

1966 AND ALL THAT: JAMES GIBSON AND BOTTOM-DOWN THEORY.

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ABSTRACT

The 'later' James Gibson is widely misrepresented as an extreme stimulus-response theorist. In fact, Gibson's 1966 book presents a radical alternative to stimulus-response theory. "Perceptual systems" are not passive and receptive, but "organs of active attention" (1966/1968, p. 58). Perceivers "reach out" into the world. This commentary examines some of the implications of Gibson's systems-cum-functionalist-cum-ecological approach, including the relations between the senses, the concept of 'sensationless' perception, and most fundamentally, the nature of perceptual *systems* as extending beyond the body. I conclude that an adequate understanding of perception cannot be limited to the already severely limited domain of psychology. If Gibson is right, "ecological *psychology*" is a contradiction in terms.

Key Words: J. J. Gibson, radical subjectivism, stimulus-response theory, bottom-up theory, top-down theory, John Dewey, interdisciplinarity

1966 AND ALL THAT: JAMES GIBSON AND BOTTOM-DOWN THEORY.¹

By showing the passive nature of vision, [Kepler's eye-camera analogy] cut the ground from under a vast set of theories ... which assume vision to be an "active function", a reaching out, as it were, of the soul. (Santillana, 1959, p. 36; see also Straker, 1976, p. 21)

EMPIRICISM AND EXPERIENCE

Empirical science keeps painting itself into a corner, and coming up with self-consuming arguments. The standard claim has been that, on the basis of *empirical* evidence, we must conclude that things are *never* as they seem. Here is Arthur Eddington, in his book *The Nature of the Physical World* (1935), setting up the idea of "two worlds." According to Eddington, there are, for example, two completely different tables. The first is the table we experience as substantial, tangible, and meaningful *as a table*, and the second is the alien "scientific table." The scientific table, according to Eddington "is mostly emptiness," and completely alien to our experience:

I need not tell you that modern physics has by delicate test and remorseless logic assured me that my second scientific table is the only one which is really there - wherever 'there' may be. (Eddington, 1935, p. 6; for a brilliant rejoinder, see Susan Stebbing, 1937!)

James Gibson read Eddington as a student and admitted that it had been completely taken him in. "It took me years to get over it" (Gibson, 1967, p. 172; see also Gibson, 1966/1968, pp. 21-22).

This "two-worlds" thinking has profoundly structured perceptual theory, and in a thoroughly disastrous way. Kepler attempted to provide a *mechanical* explanation of vision but it was an explanation that emphatically *stopped* at the stage of the formation of the retinal image, thus setting up entirely *different* kinds of 'psychological' questions – and possible answers - about what happens *beyond* the retina (Crombie, 1964).¹

¹ Thanks to Endre Kadar, Ann Richards, and the reviewers for very helpful comments.

Two-stage theories have a *very* long history, and have been based on the concept of a passively received, inchoate, 'sensory core' that has to be embellished by 'the intellect' to be rendered coherent and meaningful (Hatfield & Epstein, 1979). The problem, of course, has been how the intellect could possibly 'reach out' beyond the sensory core. One 'solution' has been to appeal to the power of inference:

That the information obtained through the eye consists of two things — sensations, and inferences from those sensations: that the sensations are merely colours variously arranged, and changes of colour; that all else is inference, the work of the intellect, not of the eye (J. S. Mill, 1842, p. 322)

But inferences need premises, and these premises could *never* have been based on past experience, either of the individual or the species. For, according to the very assumptions of such inference theories, the relation between perceiver and world was no different - and, hence, no less dire - in the *past*.

The favoured alternative account in modern psychology has been that perception is based upon the construction of cognitive representations. Yet the same problem arises. Here is Richard Gregory relishing in what he presents as a firmly *empirically* grounded argument for radical subjectivism:

It used to be thought that perceptions, by vision and touch and so on, can give direct knowledge of objective reality. ... *But, largely through the physiological study of the senses over the last two hundred years, this has become ever more difficult to defend.* ... ultimately we cannot know directly what is illusion, any more than truth for we cannot step outside perception to compare experience with objective reality. (Gregory, 1989, p. 94; emphasis added.)

