BOOKS

PSYCHOLOGY

Beyond the IQ

Beyond IQ: a triarchic theory of human intelligence
by **Robert J. Sternberg**
Cambridge University Press,
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Robert J. Sternberg, of Yale University, is one of the most significant members of the new band of research workers on human intelligence who seek to surmount the limitations of traditional psychometrics, as manifested in a single immutable number – the IQ – purporting to summarize a person's mental abilities and potential capabilities.

Sternberg has constructed a framework, or at least an approach, or at best a theory of human mental activity which overcomes the contradictions, more apparent than real, between differential or correlational studies of human mentation, in which individual differences are relished; and experimental studies seeking to discover the general processes of human cognition, in which individual differences are abhorred. Although last year, *Behavioral and Brain Sciences* carried provocative commentaries on an outline of Sternberg's "triarchic theory", this book represents the first full statement of that theory.

An historical account of various conceptions of intelligence precedes a detailed description of the triarchy. Here, Sternberg makes the case for a distinction between explicit theories, in which the nature of intelligence is defined by psychologists and forms the object of empirical investigation; and implicit theories, which form the basis of everyday actions; here, intelligence becomes simply "what the people say it is". The triarchy itself consists of three interrelated subtheories, but no hierarchical positioning is implied.

The "componential subtheory", the best amplified, is an attempt to "specify the mechanisms by which intelligent performance is generated". The unit of analysis is the "component" – "an elementary information process that operates upon internal representations of objects or symbols". The identification of a component "depends upon the desired level of theorizing". Here, recourse is made to the notion of "levels of explanation", an effective way of avoiding the dangers of reductionism. Mark Cook used it persuasively in his *Levels of Personality* (1984). Sternberg claims that "what is a component in one theory might be two components in another"; and that "theories at different levels serve different purposes and must be justified in their own right". Even so, with this degree of freedom and number of arbitrary elements, the theory might be untestable. Fortunately, an escape from this calamity is made by classifying components into three types: "general" (employed in all tasks – for example, recognizing a problem); "class" (employed in at least two tasks – for example, making an inference); and "specific" (employed in only one task). These types form hierarchies which are constrained, making "disconfirmation of a given theory both possible and feasible". They also carry some similarities to the general, group and specific factors of the more traditional psychometric models of intelligence, which are based solely on test rather than task performance.

There are three kinds of components: "meta-components", responsible for setting up a general strategy to solve a problem; "performance components", "used in the execution of various strategies for task performance"; and "knowledge-acquisition components, used for gaining new knowledge". Armed with these components, Sternberg interprets 12 aspects of human intelligence. Taking just one, the fact that the absolute level of intelligence increases with age, is seen as a feedback loop in which an increase in the effectiveness of using components leads to an expansion of the knowledge base. Although it is possible to object that Sternberg has proffered a mere re-description of intellectual growth, that objection would be unsustainable because the subtheory is open to experimental tests.

The "experiential subtheory" considers the "role that intelligence plays at various points in our continuum of experience with tasks and situations". It has two related facets, consisting of those abilities required to cope with novelty and those to automatize information processing. In the first encounter with a task (for example, a crossword puzzle), novelty is at a maximum and then decreases with exposure to the same kind of task (further crosswords); production of the correct responses becomes smoothly automatic and moves out of conscious control. Sternberg maintains that existing IQ tests must be supplemented, if not replaced, by tasks which are specifically designed to measure a person's facility in dealing with novelty and becoming "automated". Yet, the question of at what practice point in a task is intelligence best measured, remains open. Although Sternberg recognizes this difficulty, he fails to realize that the problem directly relates to the controversy of IQ stability and the effects of coaching. Arthur Jensen (1980), having inspected the findings, recommended a "standardized procedure of brief special instruction in test taking", together with a practice session on a version of the actual test; and noted that "this would seem especially appropriate when there is evidence that applicants have had diverse educational backgrounds". If this advice is followed, the plea for including response to novelty in a definition of intelligence is weakened. If it is ignored, justifiable accusations of test bias can be made.

