

Book reviews

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A note from the new review editor

It is with pleasure and anticipation that I accept the role of editor for book reviews for the *American Journal of Psychology*. As the tenth person filling this role in almost 100 years, my goal is to maintain the high standards of my predecessors. To help achieve this goal, I would like to take the opportunity to hear from those readers who would be interested in reviewing books for the *Journal*. Please include the subject areas of your interest.

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Book reviews

DOMINIC W. MASSARO

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To our subscribers, authors, and colleagues:

It is with pleasure and anticipation that I undertake the role of editor for book reviews for the *American Journal of Psychology*. As the tenth person filling this role since 1929, my goal is to maintain the high standards of my predecessors.

Developments in the last three decades have led to a broadening of the domain of psychological inquiry and, therefore, of the books appropriate for review by the *AJP*. We will review books in the fields of cognitive science, cognitive social psychology, and neurosciences in addition to those in the traditional areas of experimental psychology.

To help achieve this goal, I would like to take the opportunity to hear from those readers who would be interested in reviewing books for the *Journal*. Please include the subject areas of your interest. Address correspondence to

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The Modularity of Mind: An Essay on Faculty Psychology

By Jerry A. Fodor. Cambridge, MA: MIT Press, 1983. 145 pp. Cloth, \$18.50. Paper, \$9.00.

Jerry Fodor has written a provocative book, one already having an impact on the current literature. It should be emphasized that the provocation created by this book is not a function of a shift in our thinking in the Kuhnian sense, but represents a cumulative statement of the state of the art integrated into a parsimonious and coherent framework. The modularity of mind might be seen as a culmination of the information-processing approach now about two-and-a-half decades of age. More generally, the book formalizes certain guiding principles of science in general and certainly science as developed in psychological inquiry over the last century.

Psychologists have always carved up the cake to study isolated systems. The development of psychological insight depends on finding methods that

make this isolation possible. In the study of psychophysics, for example, it took many decades of research before psychophysicists realized that the sensory systems must be isolated from decision systems. Once the decision system was accounted for in the psychophysical task, better insights were gained into the workings of the various sensory systems. Donders (1868–1869/1969) might be said to be the discoverer of the modularity principle. He proposed that separate stages of processing were functional in various tasks and that these stages could be examined directly using the subtractive method. Sternberg's (1969) extension of this idea with the additive factor method represents a continuation of the metatheoretical assumption that there are independent systems or modules functional in various tasks and that these can be assessed independently of one another. Fodor maintains this tradition. He criticizes some research on the basis that it does not sufficiently account for the stage of processing responsible for the results. As an example, it is important to determine whether findings are perceptual or postperceptual in determining the role the context plays in perceptual tasks.

Much of what Fodor has to offer is embedded in some rather difficult philosophical discussions. It is unlikely that psychologists will have much patience for some of these discussions even though, with some work, they are thought provoking. My feeling is that psychologists will too quickly rush to what is wrong with Fodor's thesis rather than what is right with it. What is right with it is nothing more than the culmination of a hundred years of research in psychological inquiry. Fodor's thesis is that there are several independent psychological systems making up much of our mental life. These input systems are to be distinguished from more general cognitive or central systems. Fodor believes that although we can and have learned a lot about input systems, we have not and cannot learn very much about general or central cognitive systems. What properties, then, do input systems have that make them good candidates for a successful psychological inquiry? Fodor makes very good arguments for the following nine properties of input systems.

First, input systems are domain-specific, and he manages to define about six of them—five corresponding to the traditional senses and one for language. He argues that there are qualitative differences between these input systems. For example, the psychological mechanisms in vision that mediate the perception of cows are ipso facto domain-specific qua mechanisms of cow perception. He follows through with a loose description of how cow recognition might proceed. He suggests that we might use some sort of prototype-plus-similarity metric; that is, we evaluate some distal stimulus in terms of how similar it is to a prototypical cow. Cow perception is organized around prototypes. The perceptual recognition of sentences, on the other hand, should not be mediated by such procedures because "sentence tokens constitute a set of highly eccentric stimuli" (p. 50). The stimulus domain for language is viewed as being highly eccentric and therefore makes more plausible the speculation that it is computed by a special-purpose mechanism (supposedly very different from that used in visual perception because our

visual world is not an eccentric stimulus domain). "The computational question in sentence recognition seems not to be 'How far to the nearest prototype?' but rather 'How does the theory of the language apply to the analysis of the stimulus now at hand?'" (p. 51).