Gregory is not alone in wanting to have it both ways: claiming that we can indeed know what things are like (namely, when we are doing science), only to conclude, on that very basis, that in general we *cannot*. Wyburn, Pickford, & Hirst (1964) set out several fundamental objections to representationalism,

including the following:

... many versions of [Representative] theory are self-refuting. In the early part of the exposition, when the causal transmission is being established, it seems assumed that we can directly observe objects, sense organs, nerves, and brains, and so can observe causal processes outside the mind; but by the time the conclusion is reached all we can perceive are mental representations, so that the “brains,” “nerves,” etc., directly observed and described in the early stages must, it seems, have been mental representations only, and the causal relations observed must have been between such representations. The theory has “cut off the branch on which it was sitting” by disallowing the direct perception of objects in the external world on which its premises rested. (Wyburn, Pickford, & Hirst, 1964, p. 253; see also Anscombe, 1974, Kenny, 1971, Hacker, 1991; Wilcox & Katz, 1984.)

All this radical subjectivism, apparently underpinned by science itself, has a kind of plausibility when we think of science as something *all over and done with*. But, science is something people actually *do*, and are still *doing*. It is a human activity. Curiously, psychologists, of all people, seldom notice this when they theorize about ‘scientific method’ and keep proposing an ideal of scientific objectivity that would exclude the *subjectivity* of scientists. A few physicists, however, such as Richard Feynman, have noticed:

[Feynman] believed that historians, journalists, and scientists themselves all participated in a tradition of writing about science that obscured the working reality, the sense of science as a process rather than a body of formal results. (Gleick, 1992, p. 380.)

So, mental representationalism leaves us with two big problems. First, how *do* people do science – including psychology? Second, how *do* people, in general, along with other animals, actually manage to *live* in the world?

The phenomenologist, Edmund Husserl, came very close to the nub of this issue:

There are all sorts of problems that stem from the naïveté, according to which objectivist science holds what it calls the objective world to be the totality of what is, without paying any attention to the fact that no objective science can do justice to the subjectivity that achieves science. (Husserl, 1965, p. 185)

GIBSON 1950 AND 1979

James Gibson acknowledged that his teacher at Princeton, Edwin B. Holt, had been an inspiration. Holt set out powerful arguments against representational theory long before the rise of modern cognitive theory. His targets were representationalism, not so much in psychology (where, in Holt's time it was not so dominant) but primarily in the philosophy of science (see Costall, 2011). Gibson made very few references to Holt's criticism of representationalism, but did protest against radical subjectivism within social and clinical psychology in his early writings. An important concern in his early 1950 classic, *The Perception of the Visual World* was social stereotyping, including witch-hunts - to which Gibson was himself subject during the attacks against 'un-American activities' (see Reed, 1988, pp. 106-113).

Gibson's political and ethical concerns are very clear in his early work, including the rise of European fascism (Gibson, 1939). But one big problem with his first book is that it is primarily about defining a "literal perception" of visible *surfaces* ("the visible world") that is supposed to provide *a safe retreat from cultural and political relativism* (Costall & Still, 1989; Costall, 1995).

In a now largely forgotten chapter on meaning towards the end of book, Gibson insists that it is *meanings* not the surfaces of things that are fundamental:

... 'use-meanings' have to be regarded from a biological viewpoint as primary, in contrast to the standard topics of perceptual research: the shapes, colours, motions and distance of things (Gibson 1950, p.198; see also Gibson 1959, p. 485).

However, I think it is fair to say that in this first book, Gibson leaves the

relation between meaning and surfaces hanging in the air:

Meanings and spatial properties are not entirely separable from one another; meaning is not entirely detachable from color, form, and texture. Symbolic meanings, however, seem to be detachable from their objects and are presumably learned. (Gibson, 1950, p. 211; emphasis added)

The 1950 book not only treats vision largely as a self-contained sense, it is also a resolute attempt to consolidate *stimulus-response theory* in a way that would eliminate any need to appeal to inferences or representations (see also Gibson 1959). Gibson was not alone in this project. Gibson took part in a conference at Cornell bringing together a range of international researchers engaged in the same project. The aim was to redefine the stimulus as a higher-order, spatiotemporal structure (Hochberg, 1957). As Gibson put it:

Gestalt theory denied any one-to-one correspondence between the stimulation of receptors and the experience which resulted. The assumption of such a fixed correspondence was called the “constancy hypothesis.” . . . The aim of this chapter is to reassert the constancy hypothesis on the basis of a broader conception of stimulation. (Gibson, 1950, p. 62)

Although Gibson’s last book (Gibson, 1979) is fundamentally different from his 1950 book, it was initially intended to be an up-date of that earlier book,² and it is perhaps for this reason that it suffers from its two main limitations: an (almost) exclusive emphasis on vision (but see pp. 200 & 253), and, once again, an awkward switching back and forth between the perception of *surfaces* and *meaning* (Costall & Still, 1989).

