

are correct. If they are correct, then psychologists can prepare for the battle by reviewing the clearly written chapters in this book.

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Patterns, Thinking, and Cognition: A Theory of Judgment

By Howard Margolis. Chicago: University of Chicago Press, 1987. 332 pp. Cloth, \$45.00. Paper, \$15.95.

Howard Margolis, a senior lecturer with the Committee on Public Policy Studies at the University of Chicago, adds cognition to the necessary ingredients to explain public behavior. A theme of the book is that rule-following processes "must be reduced pattern recognition, not the reverse" (p. 4). That is, interests plus logic are not sufficient to account for judgment; *P-cognition*, or the mechanisms involved in pattern recognition, also plays a role. Needless to say, I was impressed that a person within the perspective of the political sciences would arrive at an interpretation similar to one that has emerged in experimental psychology. Of course, Margolis is not the first to claim that pattern recognition is central to thinking. Loosely speaking, the Gestalt psychologists must have had a similar notion in mind, as have investigators in more current studies of game playing, medical diagnosis, and language processing.

If pattern recognition is central to thinking, then complex behavior can be understood in terms of the information available to the thinker and how that information is processed. This perspective of information and information processing, can account for apparent leaps in understanding throughout history. In scientific inquiry, for example, some "revolutionary" contribution could result from the patterns and cues available to the revolutionary scientist.

Entering the debate over rationality, Margolis argues against analyzing irrational choice in terms of two processes: a framing stage and a judgment stage. Other defenders of rationality see apparent nonoptimal behavior as a breakdown in the first stage, but never in the second stage. But, in fact, Margolis seems to side with interpretations at the level of framing when he applies *P-cognition*: "An anomalous response will most always in fact be a reasonably logical response to another question . . . , and in particular to a question that means something in the life experience of the individual giving the response" (p. 6).

The goal is to provide an account of illogical judgment within the same theory that accounts for logical judgment. He begins with a discussion of illusions, and makes a distinction between those capable of being corrected and those immune to correction. This distinction does not appear to be critical for his arguments. Why are individuals vulnerable to an illusion,

even if they know everything there is to know about the illusion? This phenomenon relates to the idea of different levels of information being held in parallel. What is nice about this conjecture is that it follows from the independence of different sources of information. Contrary to the prototypical information-processing view, information transformed from one stage to another remains relatively intact at the earlier stage.

Margolis uses perceptual illusions as an entry into cognitive illusions. The basic building block of P-cognition is “jumping”—arriving at an interpretation of a pattern based on a partial processing of the cues. This theme is admirably demonstrated by the illustration on the book’s jacket cover, which represents an invitation to the viewer to “find the hidden man” (Figure 1). It does not matter where the cues come from, it is the information they provide that is critical. He draws a natural parallel between perceptual illusions and illusions of judgment. He places great importance on the effects of surface structure in Wason and Johnson-Laird’s (1972) four-card selection task. However, these effects have been difficult to replicate and are not that large when they are found. He is impressed with people’s confirmation bias and their persistence in defending the rationality of their judgment even after the error is revealed.

More generally, Margolis concludes that people do not give valid accounts of their own behavior. He uses a baseball analogy: A baseball pitcher’s choices come from the catcher’s signal, and at best, the pitcher can shake it off when the catcher’s signal does not look right. However, pitchers have no more insight into their day-to-day choices than into the catchers’ choices. The invalidity of people’s explanations of their behavior has been repeatedly documented. An anecdotal case involves my studies of probability learning