Cow perception is organized around prototypes, whereas sentence interpretation is not. Evidence for this Fodorian hypothesis would be a giant leap for modularity. Perceptual recognition of dishware, similar in essential respects to cows, does seem to involve prototypes (Labov, 1973; Oden, 1981). So does sentence interpretation, however. What is the actor/subject of the sentence *The horse the cow kicked?* What is the actor/subject of the sentence *Kicked the horse the cow?* If English is your native language, you probably answered cow for both sentences (Bates, McNew, MacWhinney, Devescovi, & Smith, 1982). Given that cows are not more active than horses, the answer to these two sentences seems determined mostly as a function of syntax. If our prototype for word order in English were subject-verb-object (SVO), then the answer *cow* gives the better match to the prototype. For the first sentence, *the cow kicked* matches SV, whereas VO is matched by *kicked the horse* in the second sentence. Interpreting *horse* as actor/subject would not allow as good a match to the prototype SVO. Although advocates of modularity might offer an equally good account based on some unique procedure specific to sentence interpretation, confidence in the nonmodularity explanation is boosted by the ability of a fuzzy logical model to give a quantitative description of the categorization of dishware, sentences, speech segments, printed letters and words, and people (Massaro, 1979, in press-a, in press-b; Oden, 1981).

Fodor's retort might be that none of these experiments addresses the actual computation involved in the input system, but simply represents post-perceptual processes that can be described by the same general rule. This reply would make sense according to Fodor's thesis if this general rule described a central cognitive system as opposed to being a result of specific input systems. However, Fodor also claims that central systems are not understandable, and thus the results should not be so transparent. To add insult to injury, the same model describes the integration of bottom-up and top-down information in reading and speech perception (Massaro, 1984, in press-a).

Two other questions related to the domain-specificity of input systems involve, first, the restoration of sight to congenitally blind individuals. Fodor would seem to predict no transfer from touch to sight, whereas positive transfer does seem to occur. Second, how can Fodor explain visual capture, the perceived localization of a sound at a visual source even though the sound is displaced away from the visual source? One has to postulate a localization input system that accepts input from both sight and sound (analogous to visual perception using information from both the retinal and the corollary discharge). The visual capture effect is very similar to the phenomena observed in speech perception by eye and ear which weakens arguments for qualitatively different language and nonlanguage input systems.

The *second* property of input systems is that their operation is mandatory. As Fodor says, "you can't hear speech as noise even if you would prefer to." Fodor makes a nice point in saying that the best way to not process some input is to get the input system to process some other input. All of us are impressed with the Stroop color word phenomenon and see this result as consistent with Fodor's thesis.

The *third* property is that there is only limited central access to the mental representations that input systems compute. By this, Fodor simply means that we lose a surface structure of our experience very quickly. A popular demonstration is our inability to describe accurately the face of a Lincoln penny. The perceptual constancies also are fuel for the belief that we tend not to experience the representations of input systems but higher order categories derived from these representations. Marcel (1983) also provides convincing arguments for a similar point of view.

The *fourth* property is that input systems are fast, as can be seen in rapid shadowing (repeating back) of speech. He makes the point that the quarter of a second upper boundary on the speed of shadowing is the logical limit because any faster shadowing would overrun the ability of the speech stream to signal linguistic distinctions (given the syllable as a basic linguistic unit in processing). He also cites the work on recognition memory for slides to argue that perceptual resolution of scenes can occur in about 160 ms. Input processes might be fast because, in fact, they are mandatory and major decisions do not have to be made.