1968 AND ALL THAT

Gibson’s middle book, *The senses considered as perceptual systems* (1966) (SCAPS) was published in Britain in 1968, and, remarkably, when I was a student, Tim Miles, my professor, gave us an assignment to review the whole book shortly after it appeared.

SCAPS, although the least cited, is Gibson's best book. I had moved from physics to psychology because I had become puzzled by the way scientists keep undermining "the conditions of possibility" of *doing* science. In moving into psychology, I had wrongly expected that the science of psychology, in general, would provide a more robust account of experience and subjectivity than the radically subjectivized version that had been constructed within the "metaphysics of modern physical science" (Burt, 1923/1954). Gibson's approach (as soon became clear to me when reviewing his book) was an exception.

The title of Gibson's book refers to "systems theory" but there is no real discussion of what this entails, nor any reference even to its main exponent, von Bertalanffy (e.g. 1933/1962). Gibson is just a bit more forthcoming about the systems approach in his 1979 book: "What psychology needs is the kind of thinking that is beginning to be attempted in what is loosely called systems thinking" (p. 2).

SCAPS marks a fundamental break with the tradition of mechanical science. The book should be understood in relation to a wider development in biological thought:

Function [within traditional science] was considered to be subordinate to structure; one started with the anatomic organ and looked for its specific function. ... The unit of investigation was the visible anatomical element, and the preferred method was that of dissection.

The situation changed drastically with a development that was as much a change in the object of investigation as a change of method. ... Thus it was no longer the function of a specific organ, like the stomach, which was at issue, but the role of the stomach in a function like nutrition. Structures were now subordinated to general functions that involved the interplay of many organs and systems. (Danziger, 1990, 25-26)

As Gibson himself put it:

The anatomical aspect of a perceptual apparatus is only one of several; it also has functional aspects. The same anatomy can be used on different occasions in different ways. ... [perceptual systems are not] anatomical units capable of being dissected out of the body. (Gibson, 1966/1968, pp. 56-58)

For example, if we bring something close to our eyes to inspect it more carefully, then our hand becomes part of our visual system, and when we move around in the world, our legs, too, become part of the visual system – *as does our movement in the world.*

SCAPS also stressed that we are not exclusively *visual* beings.³ Gibson (1966/1968, p. 54) quotes, approvingly, Erich von Hornbostel:

It matters little through which sense I realize that in the dark I have blundered into a pig-sty. (von Hornbostel, 1927, 83)

However, it is not just that the senses are more or less *interchangeable*: they are more or less *unified*. In fact, one of the most interesting developments within the ecological approach to perception has been the identification of informative structures that do not merely involve the ‘integration’ of the senses, but the pickup of information that is essentially *transmodal*.⁴ This research (along with other important considerations) challenges the influential “law of specific nerve energies” (i.e. each sense gives rise to its own specific kinds of sensations) as having little, if any, relevance to our understanding of “natural perception.”

Another, important aspect of SCAPS is Gibson’s new radical move *against* the “stimulus-response” approach. Yet, the later Gibson is consistently misrepresented as a bottom-up theorist (and much else besides!; see Costall & Morris, 2015):

An influential and controversial theorist . . . is James Gibson (904 –1980) [*sic*], whose theory of direct perception truly defines the bottom-up approach. (Sternberg, 2003, p. 127)

Gibson’s essentially *passive* account is very different from the notion in this

book [Gregory's *Eye and brain*], that perceptions are constructed hypotheses. (Gregory, 1997, p. 9; emphasis in the original)⁵

In fact, SCAPS kicks against the covert commitment to stimulus-response thinking that continues to prevail within cognitivist psychology: it is taken for granted that we are bodily passive to the world, and that it is just internal 'cognitive processing' that is active. As Gibson stressed in SCAPS, the senses are active systems of exploration: "The active senses ... are analogous to tentacles and feelers" (Gibson, 1966/1968, p. 5; see also Gibson, 1962, on "active touch"). And Gibson could not have been clearer about his rejection of S-R theory: "The observer who is awake and alert does not wait passively for stimuli to impinge upon his receptors" (1966/1968, p. 32); "percepts are not responses to stimuli" (Gibson, 1975/1982, p. 411); "The ecological approach to perception was adopted in my book, *The Senses Considered as Perceptual Systems* ... Actually it is a new approach to the whole field of psychology for it involves rejecting the stimulus-response formula" (Gibson, 1979, p. 2).

