Inattentional blindness by A Mack, I Rock; MIT Press, Cambridge, MA, 1998, 273 pages, $50.50 (£29.95) ISBN 0 26213339 3

When I was in graduate school, someone advised me to try for a finding that one could see and feel; an effect that could be directly experienced, not some ghost that would appear only when the subject's behaviour is examined artfully and indirectly, or only in the mean of hundreds of trials. The Stroop effect is a good example—you can feel the knot in your head if you try verbalise that the word "red" is printed in blue ink. There is really no need for millisecond-accurate RTs or ANOVAs—the point is clear, based on a simple and direct demonstration. Inattentional Blindness by Arien Mack and Irvin Rock is interesting because it describes a finding that is provocative for the exact opposite reason. They create events that you would think you could see and feel, but are actually ghosts that appear only with careful testing. The essence of Mack and Rock's paradigm is that an object appears on a computer screen in front of the subject and he/she does not see it. A salient visual event which should "take possession of the mind" is, in fact, ethereal. One of the best things about this research is that it starts by surprising you, and continues to do so, upping the ante several times. First, Mack and Rock report that a substantial portion of subjects fail to detect a parafoveally presented object that is present for 200 ms, then they report that subjects still miss the object if it is presented at the point of fixation, and then they report that subjects still don't see the stimulus if they leave it on the screen for nearly a full second!

Do we lose contact with our senses the moment we enter a psychological laboratory? Of course not. The key to Mack and Rock's paradigm, and the point of the book as a whole, is that we are blind to things we don't pay attention to. In the typical experiment, the subjects are informed that their task will be to judge the relative lengths of the horizontal and vertical lines in a cross. The difference is subtle which makes the task attentionally demanding, and for the first few trials nothing else happens. However, on the fourth trial, an object is unexpectedly flashed on the screen near the cross. The dependent variable is whether the subjects notice this event, and the typical finding is that between 25% and 90% of subjects do not. Thus, when subjects are not attending to some region of space, it appears that much escapes notice—this is inattentional blindness (IB), and it occurs much more readily than either the lay person or psychologist would expect. First, IB occurs even if the unexpected object is presented right at the fixation point, so long as the distracting stimulus (the cross) is in the parafovea. And, as if that's not enough, the IB effect is stronger. Mack and Rock's explanation for this latter finding is that subjects must actively inhibit visual information at the fixation point in order to attend to the cross in the parafovea. The authors also show that moving objects, which really ought to capture attention, are missed about as frequently as nonmoving objects.

Of course, the first two questions that come to mind concern whether more meaningful stimuli will be noticed, and whether unnoticed stimuli are nonetheless unconsciously perceived. In answer to the first question, Mack and Rock find that meaningful stimuli such as faces and the subjects own name are detected more frequently than jumbled/partial faces and the names of other subjects. Thus, the meaning of a stimulus can affect whether or not you see it at all—a finding Mack and Rock discuss in the context of a late-selection theory of attention. They also test for implicit representations of unnoticed objects and obtain positive findings. Unnoticed words do seem to strongly influence stem completions, and also can produce semantic priming by affecting the subject's choice of a picture from an array. In addition to answering these basic questions, the book includes several other interesting sets of experiments, testing for IB in other modalities (and finding it for auditory and tactile stimuli) and by using natural scenes and objects. In the latter set of experiments, Mack and Rock find little IB. However, recent findings from other labs do suggest that a different paradigm would yield evidence similar to IB.

Although the findings in Inattentional Blindness are striking and counterintuitive, the book's real importance lies in the challenge it presents to a wide variety of current theories in visual
cognition. For example, most theories of visual search describe an early preattentive process that detects and groups primitive features. So long as these features are sufficient to distinguish targets from distractors, the output of this process specifies the target locations which, by virtue of the preattentive nature of primitive coding, ‘pops out’ effortlessly. The implication is that so long as the primitives hit your retina, they’ll be processed and the target will be detected. Of course, this is exactly what Mack and Rock don’t find. All of the ‘pop-outs’ they tried (with one or two exceptions) went unnoticed when subjects did not attend to the array. Therefore, Mack and Rock suggest that the whole idea of preattentive vision should be rejected. Although I think a modified version of preattentive vision might accommodate IB, something has clearly got to give if preattentive vision requires attention to operate.

