content of perceptual experience and knowledge; he argues that the nature of perception will continue to be misunderstood as long as perception is cast as an internal, subpersonal process.

The Enactive Approach

Another alternative approach to perception has emerged from the work of the neuroscientists Humberto R. Maturana and Francisco J. Varela. They argue that it is a mistake to think of the nervous system as an input-output system that encodes an internal representation of the outside world (Maturana and Varela 1980, 1987; Varela 1979, 1995, 1997). Rather than representing an independent, external world, the nervous system generates or brings forth, on the basis of its own self-organized activity, the perceptuo-motor domain of the animal. (A similar viewpoint has also been put forward by the neuroscientist Walter Freeman: See Freeman and Skarda 1995; Skarda and Freeman 1987; Freeman 1999). On the basis of this reappraisal, Varela has presented an enactive approach to perception (Varela 1991; Thompson, Palacios, and Varela, chapter 15), as one component of a comprehensive *enactive* or *embodied* view in cognitive science (Varela, Thompson, and Rosch 1991; see also Clark 1997). According to this view, meaningful perceptual items, rather than being internally represented in the form of a world-model inside the head, are enacted or brought forth as a result of the structural coupling of the organism and its environment (see also Noë forthcoming).

A good example of the enactive approach is the account of color vision provided by Evan Thompson, Adrian Palacios, and Francisco J. Varela (chapter 15). They reject the orthodox view, as exemplified in computational color vision research (e.g., Maloney and Wandell 1986) and functionalist philosophy of mind (e.g., Matthen 1988; Hilbert 1992), according to which the function of color vision is to recover from the retinal image reliable estimates of the invariant distal property of surface spectral reflectance (the percentage of light at each wavelength that a surface reflects). On the basis of cross-species comparisons of color vision, Thompson, Palacios, and Varela argue that different animals have different phenomenal color spaces, and that color vision does not have the function of detecting any single type of environmental property. They then use these arguments to motivate an enactive account of color, according to which color properties are enacted by the perceptuo-motor coupling of animals with their environments (see also Thompson 1995, 2000).

Animate Vision

The research program of *animate vision* has emerged at the interface of computational vision, artificial intelligence, and robotics (Ballard, chapter 18; see also Ballard 1991; Ballard et al. 1997). Instead of abstracting perceptual processes from their

bodily context, animate vision proposes what Ballard calls a distinct *embodiment level* of explanation, which specifies how the facts of sensorimotor embodiment shape perception. For example, the orthodox view starts from the abstraction of a stationary retinal image and asks how the visual system manages to derive a model of the objective world; in so doing, it decomposes visual processes into modules that are passive in the sense of not being interconnected with motor processes. Animate vision, however, starts from the sensorimotor cycles of saccadic eye movement and gaze fixation, and asks how the perceiver is able to fixate points in the environment; in so doing, it decomposes visual processes into visuomotor modules that guide action and exploration. Such an embodied, action-based analysis reduces the need for certain kinds of representations in vision, in particular for an online, moment-to-moment, detailed world-model.

The Sensorimotor Contingency Theory

According to this theory, put forward by J. Kevin O'Regan and Alva Noë (see O'Regan 1992; O'Regan and Noë 2001; Noë and O'Regan, chapter 23; Noë 2001, 2002, forthcoming), it is a mistake to think of vision as a process taking place in the brain. Although the brain is necessary for vision, neural processes are not, in themselves, sufficient to produce seeing. Instead, seeing is an exploratory activity mediated by the animal's mastery of *sensorimotor contingencies*. That is, seeing is a skill-based activity of environmental exploration. Visual experience is not something that happens *in* an individual. It is something he or she *does*. This sensorimotor conception forms the basis of Noë and O'Regan's challenge (chapter 23) to the widespread view, articulated in this volume by Teller (chapter 13) and Chalmers (chapter 22), that the content of visual experience is represented at some specific stage of neural processing (the "bridge locus" or the "neural correlate of consciousness").

3 The Importance of Action and Embodiment

If one common theme emerges from the heterodoxy, it is that perception must be understood in the context of action and embodiment. This theme is echoed by other chapters in this book.