Gibson's move beyond stimulus-response theory had already been set out in a much earlier work with Crooks in 1938 on car driving. Harry Heft has explained the important implications of this article:

The kind of analysis Gibson and Crooks offered differs from the standard behavioristic analysis in several interrelated ways: First, action occurs within a field of objects and can only be adequately understood when examined with respect to their combined influences. As such, action in everyday settings requires more than a linear S-R causal analysis. In fact, it involves more than simply moving from single to multiple causation; it entails a somewhat different take on the notion of causality itself. A field theoretic approach proposes that environmental features constrain and channel goal-directed behavior *rather than provoke or elicit it* (Heft, 2001, 213-214; emphasis added)

This recognition of perceivers, or, more fundamentally, *agents* (Costall, 2003),

as not only active in their heads but also in the world, even occurs in Gibson's somewhat later writings at a time when he was explicitly promoting a psychophysical (S-R) approach to perception:

The normal human being, however, is active. ... If he is not walking or driving a car or looking from a train or airplane, his ordinary adjustments of posture will produce some change in the position of his eyes in space. Such changes will modify the retinal images in a quite specific way. (J. J. Gibson, 1950, p. 117.)

The limited options of bottom-up or top-down theory have, in modern psychology, been presented as the only 'games in town.' But they each presume that the perceiver/agent is bodily passive to the world. These limited options go back a long way, to attempts to mechanize, in a broken-backed way, how we experience things. Here is Kepler's version from 1604:

In what manner this image or picture is brought together by the visual spirits which reside in the retina or in the nerves, and whether it is made to appear before the soul or tribunal of the faculty of vision by a spirit within the cerebral chambers, or whether the faculty of vision, as a magistrate sent by the soul, goes out from the council chamber of the brain to meet this image in the optic nerves and retina descending to a lower court, these things I leave to the natural philosophers .. for disputing. For the equipment of the opticians does not allow them to proceed any farther than that opaque wall which occurs first in the eye. (cited in Straker, 1976, p. 21)

By insisting that we, and other animals, are active 'beings in the world,' Gibson broke away from the limited options of bottoms-up and tops-down. From that point on, he was no longer a bottom-up theorist. He was, if anything, a bottom-*down* theorist.⁶

TIM MILES (1923-2008)

Long after I had written my student review of SCAPS I discovered that my teacher, Tim Miles, had written a highly insightful review of the book:

This is a very exciting book. ... What is of interest in the case of pseudo-problems about perception is not their recognition but their unraveling – the detailed working out of what is wrong with a particular formulation and why.⁷ Gibson’s central thesis is such that it disposes *en bloc* of a large number of these pseudo-problems and shows how they are all a product of the same mistake, that of regarding the sensory nerves as transmitters of different qualities of sensation. In addition his arguments show that some of the traditional sceptical doubts are quite unfounded. (Miles, 1970, p. 145-146)

As he went on to point out, Gibson was engaging in serious philosophical issues:

... an incidental by-product of the book is to make one hesitant about making a hard and fast distinction between “philosophical” questions about perception and “psychological” ones. (Miles, 1970, p. 146)

Exceptionally, in British psychology courses, Tim Miles’ lectures drew upon the work of Wittgenstein, Ryle, and Austin, and their scepticism about the scientific foundations of psychology. (Gibson himself cites Austin at the beginning of SCAPS, p. xv.) Tim Miles published his review of SCAPS in *Mind*, a journal originally set up in the nineteenth century to bring together philosophy and the new psychology. Unfortunately, this link has long since collapsed in that journal but also much more widely. Yet psychology does need to reconnect with philosophy (though not, of course, Fodor, Dennett, *et al.*) and also, as I shall now argue, much else besides.

THE ECOLOGICAL APPROACH TO *WHAT?*

Gibson’s approach calls into question existing disciplinary categories, including psychology itself. Perceptual systems extend beyond the limits of the body. For this reason, they challenge the traditional *divisions* between disciplines, and the very coherence of psychology as a *self-contained* project. Here is Edwin Holt, Gibson’s teacher, getting to the point:

In order to understand what the organism is doing, you will just *miss*

the essential point if you look inside the organism. For the organism, while a very interesting mechanism in itself, is one whose movements turn on objects outside of itself, much as the orbit of the earth turns upon the sun; and these external, and sometimes very distant, objects are as much *constituents* of the behavior process as is the organism which does the turning. It is this *pivotal other object*, the object of specific response, which seems to me to have been overneglected. (Holt, 1915, p. 55; see also Palmer, 2004, on the “transdermal”)

