REASONS FOR REALISM

Selected Essays of James J. Gibson

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4.8 The Myth of Passive Perception: A Reply to Richards*

J. L. Austin once remarked (in *Sense and Sensibilia,* 1962) that there was nothing so plain boring as the constant repetition of assertions that are not true. He was tired of hearing that all we can ever perceive is our private sense data, or at least that they are all we can ever directly perceive. I agree with Austin. This is why I have tried to formulate a theory of the direct perceiving of the environment without the necessity of sensations to mediate the process. Perceiving is information-based, not sensation-based. But now I keep hearing that I have a passive theory; that it does not recognize the *activity* of perceiving, and I am tired of that assertion for it is also not true.[1] The kind of activity I postulate is different, to be sure, and perhaps this is the source of the misapprehension.

The only kind of perceptual activity that my critics are willing to admit is *mental activity,* that is, the operations of the mind upon the deliverances of the senses. (You can substitute the operations of the brain upon the inputs of the sensory nerves if you like, but that will come to the same thing.) Different hypothetical operations have been proposed by different theorists of perception and every new generation sees new operations proposed, mostly new names for old operations. The kind of activity, however, that seems to me important is the looking, listening, touching, tasting, and sniffing that goes on when the percep-

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[1]This criticism of Gibson goes back at least to Epstein & Park (1964) and Freeman (1965). Versions of it may be found in Gregory (1972), Gyr (1972), Hamlyn (1977) and Ullman (1980). Replies to this criticism are found in Gibson & Gibson (1972), Gibson (1973b), Flock (1965), Mace & Pittenger (1975), Reed & Jones (1978, 1981), Jones & Pick (1980) and Reed (1980). (Eds.)

tual systems are at work. These acts involve adjustments of organs, not mere stimulation of receptors. They are not mental. Neither are they physical, for that matter, but functional. My notion of the pickup of information by the extracting of invariants over time involves the optimizing activity of a system and I believe it escapes the fallacies of mentalism on the one hand and those of stimulus-response behaviorism on the other.

The classical theories of sensation-based perception can only begin to talk about activity after sensations have been aroused by stimuli.[2] They postulate activities to supplement the sensations or to correct them, or to interpret them, or to organize them, or make inferences from them, or attach meanings to them, or fuse them with memories, or combine them with concepts, or impose logic on them, or construct a model of the world from them (the list could go on and on). But the theory of information-based perception can begin to talk about activity before sensations have been aroused by stimuli, an activity that orients the organs of perception, explores the ambient array, and seeks an equilibrium. For example, the adjustments of stabilizing the eyes, fixating them, turning them, converging them, accommodating the lens, and modulating the pupil are surely activities (but not reflexes) which are quite independent of visual sensations. And the mental compensation for sensations of motion resulting from eye movements is no longer a puzzle if the sensations are irrelevant.

Richards (1976) asserts that I have a theory of passive perception and implies that such a theory has been held by others as well. But I ask who are they? Has any theorist ever believed that perception was passive? I cannot think of one. No one has ever proposed that sensations were enough to explain perception, not since Thomas Reid distinguished them.[3] There have been psychologists and physiologists who were simply not interested in the problems of perception but that does not make them adherents to a passive theory. Richards accuses me of believing that "the senses are merely conduits conveying unsullied information to mind about the real properties of the world." But I emphatically do not believe that and no experimental psychologist could possibly believe it. I reject the notion of conduits, the assumption of incoming messages, and I go so far as to question whether there are nerves that should properly be called "sensory" (Gibson, 1966b, p. 42). I suggest that the nervous system operates in circular loops and that information is never conveyed but extracted by the picking up of invariants over time. Information about the world is available in the light, sound, chemicals, and mechanical contacts that constitute the "flowing sea of stimulus energy." So, to Richards' claim that my theory neglects the activity of perceiving I submit the counterclaim that it emphasizes an activity that is central to perceiving, a genuine activity. If it has been neglected this is only because of all

[2]One supposed alternative to sensation-based theories of perception is a motor theory. However, motor theories of perception are in fact complementary to sensation-based theories because they hold that perception arises only when motor responses (tacit or actual) organize the sensory data. See, e.g. Liberman, Cooper, Shankweiler & Studdert-Kennedy (1967). (Eds.)

[3]Reid (1785). (Eds.)

the loose talk about processes of the mind or of the brain which is the seat of the mind. If physiologists would forget their precious reflexes and sensations for a while and do a little thinking about perception and the adjustments of the organs of perception, they would begin to find out about this activity.[4]

It is quite true that I reject the doctrine of specific nerve energies as Richards points out. Especially I reject the implication of this doctrine for perception, the inference that if we cannot know anything but the "qualities of our nerves" the properties of the environment are forever beyond our ken. It may be a fact that electrical stimulation of the eye causes a sensation reported as "light" instead of "electricity" but one cannot make the inference about knowledge that Johannes Müller made, not if sensations of light are irrelevant for visual perception. Only if one assumes that sensations of light are the *necessary basis* of visual perception is one faced with the great mystery of how we see the surfaces of things.

