

# Inattentional Awareness

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**COMMENTARY ON:** Arien Mack & Irvin Rock (1998). *Inattentional Blindness*. Cambridge, MA: The MIT Press. xiii + 273pp. ISBN 0-262-13339-3. Price: \$US 25 pbk.

**ABSTRACT:** The authors report "priming" effects for subjects they classify as "inattentionally blind" and interpret this as evidence for unconscious perception--an interpretation consistent with deeply entrenched metatheory. I question that interpretation, however, on methodological grounds. On these assessment procedures, some subjects could be classified as "inattentionally blind" despite representing the critical stimulus in conscious attention. Still others--presenting a more interesting challenge--could be so classified despite representing the stimulus literally in *inattentional awareness*. The study is illuminated, I believe, by seeing it in metatheoretical and experimental contexts, with its theoretical interpretation contrasted with an alternative.

## 1. Introduction

I begin this commentary by acknowledging a bias. The thesis that gives this book its title, *Inattentional Blindness*, is inconsistent with virtually every moment of my waking experience-- if the term is to have the authors' meaning of complete absence of conscious perception outside a focus of attention. I don't live in an attentional tunnel, unconscious of all that surrounds or precedes this, that, or the other focus and conscious identification. Noting that the Mack-Rock subjects and I are of the same species, I begin by doubting that they really do either. While attentively viewing what I write, for example, the rest of my office doesn't vanish into a void. And when consciously attending the soloist in a

concerto, the orchestra doesn't fall silent either. For that matter, if someone interrupts my focally attending a page as I read, I may not consciously identify what is said at the moment, but the sound nevertheless hangs in awareness for a moment or so before I wrench attention away from the book and redirect it to the voice.

How could this be? We can consciously know the existence of states of inattentive awareness in immediate memory when we metacognitively represent them. Put another way, we can give attention to an inattentive state, identifying and remembering that state as awareness even if that literal awareness does not identify anything beyond itself. Now, we all know that an intuitive exercise like this can only be a beginning, not an ultimate warrant, but theoretical interpretations that flout those intuitions invite careful examination.

This is not to attribute to myself or to others the fashionably disparaged belief that we perceive the visual world at any moment in all its glorious richness and detail. Early vision is imperfect and incomplete. What I have in mind is the literal content of conscious experience that transduction yields in early vision--the forms and colors or the pitches and volumes, for example--literal contents of conscious experience that precede and surround the conscious identification of persons, things, and places.

These two distinguished investigators--Arien Mack and the late Irvin Rock--have presented a book with two central theses and an impressively extensive and systematic experimental program: On one thesis, there is no conscious perception without attention, and in that sense we are *inattentionally blind*--a thesis that early in their work was directed toward the rejection of any kind of representation preceding an attentional state. The second, general thesis that emerges, however, is that we may still unconsciously perceive while inattentive, and those unconscious perceptions are causal. They may increase the availability of what is unconsciously perceived and even the availability of semantically related items. And so the inattentionally blind state is only conscious blindness. Extending the Oxonian oxymoron, their thesis holds that we are quite normally "blindsighted."

## **2. Metatheoretical Context**

What began as their radical thesis--nothing is inattentionally represented--became a pair of theses that sit very comfortably within the information processing metatheory that has dominated cognitive psychology for decades. Transduction has been believed to yield an early and literal symbolic code of various descriptions, from icons to geons, and these may capture an attentional state if they have enough bottom-up warrant, though often with the help of top-down habits and expectations. But this initial representation has also been said to be deeply processed, activating a semantic symbol that may only then yield the capture of attention. On this rather standard metatheory, too, consciousness is usually redefined as nothing but a smaller attentional state within a larger working memory system--one way of comfortably handling what has seemed so mysterious and threatening to many.

So two kinds of symbolic representations, literal symbols in a sensory memory and semantic symbols from a long-term memory, have been left to a symbolic and causally active cognitive unconscious. If memory, as on the standard view, is a representation-process pair,  $M = \langle R, P \rangle$ , the representation is separable from the process that brings it into a conscious remembrance and could therefore act alone. And if these representations causally activate other symbols, they would at least partially satisfy the functional definition of symbols by doing one of the significant things that symbols do.