John Dewey, an early critic of the stimulus-response formula (Dewey, 1896),⁸ was well aware of the need to think in terms of *connections* rather than *divisions* of scientific labour in order to understand the nature of human nature:

Human nature exists and operates in an environment. And it is not "in" that environment as coins are in a box, but as a plant is in the sunlight and soil. It is of them, continuous with their energies, dependent upon their support *Hence physics, chemistry, history, statistics, engineering science, are a part of disciplined moral knowledge so far as they enable us to understand the conditions and agencies through which man lives ...* (Dewey, 1922, p. 296 ; emphasis added.)

Psychology, unfortunately, has largely been in the business of making *disconnections* in order to hold onto its own distinctive ‘subject.’ The qualifier “ecological” in the term “ecological psychology” has hardly marked a decisive change in direction. Much ‘ecological’ research has been laboratory based, and used abstracted experimental paradigms. There has also been a failure to connect with other relevant developments both within and beyond psychology, such as situated action, ethnomethodology, social anthropology, and innovations in biological thought, e.g. developmental systems theory, niche construction and ‘evo-devo.’ The ecological approach needs to be *worldly*. It might even, as Gibson proposed, try to connect with “the powerful movement” of environmentalism (1979, p. 2).

To repeat, psychology, historically and institutionally, has tried to define for

itself a highly restricted domain as its subject of study. So, for a long time, I have been getting increasingly uneasy about the term “ecological psychology.” Gibson’s systems-cum-functional-cum-ecological approach implies that we should be making connections *big time*. If SCAPS is right, then “ecological *psychology*” sounds to me like a contradiction in terms. In fact, Gibson never used this term at all in SCAPS, nor in his later *Ecological Approach to Visual Perception* (1979).⁹

Of course, we can, in principle, as one of the reviewers of this commentary rightly commented, re-define “psychology” any way we choose (as indeed did Gibson, 1979, p. 7). But, unfortunately, psychology is studied by *psychologists* and, in the end, *they* are the problem. As Gibson himself did not hesitate to point out, they - *we?! -* are simply not up to the job:

Psychologists are simply, on an absolute scale, dullards. ... They are prosperous. Most of them seem to be busily applying psychology to problems of life and personality. They seem to feel, many of them, that all we need to do is consolidate our scientific gains. Their self-confidence astonishes me. For these gains seem to me puny, and scientific psychology seems to me ill-founded. At any time the whole psychological applecart might be upset. Let them beware! (Gibson, 1967, p. 142)

The ecological approach is potentially one of the very best games in town. But an *ecological* psychology free of *psychologists* is not on the cards. We need to hold on dearly to the ecological approach, but an ecological approach to *what?*

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¹ Crombie, an historian of science, celebrates this awkward juxtaposition of mechanism and mentalism as a scientific breakthrough.

² Endre Kadar, personal communication.

³ Gibson nevertheless still characterized vision as “the queen of the senses” (Gibson, 1966/1968, p. 163).

⁴ The term “amodal” which is now widely used in this context is potentially misleading, given that Michotte long ago coined it to mean something completely different (Thinès, Costall, & Butterworth, 2014).

⁵ Both Sternberg and Gregory knew James and Eleanor Gibson well, so it is puzzling that they could get things so badly wrong, and, in the case of Sternberg, even the date of Gibson’s death.

⁶ Mainstream cognitive psychology is widely misunderstood to be a radical alternative to stimulus-response psychology. As the textbooks shamelessly boast (while, at the same time touting cognitive theory’s radical credentials), it is a *variant* - an attempt to explain ‘what goes on’ *between the stimulus and response* (Hamlyn, 1981, p. 115; Reed, 1997, pp. 266-7).

⁷ This is how Gibson (1979, p. 116) himself put this point: “Psychology is plagued with efforts to find answers to the wrong questions!”

⁸ As the late Steinar Kvale put it to me, a *prescient* critic.

⁹ Although Gibson described himself as a psychologist (1966, p. 22), he makes surprisingly few explicit references to psychology at all, and these are generally negative. See Gibson (1966/1968): pp. vii, 3, 28, 39, 106, 204, 222, 263, 266-7, 276, 277, 283, 300, 311; Gibson (1979): pp. 2, 39, 42, 56, 96, 134, 135, 138, 139, 147, 220, 234, 255, 268, 293.