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Limited Capacity Theories and the Notion of Automaticity: Reply to Lucas and Bub

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Lucas and Bub argued that *automatic* should be thought of as meaning something similar to "outside of awareness." The argument they built around this definition does not bear on the existence of a limited capacity central processor. Moreover, the definition itself raises questions the resolution of which would involve systematic introspection, an experimental technique that was tried and abandoned.

Although Lucas and Bub (1981) seem to differ with us only over the definition of "automatic," there is actually more at stake. Our experiments (Hirst, Spelke, Reaves, Caharack, & Neisser, 1980) were designed to test the assumption of "limited capacity" that is common to many modern cognitive theories (e.g., Posner, 1979; Schneider & Shiffrin, 1977). These theories postulate the existence of a fixed central mechanism that plays a key role in many complex processes, for example short-term retention, strategic control, and language comprehension. To "pay attention" is to involve that central mechanism in the processing of information; the difficulty of attending to several things at once is then explained by its limited capacity. In this context the term "automatic" has a very specific meaning. It refers to information processes that do not involve the limited-capacity mechanism and hence can be combined more or less without limit. In our view, these assumptions imply that automatic processes must be relatively simple. If processes of arbitrary complexity could be carried out automatically, there would be no need to postulate a central mechanism at all. In that case, the distinction between "attended" and "automatic" processes would no longer serve a useful theoretical purpose.

That is what we believe our experiments have shown. Since our subjects were reading stories with normal speed and comprehension, their limited-capacity processors should have been fully occupied. Nevertheless, they could simultaneously understand novel dictated sentences (not just individual words) and the relations between them. If such an understanding can be achieved "automatically," it is hard to see what functions remain unique to the limited-capacity system. The task we set our subjects—integrating across sentences—was far more complex than the tasks in any of the studies involving unattended information cited by Lucas and Bub.

Information-processing models are a recent development in psychology, and the use of "automatic" to denote a particular mode of processing is more recent still. There is an older and perhaps more natural use of the term as meaning something similar to "outside of awareness" (e.g., Solomons & Stein, 1896). It is this sense that interests Lucas and Bub (1981). They cite a variety of studies to show that words can be understood "automatically"—when the listener denies having heard them, or did not attend to them, or cannot recall them, or was not aware of their connection to the task at hand. Lucas and Bub point out that this kind of processing may have occurred in our study as well. We entirely agree. There are good reasons to believe that the subjects were unaware of some aspects of the dictated material at certain points in the experiments; for example, they apparently did not notice the triadic structure of the lists in the false-

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recognition study. We discussed these issues in our article (Hirst et al., 1980). But when Lucas and Bub ask "whether writing was truly attended or automatic" on individual trials (p. 497), using these terms as synonyms for "with awareness" and "without awareness," we can only respond that our studies were not designed to answer that question.

The fact is that no satisfactory method for answering questions about consciousness presently exists. Systematic introspection was tried and found wanting half a century ago; casual introspection is surely no better. The suggestion that the postulated central processing mechanism is the seat of awareness, frequently made in this context, offers no solution to the problem. It begs the question in two ways: First because there is no nonintrospective way to confirm such a hypothesis, and second because the central mechanism itself may not exist. At the very least, our studies showed that its existence cannot be taken for granted.

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