The "contextual subtheory" is the newest and least elaborated part of the triarchy, predicated on Sternberg's definition of intelligence as "mental activity directed toward purposive adaptation to, and selection and shaping of, real-world environments relevant to one's life". Sternberg emphasizes the overwhelming importance of the interaction between people and their circumstances to an understanding of intelligence. He dismisses attempts to estimate that proportion of test score variance in a given population which is due to heredity, for "failing to answer the fundamental question of just what intelligence is". And he makes the extravagant claim that some psychologists "would like to understand intelligence solely in terms of the functioning of genes". There are, however, psychologists who occupy the completely opposite position. Notoriously, Leon Kamin emphasized in 1974 that "there exist no data which should lead a prudent man to accept the hypothesis that IQ test scores are in any degree heritable": and in 1981 he overreached even himself by having the thought "that regarding IQ tests as measures of 'intelligence' is nonsensical".

Sternberg goes on to address the issue of cross-cultural effects, concluding unsurprisingly that whereas "cultures may appear to show mean differences in levels of measured intelligence. but probably only when intelligence is measured in terms of the knowledge and skills acquired by one of the two (or more) cultures" – everything is not relative – and that many aspects of intelligence are universal. He does not accept that either the "hardware (anatomy and physiology) of cognitive functioning or the potential software (cognitive processes, etc) of such functioning differs from one culture or society to the next". Only the importances or "weights" of the processes vary across cultures. Sternberg is plainly unaware of research which shows that although biological features may not differ across cultures, cognitive processes do so vary; it is not just the "weights" that alter.

The Soviet neuropsychologist A. R. Luriya, in his study of the peasantry of Uzbekhistan in the early 1930s, demonstrated that "cognitive processes of people living in less complicated social-historical conditions, are constructed significantly differently" from those in advanced societies; and contended that "these differences rest not only on the different content of cognitive processes, but are significantly different according to their structure". Luriya interpreted these differences as being conditional upon non-arbitrary economic forces: they would change as and when the economic relations changed. In contrast, Sternberg accepts only the possibility of cultural change and believes that experts alone can solve by intervention programmes the crucial problem of how to raise "intelligence" among the peoples of the developing countries.

Sternberg has taken us well beyond the IQ. Despite criticisms that he decouples his theories from the material substrate of cognition and simplifies the effects of environment, he has by logical argument and ingenious experiment helped to refresh the somewhat exhausted field of individual differences in intelligence. His book is a major contribution to our understanding of human intelligence and should be widely read.

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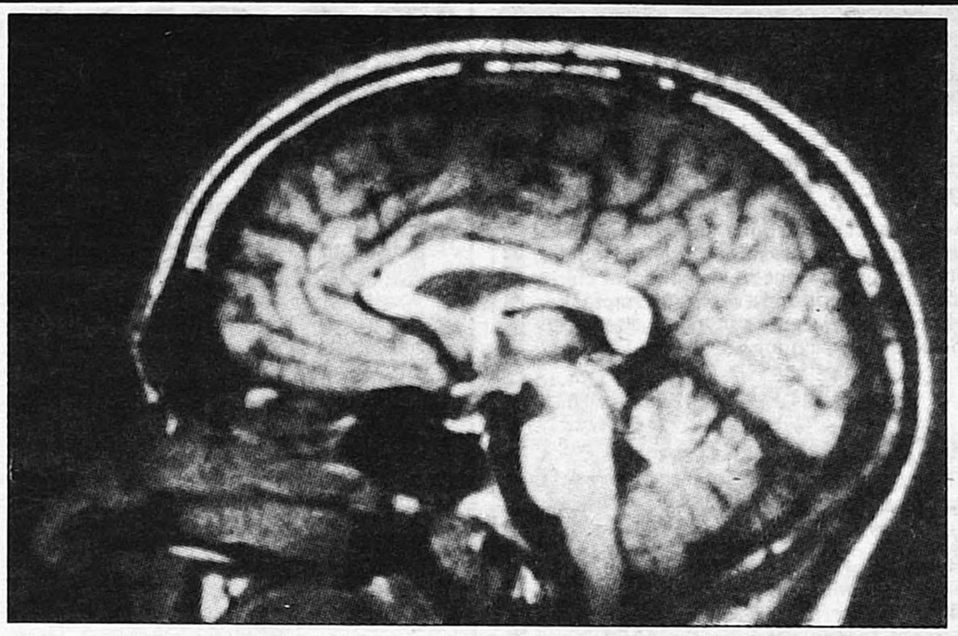