The *fifth* and maybe most important property of input systems is that they are informationally encapsulated. By this he means that the information available for processing by any input system is highly limited. Given this point, he must argue against top-down effects in perception. That is, cognitive knowledge cannot contribute to the perceptual processing of an input system. He reviews evidence showing that top-down information is, in many cases, insufficient to overcome inaccurate perceptual experiences. We know how the Ames room is built, and yet viewing the room from the appropriate perspective, we are fooled—and analogously, for the Mueller-Lyer illusion, the phi phenomenon, and so on. Fodor illustrates this principle very nicely with the corollary discharge contribution to perceiving a stationary visual world. His point is that although the corollary discharge talks to the visual input system, higher order knowledge cannot be used in the same way. When you push on the side of your eye with a finger, the information that has to be transmitted to the input system cannot be in the form of a corollary discharge. Given no link between this higher order knowledge and the input system, this information is not functional in stabilizing our visual world and the world is seen to move. As Fodor states, it appears that the visual system has access to corollary discharges from the motor system but not other higher order information that we may possess.

According to Fodor, positive evidence for context effects on sentence processing is found only when the stimulus information is highly degraded. What context effects are found, Fodor claims, can be a simple contribution

of the hearers' lexicons. Thus, the phoneme restoration effect is the function of lexical information; and, to quote Fodor, "on any remotely plausible account the knowledge of language includes knowledge of its lexicon" (p. 77). Thus, for consistency, one cannot argue that there is a separate input system for phoneme identification, because Fodor accepts the evidence that lexical knowledge contributes to this outcome. However, speech perception in terms of an input system would allow phoneme identification to be influenced by lexical knowledge.

In the same way, finding positive effects for syntactic well-formedness does not satisfy the condition of top-down effects for an input system. The syntactic knowledge would be part and parcel of a syntax recognition module. Fodor knows of no convincing evidence that semantic knowledge or context influences syntactic parsing. The study by Isenberg, Walker, and Ryder (1980), which is described by our fuzzy logical model of perception, is a candidate for a negative piece of evidence (Massaro & Oden, 1980). In this case, the syntactic form of an ambiguous word is determined on the basis of sentential context. However, it might be argued that it is the syntactic form of the context rather than the semantic form of the context that is important, so this result may not be damaging. Fodor gets good mileage from data showing that the sentential context effects that are observed are simply artifacts of connections in the lexical network. That is to say, it is not the sophisticated knowledge that the language perceiver is utilizing to facilitate lexical access, but rather it is a pure associative facilitation or inhibition that seems to be responsible.

An important point in the discussion of context effects involves the quality of the input information. Fodor admits that the context effects play a large role with degraded input, but not with undegraded input. He sees the situation with degraded input as unnatural, supposedly not occurring in the real world. The extent to which information is degraded in the real world is, of course, an empirical question. An important issue is whether qualitatively different mechanisms seem to be operating in the degraded input and high-quality input situations. If, in fact, the degraded input were unnatural, we would expect qualitatively different results in this situation relative to the degraded situation. Relevant to this issue are the many experiments that have varied the degree to which the input is degraded or ambiguous. There is no sharp discontinuity in the results for degraded and undegraded inputs. The same psychological mechanism seems to be responsible for processing in both cases. Top-down and bottom-up sources of information are evaluated and integrated in such a way that the least ambiguous information has the most impact on the judgment. It is not the case that context wins in one situation and input wins in the other. It is the case that both are evaluated and integrated. This might represent a disconfirmation of Fodor's basic assumptions about input systems. Integration of context with sensory information seems to negate the properties of information encapsulation that Fodor ascribes to input systems.

The *sixth* property of input systems is that the input analyzers have shallow

outputs. By this, Fodor means that the output of the input system for language is simply recovering the definitions of the definable lexical items that it contains. Thus, only the surface structure is obtained. We can all agree very quickly on what someone said and argue forever about what was meant. Similar processes are proposed for vision, utilizing the notion of Rosch's basic level categories.

The *seventh* property of input systems is that they are associated with the fixed neural architecture. Our knowledge of the localization of input systems is much more convincing than for cognitive processes. As Fodor puts it, there is no known brain center for *modus ponens*. The *eighth* property is that input systems exhibit characteristic and specific breakdown patterns. Thus, specific brain injury creates specific deficits. Finally, he argues for the inateness of input systems, given his *ninth* characteristic in which the ontogeny of input systems exhibits a characteristic pace and sequencing. The idea is that neuromechanisms for input systems develop according to specific endogenously determined patterns under the impact of environmental releasers.