More broadly, Mack and Rock start the book with the claim that there is no perception without attention, and end by saying that there is no conscious perception without attention. At first, this seemed to me as though the authors were starting with a provocative claim, and ending with a hedged claim that is essentially circular. One could easily define attention as the process of selecting what information will be consciously perceived, and conclude it is obvious that there will be no perception without attention. However, Mack and Rock’s final discussion suggests something more challenging and points out the potentially incorrect characterisation of perception that has dominated cognitive science. The normative model of vision, especially as it describes the transition from early parallel processes to consciousness, is strongly bottom–up. An array of dedicated feature detectors scan the world for important information, and deliver its essentials to consciousness. Although most researchers would acknowledge a role for attention in early vision, they would still suggest that the bottom–up process provides the ‘object for attention’, and therefore that the typical chain of events involves exogenous direction of attention based on early feature analysis. In this context, IB is extraordinarily provocative in revealing how a salient object can appear, disappear, and even move right in front of your eyes, and yet fail to make the transition from early vision to consciousness.

At a substantive level, the book is fascinating, but I did find myself wishing for some improvements in its form. First, there are some summary figures and tables in the book, but they are not as helpful as they might have been. Given the large number of experiments with similar methods, the reader is given quite a lot to keep in mind. This situation lends itself nicely to the development of a simple iconography that could illustrate the dozen or so experiments in each chapter with a single figure. Such a figure at the end of each chapter would have aided greatly in remembering the key manipulations in this extensive series of studies. In addition, methodological detail is presented in block quotes of small print that the authors suggest might be skipped by readers not interested in minutiae. This is a fine idea, but the problem is that the main text often does not contain the information necessary to understand the experiments. I occasionally paid a price for my haste when I skipped one of these sections to read ahead.

Most likely, the primary audience for this book will be psychologists studying visual perception and cognition, but it should be understandable for graduate students and even advanced undergraduates who have had courses in cognition and/or perception. It might make a nice reading for an advanced class in cognition or perception because it covers basic phenomena of attention (especially the early versus late selection debate), grouping and search from a novel angle, and should give students a good basis for discussion. This would be particularly true for students who wish to go beyond core empirical findings and consider metacognitive and philosophical implications of inattentional blindness—the book gives a starting point for such issues, but does not cover them in detail.

Generally, this book makes excellent reading because it is the kind of thing you need to run out and tell someone—grandmothers, neighbours, and even philosophers, neuroscientists, and those in the humanities will no doubt be hearing about inattentional blindness in the near future. This is a good thing because unraveling the relationships between vision, attention, and consciousness is going to require input from all of us. Inattentional Blindness will help anchor this search in an empirical phenomenon that will be difficult to dismiss, reinterpret, or ignore. The change is there for all to not see.

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Vision Research: A Practical Guide to Laboratory Methods is a collection of contributions covering various aspects of research methodology in vision science. The ten chapters (and their authors) are: “Optics and photometry” (Makous), “Light sources” (John Robson), “Topics in computerized visual-stimulus generation” (Tom Robson), “Specifying, generating, and measuring colours” (Mollon), “Psychophysical methods, or how to measure a threshold and why” (Farell and Pelli), “The behavioural analysis of animal vision” (Blake), “Research methods in infant vision” (Atkinson and Braddick), “Gross potential methods in ophthalmology” (Spekreijse and Riemslag), “Eye movement recording” (Collewijn), and “Techniques for the dynamic measurement of accommodation and pupil size” (Judge).