The metatheory has had outside conceptual support. On computational views of mind (e.g. Jackendoff, 1987), all cognition, all real mental activity, runs like a program in the hardware of the brain, with consciousness only a sometime, nonobligatory emergent--a view vigorously endorsed, for example, in the widely read Velmans (1991). Higher-order thought theories of consciousness converge, with all cognitive activity considered to be unconscious until graced by a higher-order reflection (e.g., Rosenthal, 1997). For many, too, the quest for neural correlates of consciousness seems to assume that some sweet spot in the brain exudes consciousness over cognitions that are already well and fully formed. On this kind of thinking, unconscious perception is only to be expected.

### **3. Basic Procedures and Findings**

The authors clearly endorse both inattentional blindness and the "late selection" that entails both kinds of pre-attentive and unconscious symbolic representation. As only one of a phalanx of commentators, I have chosen to focus on the experiments interpreted as revealing unconscious perception despite inattentional blindness, those reported and/or discussed in Chapters 8,1,10,11. On my reading, the authors' methods of assessing the subjects' awareness are deeply flawed in ways that undercut both of these theses--flawed in ways shared by other experiments presented throughout the book.

For three trials, subjects were parafoveally presented a cross for 200 ms, followed by 500 ms in which to judge which of the arms of the cross was longer--the distraction task. On the third trial, a "critical trial," they were also foveally presented a critical stimulus: a word such as Flake, Prize, Short, or Grace. As a test for awareness of the critical stimulus, the subjects were asked, following the evaluation of length, whether they had seen anything new on that trial, and if so what. The subjects were then presented a test for a priming effect of that critical stimulus. In some experiments, it was a stem completion as a test of repetition priming; and in others, it was selection of one picture from a set of five as a test of semantic priming.

In order to address more specific questions, the procedure was varied in other experiments, with the critical stimulus sometimes masked or parafoveal, and with the follow-up test sometimes being a test for selection of the critical word from a set of five. In some experiments, too, there were subsequent divided and full attention trials providing a test of the detectability and identifiability of the critical stimulus under optimal conditions.

Subjects failing to report the presence of the critical stimulus were classified as inattentionally blind. For both stem completion and the picture selection in the main experiments, more of those called "inattentionally blind" were accurate than were control subjects who had not undergone the experimental procedure. On this kind of evidence, they say (p. 228), "We now believe that the perceptual object to which attention is directed exists at the level of implicit, unconscious perception, and only if attention is engaged by this object does it become an object of conscious perception."

## 4. Methodological Critique

For satisfactory assessment of any contents of awareness, presence or identity, we must have confidence that the procedures meet well-established criteria for acceptably sensitive and valid assessment (Dulany, 1968; Ericsson & Simon, 1993). The titular thesis of this book, *Inattentional Blindness*, makes assessment of the subject's awareness a cardinal variable in these experiments. Nevertheless, although the authors are properly careful to report many details of their procedures and apparatus--the time intervals, the precise sizes of stimuli and how presented, nowhere do I find a complete verbatim presentation of their assessments of awareness where unconscious perception is the interpretation, or any indication that they were written rather than oral in order to avoid suggestive tones of voice. Neither do I find any kind of orienting instructions calling for care and compliance in reporting contents of awareness.

4.1. The first problem is simply that some subjects could shift attention to a foveally presented critical stimulus and not be willing to report it. The authors' detection measure is only a subjective report of presence or identification subject to well-known criterion and bias effects (e.g. Holender, 1986; Macmillan & Creelman, 1990). The experimenter's tone, or even inadequately phrased writing, can suggest that the real business of science was the evaluation of cross arms, and whether something else was observed is only incidental--and perhaps not to be mentioned if it would reveal that they hadn't kept their attention where they were told to, off some forbidden but very accessible foveal input. Attention obviously can shift to the critical stimulus as revealed by a substantial number of subjects who acknowledge it--and almost universally show the authors' priming effects. Of 235 subjects in the main repetition and semantic priming experiments, 106 reported detecting the critical stimulus and 81 reported its identity.