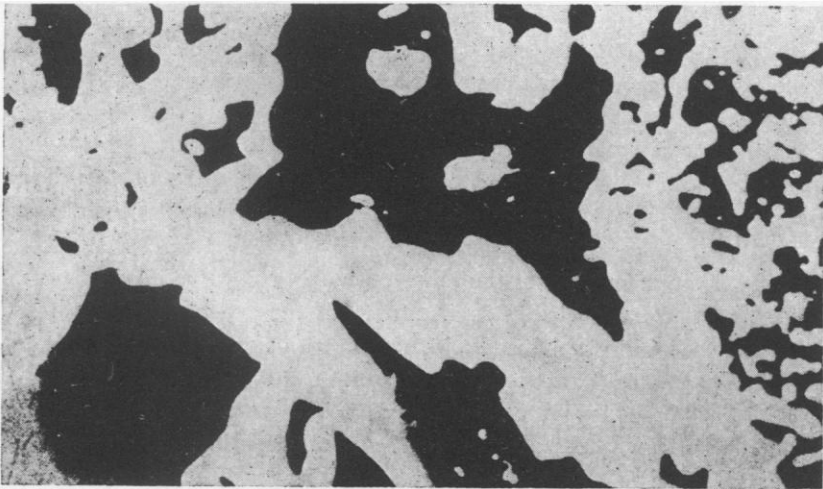


Figure 1. Puzzle-picture exemplifying the principle of pattern concealment (Porter, 1954)

as a graduate student. In this task, subjects had to predict which light would occur given a signal. The occurrence of a light was completely random. Nevertheless, subjects in the experiment concluded that there was great order in the sequence of occurrences. In addition to illustrating a confirmation bias, this anecdote illustrates Francis Bacon's tenet that people tend to impose more order on their interpretation of the environment than is actually the case.

Margolis gives an evolutionary account of cognition. His goal is to provide a functional account of behavior, recognizing the fact that large numbers of particular structures can perform the same function. (I am surprised that he does not employ convergent evolution as an argument in his favor.) Darwinian evolution is blind or nearsighted. These characteristics supposedly guarantee strong continuity of structure across diversity of function.

Margolis develops a cognitive ladder in which the initial appearance of a radical novelty of function does not require a radically new structure. His grounding of cognition in pattern-recognition is the antithesis of the approach of cognitive perceptionists such as Rock (1983): Perception is not cognitive, cognition is perceptual. Simple feedback is the first step on the cognitive ladder. A moth flies toward a light by simple feedback. Neurons in the eye are linked directly with nerves governing the wing. The more light entering the eye, the greater the activity of the neurons. The greater the activity of the neurons, the greater the beating of the wings. Pattern recognition is grounded in many neurons interacting so that there are many possible inputs and many possible outputs. Alluding to the fossil record, Margolis claims that pattern recognition (the second rung on the ladder) supposedly began about 500 million years ago (although it was not a cognitive leap). Learning is the third step, so that responses are no longer stereotyped. Learning seems to involve the shaping of the response rather than the modification of the information value of cues. The fourth step is choice, such as flight or fight. The fifth step is judgment, which is somehow a complete internalization of the choice process that already exists. Enter the role of consciousness. The sixth step, reasoning, is judgment plus language. The final step on the cognitive ladder is calculation or abstract reasoning, such as logic and mathematics.

Selfridge's (1959) pandemonium is used to illustrate the groundwork of P-cognition, and a curve-fitting model is used as an analogy to show how an interpretation is imposed on the data. The two forms of curve fitting used are "stepwise regression" and factor analysis. Throughout the book, the author stresses that his categories of explanation are fuzzily defined with no sharp lines between the categories. An important distinction is intuitive "seeing-that" versus analytical "reasoning-why." Reasoning-why might entail including additional sources of information or increased scrutiny of some of the sources. Perception and action might be said to entail a continuum from immediate holistic pattern recognition to critical analytical recognition. What goes on in the head is not formal logic, but the latter can provide an account of the former in the sense of formal normative models providing sufficient descriptions of performance. A good example is the multiple uses

in language of the word *or*, as opposed to its single use in logic. Contrary to Fodor (1983) and other proponents of modularity, there is no dramatic discontinuity between intuition and logic.

