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Book review

Review of Perceiving the Affordances – A Portrait of Two Psychologists E.J. Gibson; Erlbaum, 2002

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Open practically any introductory perception or cognition textbook (Sekuler & Blake, 1994; Medin & Ross, 1997) and you will be sure to find an abundance of references to both James and Eleanor Gibson's research. In short, the couple were highly influential in shaping perceptual research, and experimental psychology in general, for five decades. Together, they revolutionized the way we approach perception and how we investigate the world that surrounds us. But who exactly were the Gibsons? Written by Eleanor Gibson, *Perceiving the Affordances: A Portrait of Two Psychologists* seeks to answer this question, chronicling the lives of the two psychologists and the evolution of their ideas and theories. Generally, the book is a quick and not overly difficult read. Gibson presents enough scientific information to engage the reader in some critical thought about how we as organisms perceive and act in the world, yet the book contains a fair amount of personal anecdotes. Effectively, such a combination of research and life history challenges our ideas about perception without the dryness of a textbook.

Chapter one contains a detailed history of the Gibson family, and contributes little in terms of scientific discussion. Chapter two discusses mainly the early influences of James Gibson and Eleanor Gibson. Holt, a radical behaviorist, attempted to formulate a motor theory of awareness, helping to shape James Gibson's impression of consciousness as an active process. As her Master's thesis supervisor, James Gibson influenced his wife's early views on memory in favor of a functionalist viewpoint.

Following the first two chapters, the focus of the first half of the book rests on James Gibson's research, and the development of his ideas towards the theory of affordances. The chapters thus have a chronological layout, although some concepts reappear in later chapters. Essentially, *Perceiving the Affordances: A Portrait of Two Psychologists* reviews a variety of experiments conducted by James Gibson and discusses his most valuable contributions to the field of perception.

Chapter three introduces the traditional notions of perception expounded by researchers such as Edwin Boring, against whom Gibson based much of his own thought. Prior to Gibson's work, sensation-based theory dominated the field, insisting that awareness existed along four dimensions of extensity, location, shape, and depth (Gibson, 1950). Thus, in effect, according to empiricism, consciousness followed directly from sensations produced by physical stimuli in the environment. Perception was presumed to be a process whereby the mind accumulated or combined sensations, resulting in a percept.

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The fourth chapter of the book explores Gibson's research during World War II with the Motion Picture Testing and Research Team in order to contrast previous notions of space perception with Gibson's new approach. In this chapter the reader will find a discussion of the activities of the research team, as well as the methods by which Gibson attempted to re-define the concept of visual space. It was during this time that Gibson formulated his highly influential notion of 'ground theory' (Gibson, 1950), whereby space can only be perceived when a background, or continuous surface, is present. This concept was quite novel, contrasting Boring's view of the four physical dimensions of awareness. Several experiments are described in an effort to demonstrate how Gibson attempted to delineate what he termed the 'stimulus variables' comprising the perception of a background, or continuous surface. Gibson's discovery of the importance of texture, size constancy, and optical flow in helping organisms to perceive what they see is highlighted.

Following World War II, Gibson was ready to put into print his new findings and new dynamic theory of visual perception. Chapter five of *Perceiving the Affordances: A Portrait of Two Psychologists* summarizes the major points and goals of *The Perception of the Visual World*, namely that organisms are active observers using the stimulus variables of a continuous surface, or background, to both see and perceive the visual world. In this chapter, the importance of invariance is also emphasized. The notion that only stimulation over time yields invariant properties that enables us to perceive the world as constant was new. Additionally, this chapter also covers James Gibson's approach to the problem of object constancy, and his insistence that we use visible surfaces to perceive objects as constant in size. In other words, we do not simply rectify our sensations.

Chapter six reviews the importance of time as a factor in perception, and briefly discusses James Gibson's hypothesis that motion is highly influential for perceiving a surface, especially one that is receding. The minimum principle, whereby perception is a selective and economical process, is also touched upon. Gibson also addresses several experiments in this chapter related to perceptual learning. There is an elaborate description of an experiment by Gibson and Gibson on estimating distance under natural conditions, and what might be learned when judgments are corrected. Differentiation learning is also explained in this chapter, and another experiment on perceptual learning involving nonsense drawings is described at length. Two theories of perceptual learning, enrichment theory and specificity theory, are explained to the reader, showing how the results for Eleanor Gibson's nonsense drawing experiment supported differentiation, and thus specificity theory.

The seventh chapter contains an account of the Gibson's travels overseas. As well, Gibson's discussion of perceptual learning as 'an increase in correspondence of perceived properties with physical properties . . . in the environment' (p. 71) is continued, further highlighting the differences between specificity theory and enrichment theory. Ivo Kohler's finding that adaptation to wearing distorting prisms is related to one's actions is mentioned in relation to the Gibson's belief that invariant properties over continually changing images are the key to understanding how our perception of the world remains constant. Adaptation related to actions is emphasized as being an active process.