Chapter 21 by the neuropsychologists A. David Milner and Melvyn A. Goodale provides an example from recent neuroscience that draws attention to the importance of perception-action linkages. Milner and Goodale argue that two visual systems exist, one of which is dedicated to the visual guidance of action (chapter

21; see also Milner and Goodale 1995). In support of this finding they adduce clinical studies in which the reports that perceivers make indicate *misperception* even though their motor responses seem to be based on accurate visual assessments of the environment.

Paul Bach-y-Rita (chapter 20) discusses his work on tactile-vision substitution systems. This research suggests that it is possible to "see" by means of tactile sensations, if these sensations are appropriately embedded within a sensorimotor framework.

In a different vein, Gareth Evans (chapter 14) emphasizes the importance of skillful capacities of bodily movement for perception, in his philosophical analysis of the classic "Molyneux Question" posed by William Molyneux to John Locke—whether a man blind from birth, who is able to distinguish a sphere and a cube by touch, would be able to tell, upon having his sight restored, which is which by sight alone before touching them. Evans argues that mastery, by the perceiver, of a set of perceptuo-motor skills is a condition on the perceiver's ability to experience space.

Finally, the importance of action and embodiment has long been emphasized by philosophers and psychologists working in the tradition of phenomenology derived from Edmund Husserl; for this reason, there is significant convergence between the concerns and analyses of this tradition and action-oriented approaches to perception in recent cognitive science (see Petitot et al. 1999). Husserl, in his groundbreaking and extensive analyses of the phenomenology of perceptual experience, delineated the intricate functional interdependencies of perception and kinaesthesis (Husserl 1997; see also Mulligan 1995), and these analyses were taken up and developed by Maurice Merleau-Ponty in his 1945 book, *Phenomenology of Perception*, selections of which are reprinted here.

4 Perceptual Experience and the New Skepticism

We now turn to another recent topic of discussion in philosophy and visual science that also brings critical pressure to bear upon the orthodox view. The issue concerns the kind of experience one takes oneself to have in seeing: Does one enjoy the sort of richly detailed visual impressions that perceptual scientists and philosophers have typically assumed one does? A growing number of philosophers and scientists challenge this basic presupposition of the orthodox stance (see Dennett 1991, chapter 19; Ballard, chapter 18; O'Regan 1992; Mack and Rock 1998). As Dana H. Ballard (chapter 18) puts it: "You Don't See What You Think You See." This

challenge has given rise to a new form of skepticism about perceptual experience. Whereas traditional skepticism challenged whether we can know, on the basis of experience, that things are as we experience them as being, the new skepticism questions whether we even have the perceptual experience we think we have. Perceptual consciousness, according to the new skepticism, is a kind of false consciousness. Perceptual experience is a "grand illusion."

The skeptical reasoning goes as follows. It seems to us as if we enjoy picturelike visual experiences that capture everything before us in sharp focus and uniform detail. You open your eyes and *there it all is*. This idea about the character of visual experience is beautifully captured by Ernst Mach, who represented his (monocular) visual field in a now famous drawing (see figure 1.1). In Mach's drawing, the visual field is in sharp focus and uniform detail from the center out to the periphery where