Margolis's interpretation of cognitive illusions is that people give a normatively plausible response to a question different from what the experimenter intended. One must account for factors beyond the reach of standard logic. He analyzes three tasks: Wason and Johnson-Laird's (1972) selection problem, Kahneman and Tversky's (1972) tasks involving the use of prior probabilities, and the conjunction fallacy (Tversky & Kahneman, 1983). He argues for a real anomaly for these tasks; the typical answers are not trivial (as, for example, a misunderstanding of the question that makes the response a reasonable one).

The author distinguishes between semantic and scenario effects. The former puts the ambiguity immediately in the language of the problem and the latter in the real-world context engaged by the problem. He provides convincing interpretations of the four-card selection task by finding real-world situations that would justify any of the possible selections. According to Margolis, the subject simply generates a real-world interpretation of a general question. Unfortunately, given the multiplicity of interpretations, the author's hypothesis has no predictive power.

The conjunction fallacy has captured the imagination of many cognitive scientists, Margolis among them. Subjects are given a description of a hypothetical person named Linda:

Linda is 31 years old, single, outspoken, and very bright. She had a double major in philosophy and music. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations.

Subjects are then asked to indicate how likely is the case that Linda is a bank teller. In addition, subjects are asked to indicate how likely is the case that Linda is a bank teller and a feminist. A majority of subjects claim that the second case is more likely than the first, committing what Tversky and Kahneman (1983) labeled a conjunction fallacy.

Margolis stresses the ambiguity of the scenario established by the Linda problem. He focuses on the word *probable* and its two senses or meanings. There is probability in the gambling sense (most appropriately equated with probability theory). There is also probability that is synonymous with believable or plausible. The latter would seem to be best equated with making decisions about the world around us based on ambiguous information. To instantiate the use of the gambling sense of probability, Margolis (p. 166) suggests modifying the Linda problem by adding the following warning along with a rephrasing of the question.

A personnel survey showed that of clerical workers in banks (including tellers) fewer than 1% have personality profiles that sound similar to Linda's. If you stood to win \$10 if the statement you choose turns out to be true (whether or not the other statement is also true), which choice is more likely to win you the \$10?

Supposedly, this reformulation of the question will not lead to a conjunction fallacy (although no actual results are presented). The important feature, according to Margolis, is attaching the word *likely* to winning the prize rather than to the actual choices. Evidently, by attaching the word likely to the choices, the believable meaning of likely (or probability) is engaged and, hence, a conjunction fallacy occurs. That is, asking subjects about the probability of the choices directly is equivalent to asking them about similarity (as Tversky and Kahneman, 1983, did in their original study). According to Margolis, a subject's choices in the Linda problem make sense when they make judgments on the basis of believability, plausibility, or similarity. Tversky and Kahneman would agree with this. Margolis would claim that asking about probability in the manner of Tversky and Kahneman is interpreted in the same manner. By enforcing an interpretation in terms of the gambling sense of probability, a conjunction fallacy is avoided.

Margolis does not end with esoteric problems from the psychologist's laboratory. The final third of the book extends his analysis to the discoveries of Darwin and Copernicus and the political maneuvers of Galileo. Margolis describes very convincingly how the belief in discrete categories of species impeded an acceptance of evolutionary theory within the field of biology. In addition, an important contribution to Darwin's development of the theory was Lyell's geology. The current marvels of nature can be described by long-term processes of continuous and gradual change over time. Animals and plants might reflect analogous processes; the "unique" individuals currently inhabiting the earth represent the gradual evolution resulting from local, gradual, and continuous processes (without any grand design or designer).

An interesting extension of the author's analysis is the development of an explanation of public societal consciousness that parallels his explanation of individual performance. There are no sharp boundaries between copying and discovery, and between familiar and novel situations. Chance plays an important role in discovery. Scientists find it comfortable and reasonable to work within opposing paradigms depending on the immediate goals. For example, geneticists can utilize either Mendelian or molecular genetics. To do so, a gestalt shift is needed to switch from one paradigm to the other.

In summary, this ambitious book should be among the armament of cognitive psychologists interested in thought and its consequences in the real world past and present.

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