In fact, the authors report surprise that "the amount of IB more than doubled" (p. 17), on their categorization, when the critical stimulus was foveal compared with parafoveal. Considering the demand characteristics of these experiments, we can very well ask which is the more credible interpretation: Subjects found it easier to resist attention to a foveal stimulus--or more satisfying to claim they did.

Holender's (1986) well-known critique of the attempt to demonstrate unconscious perception and late selection in dichotic listening (as in MacKay, 1973, for example) is simply this: When conscious attention can be shifted to the attractively forbidden, it sometimes is and the shift isn't acknowledged. When conditions are such as to prevent

that shift, the priming effects have not been replicated (as shown by Newstead & Denis, 1978, and Johnston & Dark, 1980). There is a relevant moral in this non-cited classic.

4.2. A second problem is that some could detect or even identify the critical stimulus, yet reply "No" to the detection question because it actually calls for a rather difficult discrimination between recent and less recent perceptions of fleetingly presented and difficult to remember events on current and earlier trials: "Did you see anything on the screen on this trial that had not been there on previous trials?" (p. 13, also generally paraphrased elsewhere, e.g., pp. 54, 63, 177). Since the distracting stimulus had been twice presented earlier, it would be reasonable for some to assume that what they just noticed, the critical stimulus, was also presented earlier--and join the "inattentively blind" with a "No."

4.3. Still others might give the critical stimulus only limited attention, enough to establish some memory of it, but so little that the memory is tapped, not by the awareness questions, but only by the more sensitive memory measures that follow. Short of precience, awareness of awareness is remembered awareness, and an essential requirement for validity of its report is that the assessment be sensitive to that memory. In this experiment, reports of both detection and identity require free recall, a relatively insensitive measure of explicit memory for what is consciously attended. For their "repetition priming test," it is not even clear whether subjects were instructed to complete the stem with the "first word that comes to mind," a standard implicit memory measure, or could use the fragment in a cued recall of the critical stimulus, a standard explicit memory measure (e.g. Graf, Squire, & Mandler, 1984). Some subjects could have answered one way, some the other. For that matter, picking the picture named by the critical word, in their "semantic priming test" could be as much a cued recall measure as a priming measure.

The problem is that either kind of measure, implicit priming or cued recall, can reflect a consciously attended prime when free recall fails. In fact, one of their supplementary experiments showed that 47% of those who didn't report presence or identity, and were classifiable as "inattentionally blind," nevertheless recognized the critical word as having been presented by picking it from a set of five--also a more sensitive test of recognition memory for the consciously perceived (pp. 179-180). We may not give something enough attention to recall it if asked, but if we see it or part of it or its picture, we remember experiencing it.

4.4. The most serious problem, I believe, also provides the most interesting challenge. Some subjects could experience a fleeting literal awareness of the unattended critical stimulus, or only a fragment of it, and then report truthfully a few seconds later that they remember nothing new on that trial. Report of the presence of the critical stimulus can only come by explicit remembrance that "For the first time, the (critical stimulus) was presented during presentation of the cross," but there is good reason to believe that attention is necessary for the establishment of explicit memories. In Carlson and Dulany (1985), for example, predictive cues for categorization, having various validities, were presented in a partial report line for attention in one condition, and outside the partial

report line and attention in another condition. By a number of measures, only information in the attended and reported line was retained in explicit memory. On this requirement for establishing explicit memories, then, a condition for the valid report of the critical conscious content is violated to the degree attention is successfully kept elsewhere.

Here, then, is the methodological Catch-22: Some can fail to follow instructions, fully attend the critical stimulus, and remember its identity when they report. Others obediently deny it attention, can't remember it, and are conveniently categorized as inattentionally blind--permitting unremembered but conscious literal contents to the "inattentionally blind" who are said to "unconsciously perceive" their causally effective primes. On this procedure and categorization of the inattentionally blind, their hypothesis is nicely invulnerable. It is a problem, by the way, not exclusive to the authors' paradigm.

