

Broadbent D E. *Decision and stress.* London: Academic Press, 1971. 522 p.
[Medical Research Council. Applied Psychology Unit, Cambridge, England]

This was a review of psychological experiments during the 1960s on attention, memory, decision time, and the effects of environmental conditions on performance. It concluded that random subprocesses are combined so as to give predictable gross behaviour. [The SSC1® indicates that this book has been cited in over 710 publications.]

The Complexity of Human Performance

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During the 1950s and early 1960s, experimental psychology adopted with enthusiasm the approaches and concepts of engineering, information theory, and cybernetics. Such methods allowed discussion of events within the person, in words independent of any particular physiology, but apparently more precise than older "mentalistic" language. By a decade later, the literature was crowded with appropriate experiments. This book was an attempt to sum up the 10 years of progress and to see how far the original concepts needed modifying.

It mentioned, summarised, and debated most of the experiments of the 1960s in the area it covered, a wider trawl than most single-author books could now contemplate. The sheer bulk of data and the specialisation of topics have driven the community toward multi-author volumes or narrower dedicated monographs. Even then the book was, frankly, almost unreadable, and the most probable reason for its citation is that it served for a few years as a quarry for those seeking exact references to the literature. I still use it myself in that way, for papers in that period. Indeed, I still believe this mountain of facts carries certain general implications and that the ideas in the book are therefore "true." Those ideas,

however, have not been much discussed in the 20 years that have followed; others drew different implications from the data.

What can we all agree we learned from the 1960s? At the start, psychologists hoped (as I still would) to build machines whose function is describable by the same mathematics as human thinking is. Many of them, however, hoped also that these machines would be like steam-engines or typewriters: that they would behave in the same way if put back in the same situation and that their internal operations (which after the 1950s we could discuss) would unroll in identical ways in different circumstances. That false hope was killed in the 1960s.

By 1971 it was clear that each psychological relationship depends on the exact background conditions. The effect of prolonged work on signal detection depends on the false-alarm rate allowed, the relationship between reaction time and information transmitted depends on the particular set of stimuli and responses employed, different tasks show different effects of prior instructions to attend to one stimulus in a large set, and the bad effects of poor environments depend upon the methods of coping used by the person. In general, everything depends on almost everything else. This book was certainly a factor in driving that message home.

Some people concluded that we must keep the aim of looking for steam-engines and therefore turned to simpler aspects of perception, of motor control, or of a rejuvenated physiological psychology. Some turned to the formalisms of linguistics or logic. Some decided that all psychology rests on process, with no persisting structures, and that the aim must therefore be to describe more perfectly the history of the series of external events and their corresponding idiosyncratic processes. I myself thought, and still think, that these were the wrong reactions.¹

We can infer, from easily repeatable experiments, that human decision is the outcome of many partially random neural events. Yet it has critical points at which a discontinuous step is taken in favour of one action rather than another. The setting of these critical points, and the consequences once a particular step has occurred, do obey lasting rules.² If we ignore those rules and try to build a science for particular paradigms, modular domains, or formalisms, we shall be continually frustrated by bizarre exceptions to our steam-engine models.³ This book failed to convince readers of the answer, only of the problem. There will in the end be clearer, cleverer, and thus more successful advocates of the same position.

1. Broadbent D E. Structures and strategies: where are we now? *Psychol. Res.* 49:73-9, 1987.

2. Luce R D. *Response times: their role in inferring elementary mental organization.* New York: Oxford University Press, 1986. 562 p. (Cited 15 times.)

3. Johnson-Laird P N. *Mental models: towards a cognitive science of language, inference and consciousness.* Cambridge, England: Cambridge University Press, 1983. 513 p. (Cited 170 times.)