A computer-reconstructed image of a cross-section of a normal brain, using data derived from the nuclear magnetic resonance of hydrogen in the water molecules of the subject's head, from the second edition of Sally P. Springer and Georg Deutsch's *Left Brain, Right Brain* (Freeman, £25.95 and £14.95).

Wugs and zits

Psycholinguistics: the experimental study of language
by **Gary D. Prideaux**
Croom Helm, £10.95
ISBN 0 7099 2069 5

Psycholinguistics began in the shadows of linguistics. During the 1960s, when rapid theoretical advances were being made in linguistics, psycholinguists were psychologists who devised tests of the "psychological reality" of theories put forward by linguists. In the 1970s, however, psycholinguists became disillusioned with this subsidiary role: psycholinguistics turned into a branch of psychology, its goal now being to construct models of language performance – producing language, understanding it, acquiring it. At this time, psycholinguistics was independent of what linguists were saying about language.

In the 1980s, the linguists are once more in evidence, but instead of testing (already constructed) linguistic theory for psychological validity, the new breed of psycholinguist tries to construct linguistic theories which from the outset are designed to account for psychologists's findings. Today, psycholinguists are either psychologists or linguists, but never both. They differ in their background assumptions, factual expertise and theoretical goals. They may do very much the same sort of experiments, but the framework within which their findings are interpreted is very different.

It is easy for the casual reader to assess whether a textbook called simply *Psycholinguistics* has been written by a psychologist or a linguist. A psychologist's book will begin with linguistics, an introductory section presenting a brief sketch of phonetics and phonology, morphology, syntax and sematics. Following chapters usually describe psycholinguistic research on language production, understanding and acquisition. A linguist's textbook, by contrast, covers types of language performance in an introductory section, and organizes the meat of the book according to linguistic level – research bearing on phonetics, on morphology, on syntax, on semantics. Gary Prideaux is a linguist.

Is there any reason to prefer one view of psycholinguistics to the other? Both, after all, will be sure to recount the most important psycholinguistic discoveries. No psycholinguistic textbook, for example, omits the "wug" experiment, in which Jean Berko studied how young children learn the English plural ending pronounced /z/ on words like "dog", but /s/ on words like "cat". She showed children pictures of funny looking creatures with names like "wug" or "zit". When the children were presented with two wugs or two zits, how would they pronounce the plural form? Berko found that they correctly used /z/ on "wug", /s/ on "zit". That is, the children did not just know how to make plurals of words they already knew; they had developed a *rule* for the phonetic form of the English plural.

Psycholinguists draw two kinds of lesson from this finding. To the linguist, Berko's experiment confirms the appropriateness of the linguistic representation of the English plural ending as an abstract marker which happens to be realized sometimes in one phonetic form, sometimes in another. To the psychologist, it tells something about the way children acquire their native language: not by passively learning forms as they come across them, but by actively deriving general principles from the forms they happen to encounter. Which view of psycholinguistics one prefers therefore depends on whether one is primarily interested in what language is like or in how people use it.

There is one further difference between the two approaches. Most psycholinguistic experiments are still being done by psychologists, and results in psychological journals reach linguists only slowly. Thus, linguistic psycholinguistics in the 1980s is based on psychological work of the 1970s. Prideaux's book is in this respect typical: it covers psycholinguistics competently (indeed, excellently in the areas of syntax and morphology) but only up to the late 1970s. It is, however, untypical in ignoring phonetics and phonology.

As an undergraduate textbook, it suffers from a difficult typeface, numerous printing errors and leaden style. This is a pity, because it is otherwise a good and representative example of one way of approaching this curiously divided field.

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