The eighth chapter concentrates heavily on Eleanor Gibson's development of her perceptual learning theory. Her now famous experiment with the visual cliff, and the research leading up to its construction, are described in much detail. The experiment was originally tested with rats, and eventually attempted with human infants, impressively showing the impact that experience with locomotion has for human infants in terms of depth perception. Essentially, human infants require practice, in the form of crawling, in order to determine which surfaces afford them safety, and which do not. In terms of her husband's research, the author outlines the contents of his 1966 publication, *The Senses Considered as Perceptual Systems*. Active perception is defined as involving two types of behavior: exploratory and performatory.

Chapter nine describes a prolific period in the Gibsons' careers, with four books published between the two. The author recounts her desire to develop a theory of perceptual learning. She summarizes the content of her first book, *Principles of Perceptual Learning and Development* (1969), emphasizing the text's concentration on generalization, and what is

learned when perception occurs. Gibson relates how the significant contribution of her 1969 publication was to describe her theory of perceptual learning as an active differentiation process, whereby organisms select 'critical' information from a mass of sensory information. This chapter also defines the 'reduction of uncertainty' principle, highlighting how selective factors aid individuals to discriminate an object as different from the large amount of sensory information available to us. As well, chapter nine delves into Eleanor Gibson's research on the developmental aspects of reading. Her perspective on reading changed drastically throughout her career, eventually acknowledging reading as a dynamic process in which the reader selects information in an economical manner. Gibson later added to her definition of the function of reading to encompass the idea that reading affords the reader meaning and understanding that is adaptive. The second half of the chapter discusses James Gibson's influential book, *The Ecological Approach to Visual Perception*. Eleanor Gibson confesses that by the time he wrote his last text book, her husband no longer believed in the traditional notion that the retinal image was the foundation of perception, an argument he detailed at length in *The Perception of the Visual World* (1950). Instead, Gibson focused a major portion of his last book on the term 'affordance,' and criticized perceptual research as having erroneously focused on light optics and geometry, neglecting the 'layout of surface and objects appropriate to the scale of the animal' (Gibson, 1979).

Gibson begins chapter ten on a cheerful note, describing the celebration of the birth of her grandchildren. This chapter is mostly dedicated to personal events, such as coping with the death of her husband, and her own ailing health. Here, the author gives the reader interesting insight into the unique and dynamic relationship between the Gibsons. Insisting that they were never a 'husband–wife team' (p. 109) nor was she a long-suffering wife forced to compromise her career for her husband's professional opportunities, Eleanor Gibson asserts that the two scientists always influenced each other most. The conclusion of the chapter shows links between James Gibson's concept of affordances, and Eleanor Gibson's research on perceptual development in infants.

The eleventh chapter relates Gibson's research on multi-modal perception, the developmental perception of the affordances of different objects, places or events, and the perception of object surfaces, following her husband's death. The late James Gibson had been curious about locomotion, namely why individuals select a certain path, what evaluative process is used when a terrain is selected to cross, and how postural stability is maintained. Eleanor Gibson discusses how she continued to explore these scientific questions in her own research in her infant laboratory, motivated to study such queries because of the relationship between locomotion (i.e. crawling) and the multimodal information necessarily processed by the infant when locomotion occurs.

Chapter twelve explores a prolific era in Eleanor Gibson's life in which she was able to focus on her thoughts and visions for the future directions of the field of perceptual learning. The relationship of cognition to perceptual learning and affordances are highlighted. The chapter concludes with Gibson's opinion on various trends in the discipline of psychology. She voices her dislike for psychology departments engaged in studying cognitive neuroscience, and stresses her belief that behaviorism is an important subject matter for psychologists. Additionally, Gibson adds that there is an overemphasis on the role of genes in the development of perception and cognition. Finally, she applauds the increased interest in research on perceptual learning in infants.

The postscript finds Gibson reflecting back on her life thus far. She explores the nature versus nurture question, suggesting that genes and the environment both contribute to the development of an individual. The reader is left with one last piece of wisdom elucidating the analogy of affordances with life: the environment affords us with the opportunity to make choices that result in the most personal satisfaction and success.