These are the nine properties of input systems, and they are best understood when contrasted with his description of central systems. In contrast to input systems being domain-specific, certain cognitive mechanisms are not, and these are called central systems. The main distinction here involves what the input systems compute as opposed to what the central system believes. For example, when we use language to communicate our views, we draw on all of what we have seen, heard, remembered, or think; and thus these cognitive mechanisms must have an interface among the outputs of all of the input systems that have been described.

His last argument for central systems takes a nice turn by drawing an analogy between cognitive central systems and confirmation in scientific enterprise. Confirmation is *isotropic*, by which Fodor means that the data relevant to evaluation of scientific hypotheses may be drawn from anywhere in the field. The second property is called being *quineian*. This property means that one theory is preferred over another if it has going for it better simplicity, plausibility, or conservatism. The definition of central systems contrasts nicely with those previously described for input systems. He gives three taxonomies to distinguish the two: First, there is a functional taxonomy. Input systems have input analysis, whereas central systems have a fixation of belief. The second taxonomy, by subject matter, says that input systems are domain-specific, whereas central systems are neutral with respect to domain. The third taxonomy is by computational character. Information is encapsulated in the input systems, whereas it is isotropic and quineian in central systems.

Relevant to the distinction between input and central systems is the extent to which input systemlike processes appear to be functional in central system processes. In problem solving, Shepherd and Podgorny (1978) make the case that there is a close link between what is naturally done in perceptual processing and the processing involved in more complex problem solving.

Simon (1978) discusses problem solving within the framework of information processing theory and relies heavily on perceptual and mnemonic processes. As an example, perception and recognition make a substantial contribution to the solution of geometry problems. To the extent that input processes are functional in cognitive tasks, the qualitative distinction between input and central systems is infirmed.

Fodor finishes his monograph with the prospects for research in cognitive science, given the distinctions he has made between input systems and central systems. His main thesis is that input systems are understandable, whereas central systems are not. We know a lot about the transformation of representations via input systems but very little about the central processing of this information. He is impressed by the general failure of models of intelligent problem solving, both in artificial intelligence and in cognitive psychology. As he says, there is no serious psychology of central systems for the same reason that there is no serious philosophy of scientific confirmation. Both exemplify the significance of global factors in the fixation of belief, and we do not begin to understand how such factors have their effects. From my perspective, I do not notice such a gap between the states of art in input and central systems. In both domains, we have made some progress in simple laboratory tasks, but have not begun to provide convincing accounts of phenomena approaching the complexity of everyday life.

D.W.M.

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Forms of Psychological Inquiry

By Joseph M. Notterman. New York: Columbia University Press, 1985. 194 pp. Cloth, \$20.00.

This slim book, an outgrowth of Notterman's surely unusual and interesting Princeton course on issues in the history of psychology, is too sketchy and idiosyncratic to be satisfactory as a principal textbook. Problems to be noted also make it questionably satisfactory for supplementary assigned reading. Instructors in such courses may find it worth their attention, however, as it may jog them out of their accustomed conceptual frame.

In 23 pages, Notterman carries psychological inquiry from primitive animism through Plato and Descartes to the structuralists. A list of the *entire* set of topics treated (each ever so briefly) under structuralism may communicate the idiosyncrasy of his approach: Weber's and Fechner's laws, Titchener's definition of consciousness and mind and his core-context theory of meaning, Wundt's parallelism, Kulpe's imageless thought, Langfeld's efferent feedback, Tart's altered states of consciousness, and Hilgard's recent characterization of consciousness in contemporary psychology. The following chapter, on functionalism, goes from brief vignettes on James's and McDougall's purposivism to cybernetics and contemporary research on tracking behavior. The wild though basically relevant leaps through time stimulate the mind when they do not boggle it, but the reader dependent on this text alone will have a hard time gaining any grasp on the respective historical schools.

Similarly, associationism is treated with a hop, skip, and jump, linking the reflex arc of Descartes and La Mettrie with the Mills, Ebbinghaus and Thorndike, and Kent-Rosanoff and Rorschach tests as contemporary clinical associationism, treated unhistorically and uncritically. The chapter on American behaviorism includes Watson and Skinner but takes no notice of Hull, Spence, or Tolman. An unusual feature is a chapter on Russian dialectical materialist psychology, a generally fair appraisal although the account of Pavlov's contribution is weak and scanty, the concrete examples of Soviet psychology seem to be chosen quite haphazardly, and Vygotsky, whose