It is true that my hypothesis of an inexhaustible reservoir of information about the environment outside the observer was not entirely clear in my essay entitled *Perception as a Function of Stimulation* (Gibson, 1959a) but it became clear by the time I published *The Senses Considered as Perceptual Systems* (Gibson, 1966b). I now make a sharp distinction between stimulus energy and stimulus information.[5] I would no longer suggest that an act of perception had a stimulus or could be touched off by stimulus energy (although a sensation, of course, has a stimulus and is touched off by it). This change in my theory has confused Richards, along with other readers, and I am sorry for the lack of clarity. The concept of the stimulus has had a baneful influence on psychology (Gibson, 1960c) and I myself have had trouble in getting free of it. I would now deny that there is ever a one-to-one correspondence between stimulation and perception. What I should have said was that perception is wholly constrained by stimulus information.

My theory of the available information in ambient light is radically different from the modern theory of information considered as signals, the mathematical theory founded by Shannon.[6] But my critics have not understood this fact, and here is another source of confusion. I argue that the perceptual systems are not to be compared to the media for human communication, that the inputs of a sensory nerve have nothing to do with messages, and the outputs of a motor nerve have nothing to do with commands. The world does not telegraph the brain and the brain does not telegraph the muscles; only a whole man sends telegrams. The brain is not a receiver nor a sender; not a homunculus but only an organ. Richards is quite wrong to say that I have appealed to *information theory* in order to buttress the concept of *information* that underlies my theory of perception.

My notion is that information consists of invariants underlying change. It does not consist of stimuli, nor of patterns of stimuli, nor of sequences of stimuli. A

[4]Wall (1970) attempts to do just this. (Eds.)
[5]Cf. Chs. 1.4, 1.6, 4.3 and 4.4 (Eds.)
[6]See Shannon (1948). (Eds.)

perceptual system does not respond to stimuli (although a receptor does) but extracts invariants. This notion is radical and unfamiliar but why should it be so difficult to comprehend? Gradients, transients, derivatives, ratios, and rates in a flowing array of energy are actually much more plausible than patterns of stimuli that go on and off at a mosaic of receptors.

Richards seems to take it for granted, however, that psychology cannot get along without the assumption of these discrete stimuli. He says "all that we have in immediate sensory stimulation is one receptor or a group of receptors firing in a certain sequence. . . . Relations, at least those to which Gibson here refers, are not real features of the physical world. . . . What is a border of light? In the natural world . . . there are only discrete photon units. . . . Borders are relations which exist only for cognating perceivers." But I deny just these assertions, all of them. Richards accepts the doctrines of physical optics, whereas I propose a new level of ecological optics.[7] He believes the orthodox physiologists whereas I believe they are out of date. There are some physiologists who reject the doctrine of specific nerve energies as strongly as I do.

Richards assumes that the retina, the optic tract, the lateral geniculate body, and the striate cortex "together constitute the organ of visual perception." He even leaves out the eye! I assert that the whole eye-head-retino-neuro-muscular system with all the precise adjustments involved in looking constitute the visual system.

Richards assumes that a "cognitive reworking" of the input of the sensory nerves is necessary for perception. He has to assume something of that sort since the sensory input is obviously insufficient, for example in the case of the optic nerve where the third dimension has been lost in the retinal image. So has every other theorist had to assume something like a reworking of the input, but they have not been able to agree on what it is. Anyone who believes the senses to be channels of sensation *has* to be a mentalist when it comes to sense perception. I, on the other hand, assume that cycles of input and output that reach an optimal state are necessary for perception. The brain is not the place where it occurs but only the central part of the perceptual system. I do not have to say anything whatever about inputs alone, or sensations, or the "processing" of inputs, or the traces they might leave. I am tired of hearing about cognitive reworking and organizational processing and intellectual machinery. It is time for a fresh start on this ancient problem.

I repeat what I said in reply to Gyr (1972) who is another critic of my theory. "A whole set of current experiments and controversies will go by the board if the modalities of sense are recognized as being unimportant for the activity of perception, for the theory of direct perception implies an equally direct awareness of the body of the observer and the adjustments of its perceptual organs. New experiments will have to be designed to test this theory" (Gibson, 1973b, p. 397).

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[7]Cf. Ch. 1.4. (Eds.)