One important positive aspect of *Perceiving the Affordances* is that it has the potential to be appreciated by a wide audience due to the blend of scientific thought and storytelling. For instance, historical psychologists may find the progression from sensory-based theory to James Gibson's perceptual-environmental approach to be of interest in tracing the roots of ecological psychology. As well, students interested in the role of perceptual learning processes in infancy might benefit from understand-

ing the origins of the field and the theories of its early members. Additionally, cognitive psychologists curious to become acquainted with the role of cognitive processes in perception may find the book to be a good starting point in the literature as it introduces the models of early thinkers. Evolutionary psychologists may also be interested in the book, as it emphasizes the need to place perception in an evolutionary context and to conduct one's experiments with our ancient environments in mind. Lastly, those readers likely to benefit most from *Perceiving the Affordances: A Portrait of Two Psychologists* are undergraduate students considering a career in academia, or those wishing for an introduction to Gibsonian perceptual theories. The former category of students will gain perspective on what life in an academic community can be like, if one is clever enough and strives for scientific success. The latter category of students will enjoy the concentration the author places on Gibsonian philosophies and descriptions of the Gibson's research paradigms.

However, although the book is sufficient as a basic overview of ecological psychology as espoused by the Gibsons, undergraduates, or those somewhat unfamiliar with ecological psychology, may find the book lacking in definitional terms. Essentially, *Perceiving the Affordances: A Portrait of Two Psychologists* is written in a somewhat introductory manner, but assumes knowledge of some key concepts. For example, though outlined more specifically elsewhere in Eleanor Gibson's work (Gibson, 2000), *Perceiving the Affordances* fails to describe precisely what is meant by an affordance, and no glossary is provided for any of the other concepts explored in the text. A reader for whom the vocabulary is new may thus finish the book without a complete appreciation of the work of the Gibsons, and without an understanding of the significance of their research in facilitating a shift in perspective in the field of perception.

A further criticism of *Perceiving the Affordances* is that the book lacks a discussion of other theories that oppose or counter the Gibsons' approach to perception. For example, although there is a brief explanation of Boring's sensation-based theory, Gestalt psychology is rarely mentioned, though it was a competitive theory at the time. In contrast, James Gibson's 1950 publication, *The Perception of the Visual World*, presents the arguments of both sensory-based theorists and Gestalt followers before attempting to refute the theories. Chapter seven relates briefly an argument against specificity theory, and the research interests of Ivo Kohler and Gunnar Johansson are mentioned. That the book does not cover other theorists in depth is somewhat understandable when one considers that the author intended the book as a tribute to her husband and his life.

Related to the lack of emphasis placed on competing theories of the past, the author also does not write in detail about any further research that her husband inspired. A study by Lalonde, Liu, Collin, and Chaudhuri (2000) provides an example in which texture gradients were proposed to be a variable used to perceive depth in human faces. As well, the extension of the theory of affordances to other modalities of perception other than vision are not discussed. For instance, A. Bregman's research on scene analysis and auditory perception mirrors a Gibsonian ecological perspective (1990). It might have been of interest for readers to learn something about contemporary research influenced by Gibsonian theories.

Lastly, also somewhat disappointing is Gibson's discussion of cognitive neuroscience. In chapter twelve, the author expresses her discontent with the prevalence of terms such as 'cognition' and 'neuroscience', and emphasizes her distaste for recent concentrations on the genetics of development. However, what Gibson fails to appreciate is that cognitive neuroscience is a collaboration of several fields that enable scientists to probe further into various psychological phenomena. Identifying psychological occurrences usually leads to asking how such events transpire, and by what causal factors. Was it not her husband's desire to understand the environmental contribution to perception, to probe further into the physical aspects of visual perception, that resulted in the development of his ecological approach? In this century where a vast amount of information is instantly available, the walls between disciplines are beginning to crumble; the technology and desire to understand how the environment affects cognition at the molecular level is paramount in understanding the organism, for we must locate the neural substrates that accord with a Gibsonian account, or for

that matter, any other account, of perception. Furthermore, Gibson notes the current unfavorable status of behaviorism among contemporary researchers, stressing that behaviorism should not be put aside. Perhaps Gibson therefore also neglects the point that what *causes* behavior is vastly more interesting than the behavior itself.

In short, *Perceiving the Affordances: A Portrait of Two Psychologists* is generally enjoyable because it gives the reader a greater understanding of the Gibsons' theories. Classic concepts such as depth perception, optical flow, object constancy, locomotion, and many other topics, are all presented from a unique ecological standpoint. Additionally, Eleanor Gibson provides a detailed description of many procedural details and methodological issues encountered in the design of the Gibsons' experiments, allowing the reader to sample and think upon a wide variety of useful experimental paradigms. The reader will thus be endowed with insight into how a successful experiment is planned and organized. Furthermore, the social commentary in the book is also interesting. That Eleanor Gibson was able to pursue her studies and research during a period in which women were openly discriminated against is a remarkable feat. That she became a professor of psychology, producing a prolific amount of data in a field that she 'carved out', is an even more impressive accomplishment. What seems to be the most important element in Eleanor Gibson's success is her patience and confidence in her own abilities. Although she confesses that she put her career on hold in order to raise her children and support her husband's professional development, she never lost her focus and desire to pursue her own questions. Such determination is the mark not simply of a brilliant woman, but more importantly, a brilliant scientist.

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