In fairness to the authors, it should be said that they did recognize the possible interpretation that the critical stimulus was consciously perceived and forgotten. In an effort to disconfirm that possibility, they conducted further experiments in which more than one shape was presented sequentially, reasoning that if the critical stimuli were consciously perceived, they would be reported as two or as a single moving stimulus. Some subjects did, but some did not--and the latter were said to be inattentionally blind on essentially the same kind of assessment of awareness. I see no reason why the problems listed above would not still apply. In any case, there was no test for priming in these experiments and so no claim for unconscious perception.

Moore (2001), too, proposes in her commentary that the reported inattentional blindness may really be inattentional amnesia, and Wolfe (1999) has elaborated a very relevant conception of inattentional amnesia. Indeed, there is now a growing literature focussed on paradigms in which briefly presented material has been interpreted as unattended and too fleetingly remembered to register in some measures (Coltheart, 1999).

4.5. We can also wonder--incidentally--whether there was bias against target selection among controls who were compared with those categorized as inattentionally blind. For the repetition priming experiments, the authors write (p. 177) that "A separate control experiment was run that consisted of asking people encountered in the halls of the New School Graduate Faculty building to complete one of the four stems used in the main experiment with the first two English words that came to mind." Who knows what other consciously available and interfering primes were present in those hallways? Furthermore, for the semantic priming experiments, 60 subjects in "...a control group who had not participated in the experiment but simply were shown the five picture array and asked to choose a picture" (p. 187) provided the experimenters with a sub-expectation 12% selection of the picture whose label had been a prime (pp. 188-190).

## **5. Experimental Context: Supportive Convergence?**

The authors (p. 174) introduce their priming experiments with the statement that "...there is now ample evidence in the literature that sensitive, indirect methods of testing often reveal that perceptions not consciously experienced seem to be encoded, and facilitate or

inhibit subsequent perception..." This is not the place to review that literature, but I think it is a place to characterize it in order to say that weak procedures cannot leech support from other weak procedures. Although assessments of contents and states of awareness may be valid enough to enter into strong lawful relationships (e.g., Dulany, 1968; Carlson & Dulany, 1988), they are inherently subject to sources of error, some noted above, all of which can permit inadequately sensitive reports of "no awareness" and the interpretation of unconscious perception. In short, the literature is characterized by asymmetry of error biasing results toward spurious reports of unconscious perception, resulting in a revealing pattern and trajectory. Widely cited reports of unconscious perception are often followed by less noticed re-examinations that identify methodological flaws and/or fail to replicate.

5.1. Many studies, like the present one, have relied on the "subjective report" of awareness, as it is now termed. From Holender (1986) and Reingold & Merikle (1988) onward (and indeed earlier), that kind of assessment has been considered to be unacceptable for reasons intrinsic to signal detection theory: Various biases may influence the criterion for report of presence or identity. I have already mentioned the experimental critiques undercutting MacKay (1973) and the use of dichotic listening. Corteen and Wood (1972), too, have been widely credited for a conditioned emotional reaction to unconsciously perceived stimuli, but the result is challenged by Dawson and Schell's (1982) inability to produce their effect, testing for it over all trials with no report of attentional shift, although they report a small .05 effect for a subset of subjects. Given the intrinsic susceptibility of the subjective report to bias, it is common for such small, internally unreplicated effects to be attributed to unacknowledged shifts of attention in a few subjects (e.g. Pashler, 1998).

5.2 Other studies have used the more sensitive, but imperfect, "direct objective" method of awareness assessment (Reingold & Merikle, 1988). That measure is given by association of "Present" and "Not present" with presence and absence, in the detection case, or "Identification" vs. "Not" (or "Other") in the identification case. Many, including the authors, cite the masked priming results of Marcel (1983), a study using that measure, but not the failures to replicate that even achieved earlier publication (Fowler, Wolford, Slade, & Tessanary, 1981; Nolan & Caramazza, 1982). The assessment continues to be used in various ways (e.g. Draine & Greenwald, 1998) now subject to various criticisms (e.g. Doshier, 1998; Merikle & Reingold, 1998). Indeed, arguments have been presented that this direct objective assessment, though the most sensitive, is still intrinsically subject to various failures to be exhaustive (Reingold & Merikle, 1988; Merikle & Reingold, 1998; Dulany, 1997).