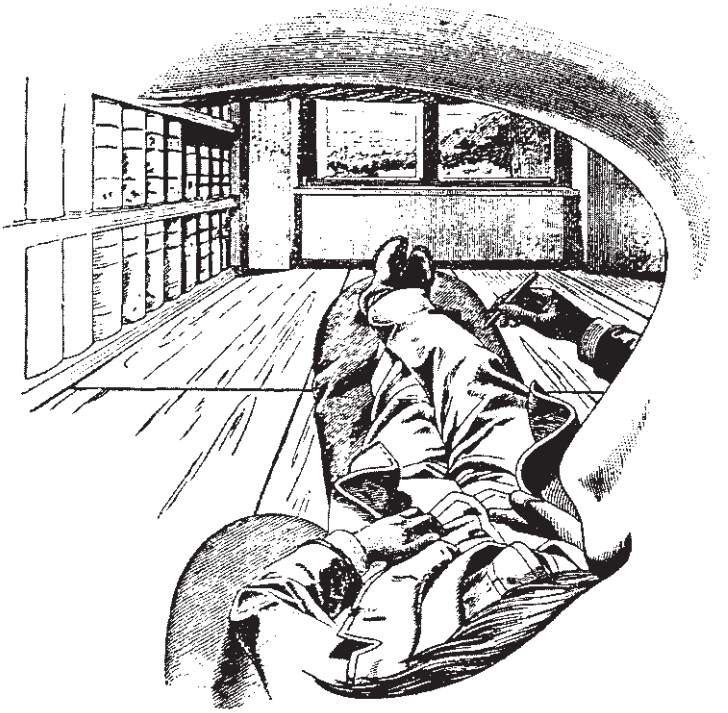

Figure 1.1
From *The Visual Field* (Mach 1959).

it suddenly fades to white. Yet there is ample reason to believe that visual experience is not as Mach's picture would have us believe.

First, because of the relatively limited number of photoreceptors at the periphery of the visual field, humans have very poor parafoveal vision. Hold a playing card at arm's length just within your field of view. You will not be able to tell its color. The visual field is *not* sharply focused from the center out to the periphery, contrary to what Mach's drawing suggests.

Second, there is in each eye a stretch of the retina—the optic disk—where there are no photoreceptors. As a result, one is in fact blind to what falls on this region (the "blind spot"). One does not normally notice the gap, even in monocular vision. If you fix your gaze at a wall of uniform color, with one eye shut, you will not notice a gap in your impression of the wall corresponding to the part of the wall you cannot see because of the blind spot. Your perceptual experience, so runs the skeptical reasoning, deceives you as to its true character. The visual field is not continuous and gap free, as Mach's picture would suggest.

Third, psychologists have recently demonstrated the attention-dependent character of perception. Unless you actively attend to detail in your environment, you do not perceive that detail. In one demonstration, you are asked to watch a videotape of a basketball game and to attend to some aspect of play. A person in a gorilla suit walks onto the court, stops in the middle to do a little jig, and then continues his way across the court (Simons and Chabris 1999). Very few people watching the tape will report seeing the gorilla! In another series of demonstrations, changes are made to the scene before you, and you are asked to report the change. It is very difficult to do this because, unless you attended to the change when it happened, you are unlikely to be able to tell. What makes these experiments striking is that they seem to challenge Mach's conception of what seeing is like. Despite the impression of seeing everything, people see only very little of what is there before them.

From these facts, one can conclude that the way of thinking about perceptual experience captured by Mach in his drawing is, in fact, a mischaracterization of what experience is really like. It may seem to you as if your perceptual experience is detailed, continuous, and gap-free. In fact, it is fragmentary, discontinuous, and sparsely detailed. You have false beliefs about the character of experience. You do not actually enjoy the experience you think you do.

This rejection of the phenomenological assumptions implicit in the orthodox approach to perception has important implications for framing the key problems of perceptual science. As we have seen, the central problem for traditional visual science is that of understanding how you see so much given such limited perceptual

contact with the world. A new approach, taking its start from the new skepticism, seeks to understand instead why it seems to you as if you see so much, when in fact you see so very little!

Is perceptual experience a grand illusion? What is the character of perceptual experience? The chapters in this volume by Daniel C. Dennett, Dana H. Ballard, and Alva Noë and J. K. O'Regan all touch on these questions.

Finally, it bears mentioning that these questions about the nature of visual experience are relevant to another long-standing issue in the philosophy of perception—that of how to understand the differences between the sensory modalities. One way to appreciate this issue is to notice that there is nothing about the character of the neural impulses in the brain that indicates whether they are caused by stimulation of the retina, cochlea, or other sensory membranes. Many scientists seem satisfied with some variant of Mueller's (1838) idea of "specific nerve energy," according to which the senses are differentiated by the different pathways along which they propagate neural activity. An alternative and widely influential philosophical proposal is advanced by H. P. Grice (chapter 3), who argues that the senses can be individuated by their distinct qualitative characters. O'Regan and Noë (2001) and Noë and O'Regan (chapter 23) have challenged these proposals, arguing instead that the senses are to be distinguished by the different patterns of sensorimotor contingency by which they are governed. Their position is compatible with Bach-y-Rita's work on tactile-vision substitution systems (chapter 20), which suggests that it is possible to "see" or experience the world "visually" through sensory systems other than vision.