In the preface, the editors express the hope that “this book may not only serve as a little repository of practical wisdom for those already working in the field, but also encourage newcomers ... to have a go themselves” (page vi). Overall, the book fulfils its stated objective. I found it an enjoyable read, and the majority of the contributing authors have managed to present a large amount of useful information in an accessible and, at times, entertaining manner. The references at the end of each chapter are generally extensive, and will act as a good starting point for further investigation of a particular area; in those chapters that deal with bits of kit (such as lenses, eye trackers, or whatever) addresses and/or web sites for suppliers are provided.

The book is well illustrated throughout; indeed, in a few sections there appear to be too many figures, resulting in a lot of page flipping from the text to the relevant diagrams and back again. Another minor irritation was that my copy had several pages with faint, doubled print on them. I hope that this was just bad luck, but potential purchasers might want to check pages 27, 30, 31, and 46.

The chapters by Makous, Tom Robson, Mollon, Blake, Atkinson and Braddick, and Collewijn all share common features: each is an informative and enjoyable tour through a particular area of interest; extensive use of examples, either anecdotal or from the literature, makes the various subjects come alive; potential pitfalls in each field covered are highlighted, and various solutions to these problems are clearly explained. The contributions by Atkinson and Braddick, Collewijn, and Blake do a particularly good job of using examples from the literature to illustrate and support each point made by the authors; this helps to place the information contained in each chapter within the broader context of contemporary and past research in a given area.

John Robson’s chapter on light sources is extremely thorough, but somewhat heavy going in parts. The same could be said of Judge’s contribution on the measurement of accommodation and pupil size, and, to some extent, Spekreijse and Riemslag’s chapter on gross potential recording methods (although the many clinical examples cited liven it up somewhat). Farell and Pelli’s chapter on psychophysical methods is clearly written, and good as far as it goes. It is extremely succinct, perhaps too much so, and comes across as rather dogmatic in comparison with much of the rest of the book (an apparent dogmatism that, I feel, stems from its brevity). I think that some of the points made could have been expanded and justified; for example, the claim that one particular staircase is the best experimental procedure, and the statement that about 60 trials are required to obtain a good threshold estimate when using a 2AFC task. My suspicion is that most readers will want to know not just what to do, but also why.

As a whole, then, the book is a well-written collection of useful guidance, hints, and tips, which are presented clearly, and often backed up with relevant examples from either the literature or the author’s personal experience. Inevitably, a book with such a broad remit as this one cannot cover everything, and for me there were two obvious omissions. As Spekreijse and Riemslag point out, “by integration of the present-day, non-invasive, brain imaging techniques new and detailed insights can be obtained about the functioning of our brain” (page 241); I would have liked to have seen a separate chapter on imaging techniques (eg MEG, fMRI). A chapter on single-cell recording would also have been a welcome addition. Both topics would seem to qualify as laboratory methods, and their absence is a little puzzling.

Given the nature of the book (covering, as it does, a wide range of vision research areas and techniques), it seems likely that few individuals apart from reviewers will read the entire volume. This makes the large amount of cross referencing between the different chapters an extremely useful feature. One exception to this is the treatment of screen calibration in Spekreijse...
and Riemslag's chapter on gross potential recording methods, which I felt would have benefited from a reference to Tom Robson's chapter on computerised visual-stimulus generation. This is, however, a minor point—in general the reader is sent in the right direction for either elaboration or an alternative viewpoint from one of the other authors. If it is unlikely that any one person will read all of it, who will buy this book? It doesn’t seem worth forking out £30 (or $55) for just one or two chapters of interest. I think, however, that this is the wrong question to ask; the book strikes me as a good one to have around in the lab, so I would guess that it will end up on the communal bookshelf, rather than the individual one.

Vision Research: A Practical Guide to Laboratory Methods provides precisely what its editors hoped it would: “information of a kind that is seldom written down explicitly in the ordinary course of scientific publishing” (page v). It effectively offers the reader the chance to peer round a door into someone else's lab, and have a few pertinent questions answered by an expert. I would recommend it to anyone interested in the areas of research that it covers, both as an excellent starting point for the newcomer and also as a guide to some of the questions and problems that will arise as one explores the field further.

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