5.3. Some currently advocate a logic of gaining confidence in those flawed measures by showing that there are different behavioral consequences when the measure indicates awareness of the stimulus and non-awareness of the stimulus. But the logic is easily rejected on the recognition that there can be different behavioral effects of different contents of awareness--most relevantly in the present case, different consequences of literal and identity contents of awareness. There have also been failures of replication. Jacoby and Whitehouse (1989, p. 132) concluded that "Our results provide conclusive evidence for the existence of unconscious perception," but Bernstein and Welch (1991)

and Joordens and Merikle (1992) reproduced their pattern of results while showing that the controlling stimuli were in awareness. More recently still, Debner and Jacoby (1994) concluded that failure to exclude a masked stimulus from a fragment completion, as instructed, revealed unconscious perception of that stimulus. But Visser and Merikle (1999) showed that exclusion failures could be reduced even beyond controls by rewarding exclusion responses, and Haase (in press) and Snodgrass (in press) have presented evidence and principled arguments (from signal detection theory) that exclusion failure is a criterion artifact consistent with conscious perception of the presented stimulus.

5.4. The literature of "blindsight" seems especially relevant because the authors are saying essentially that outside the focus of attention lies nothing but a "functional scotoma." They cite Weiskrantz (1986) for convergence from the unconscious perception interpretation of neuropathological "blindsight," but there is no mention of other interpretations that have been offered: (a) Some judgments may be guided by correlated contents of awareness, as for example when DB describes a square as producing a "corner shaped wave" (Weiskrantz, 1986, p. 95). (b) Sometimes, too, conscious perception may be too degraded to meet the criterion for a subjective report of "seeing," an interpretation made plausible by the discovery of islands of sensitivity in DB's scotoma, along with 10% shrinkage over the years of his study (Gazzaniga, Fendrich, & Wessiner (1994, p. 94)--a possibility they raise for GY as well because "injury to the left occipital lobe came early in life." The possibility gains plausibility, too, by the existence of tracts from the retina via the superior colliculus to V2, V3, and V4, bypassing primary visual cortex--tracts that Weiskrantz (1997) describes (pp. 127-128). (c) Perhaps most interesting of all is Humphrey's (1992) suggestion that nonvisual awareness might be mediated by tracts from the retina to still other cortical centers. GY is commonly reported to say that he "feels" or "knows," or is even "aware" of, something although he doesn't "see" it (for example, Weiskrantz, 1995, p. 148).

For the recently standard measure of awareness by commentary key, GY "was instructed that he was to press the 'yes' key if he had *any* experience whatsoever of the visual event..." a metacognitive report of visual experience (Weiskrantz, 1997, p. 64). Furthermore, the measure said to reveal unconscious perception--for example, of the direction of movement--is simply the objective direct measure commonly regarded as the most sensitive measure of conscious perception (Reingold & Merikle, 1988). Therefore, whatever the contents or modes of awareness guiding that latter judgment---whether one of those listed above or something else, its dissociation from reports of seeing would be an interesting dissociation *within* consciousness, between first- order and metacognitive awareness, not between consciousness and unconscious perception.

This is only illustrative of a pattern of findings that have been described in many sources, a pattern that would be unsurprising to followers of the recent philosophy of science: Methodological constraints relax to accommodate central tenets of deeply entrenched metatheory. After commenting on Draine and Greenwald (1998) and the Doshier (1998) critique of that study, Merikle and Reingold (1998, p. 309), early proponents of



unconscious perception, write that "We doubt that it will be possible ever to prove the existence of unconscious perception."

We can therefore view the Mack-Rock results within a context--a context which, by the way, includes some of the authors' own failures to produce a priming effect among those they classify as inattentionally blind (pp. 185-186). A view I have expressed (Dulany, 1999) is that if unconscious perception (and comparable dissociations) were a reality, the effects would be too clear and replicable for these literatures even to be controversial. Alternatively, we can believe that evolution has provided us a mechanism for unconsciously perceiving reality, but it shows up only in experiments that fail to replicate or that embody questionable procedures.