5 The Argument from Illusion

In a different context from that of the foregoing discussion, some philosophers have attacked the conception of perceptual experience implicit in the orthodox approach. J. L. Austin, and then after him Paul Snowdon and John McDowell, have attacked the well-known *Argument from Illusion*. According to this argument, it is not possible to tell the difference between a veridical visual experience and a corresponding hallucinatory one. That's why hallucinations can fool you. Therefore, it must be that there is no difference in what you are aware of when you undergo a perceptual experience and what you are aware of when you undergo the corresponding hallucination. You know, in the hallucinatory case, that what you are aware of is a mental figment. It follows, then, that what you are aware of in the veridical case

is also, at least in the first instance, a mental figment. The conclusion of the argument is that the direct objects of perceptual awareness are not things in the world, but mental items called "sense data."

Snowdon (chapter 9) and McDowell (1982, 1986), building on ideas of Austin (1962) and Hinton (1973), reject the claim that there is a common experiential content to perceptual experiences and the corresponding hallucinations. There is all the difference in the world between something's looking a certain way to one, and its merely seeming to one as if something looks a certain way to one. In the first case, one's experience involves an object in the world. In the second, it does not. Because there is no common content to veridical and hallucinatory experiences, the idea that an individual is aware of one and the same thing when he or she perceives/hallucinates can be rejected.

Philosophers have explored the further implications of this way of thinking about perceptual experience (the so-called disjunctive view of experience). One important further implication concerns the status of what is known as the causal theory of perception. On one natural interpretation, this theory rests on the idea that cases of genuine perception and some cases of misperception turn only on the absence of an appropriate causal dependence between the experience and what the experience is of. It might seem, however, that this cannot be right, at least on the disjunctive conception. After all, on the disjunctive conception, there is no one experiential content common to both the hallucinatory and the veridical episodes. This issue is explored by Snowdon (chapter 9). David Lewis (chapter 8) provides a now classic presentation of the causal theory of perception.

6 Thought and Experience

The thought-independence of perceptual experience is another important theme in recent philosophy of perception. It has been defended and elaborated, over the years, by both Fred Dretske (1969; chapter 16) and by Peacocke (1992). It is rejected, however, by some of the philosophers collected in this volume—G. E. M. Anscombe (chapter 4), Grice (chapter 3), Strawson (chapter 6), Peacocke (chapter 12)—and also by Sellars (1963). The central idea of these writers—central also to the phenomenological tradition—is that perceptual experience has *intentional content*—that is, it purports to represent the world as being this way or that. For experience to have perceptual content in this way, the perceiver must have some grasp, however primitive, of how the experience represents the world as being. The intentional,

world-referring character of perceptual experience has a further important consequence. It is a common claim that perceptual judgments made on the basis of perceptual experience—such as, for example, that there's a tomato on the table—go beyond what is, strictly speaking, given in the experience itself. The experience itself, is after all, compatible with there being no tomato on the table at all, but merely a tomato likeness of one kind or another. A strictly accurate description of experience, so runs this line of reasoning, must abjure all mention of the stuff of the mind-independent world and confine itself to the raw sensory data the presence of which is guaranteed by the mere occurrence of the experience itself. This argument falters, however, because, as Strawson (chapter 6) insists, it utterly misdescribes the character of our perceptual experience, which presents itself to us precisely in the terms needed to frame the relevant judgment. It would be impossible to describe accurately the experience in question, so the rebuttal runs, without mentioning tomatoes. The concept *tomato* enters immediately into the content of the experience.

7 Conclusion

It would be difficult to overstate the degree to which the problems dealt with by the writers in this book are alive and unresolved. Insofar as these problems are empirical, much work remains to be done. But what is at stake is not merely the correct empirical account of the workings of perception, and hence the standing of various approaches in visual science. Rather, because perception is such a pervasive feature of one's conscious life, what is at stake is ultimately one's understanding of consciousness itself and one's conception of one's place in the natural world.

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