## **6. An Alternative Interpretation**

This interpretation draws on a mentalistic metatheory elaborated in Dulany (1991, 1997), and I offer it for heuristic value, although its selective support would require different experimental procedures. Put simply, this begins with the unremarkable view that we consciously identify what things are, the attentional contents, from how they consciously look, sound, taste, smell, and feel--the literal outputs of sensory transduction systems, though sometimes with a little top-down help in awareness. We could be "inattentionally blind," in a proper sense of "blind," only where imperfect transduction systems fail to yield those literal contents of awareness, contents that should be necessary, on this view, for further causal effects.

As I would see it, each of the prime words is represented in memory by a neural network, and aspects of associated experience, experimental or otherwise, may become incorporated in a broader network. For the word to be strongly or weakly attended means that literal awareness of form strongly or weakly activates its identity awareness--an evocative mental episode connecting the graphemic level to the lexical level. Upon presentation, one's own name would get a special boost in activation over other frequent words like "Time" from the name's especially strong connections to awareness of aspects of self within the broader network--and so would be more susceptible to "attentional capture" (cf. Ch. 5, pp. 128-138).

In the especially interesting case of the unattended word, literal awareness of the word's form should nevertheless initiate a degree of activation in the network that is insufficient to yield identification of the word as such, the attentional state. In all of these cases, however, residual activation should endure as a function of time and its original level during the word's presentation. Models generally incorporate a decay, not an abrupt loss, parameter.

Although I have suggested above how word stems and pictures may cue recall of a weakly attended critical word, I focus here on the case in which the critical word has been unattended but represented in literal awareness. With the word stem as a test of repetition priming, this residual activation should tend to permit literal awareness of the stem to activate identity awareness of the full word--another evocative mental episode.

With five pictures as a test of semantic priming, each should tend to evoke its label, but the residual activation in the network for the prime word should give one of the names a little greater conscious sense of familiarity, which would provide a best guess with nothing better to go on.

In neither case would this reveal unconscious perception of the word or unconscious memory that "(critical word) was presented." It would be conscious contents evoking others, by virtue of nonsymbolic neural networks yielding symbolic contents in consciousness--a point generally consistent with views recently expressed elsewhere, for example, Carlson (1997), Dulany (1991, 1997), O'Brien and Opie (1999), Perruchet and Vinter (2000), and Tzelgov (1997). It would reveal priming of identity awareness by literal awareness of word form--priming by contents of *inattentional awareness*.

Are those literal and fleeting contents, the output of early vision, really represented in awareness? They are revealed, even if imperfectly, in on-line detection reports of immediate memory when identification fails. Furthermore, on evidence from the relevant partial report paradigm, Coltheart (1999, p. 2) reminds us that Sperling (1960) reported that his subjects reported the presence of more letters than they could identify. And Baars (1988, p. 16) wrote that "The Sperling experiment reminds that conscious events may decay in a few hundred milliseconds." Doubters may let themselves be a subject in a partial report experiment as I did in pilot work for Carlson and Dulany (1985). On a more recent terminology (e.g., Loftus & Irvin, 1998), it is not only the "informational persistence" but also the "visual persistence" that carries a conscious content. In any case, I find nothing in this evidence to shake the view that the literal representations that precede consciously identifying something--the attentional content--are anything other than how it consciously looks, sounds, tastes, smells, or feels.

## 7. The Contribution

I have challenged the authors' thesis of inattentional blindness, of blindness to everything outside attention, and proposed that the most interesting inattentional priming effects may be explainable by inattentional awareness. These would be interesting dissociations *within* awareness when activation fails--dissociations between literal and identity awareness, not between unconscious and conscious perception. The authors' impressively extensive and systematic work can, however, also be viewed as showing an interesting range of conditions that capture attentional awareness. The theoretical questions raised and those latter findings are what I would see as the clearest and most worthwhile contributions.

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