

SPECIAL REVIEW

Three views of intelligence

PAUL KLINE: *Intelligence: The Psychometric View*. Routledge, London (1990). 166 pp. £9.99 Paperback. ISBN 0-415-05512-1.
ROBERT J. STERNBERG: *Metaphors of Mind: Conceptions of the Nature of Intelligence*. Cambridge University Press, Cambridge (1990). 344 pp. £30.00. Hardback. ISBN 0-521-35579-6. £11.95. Paperback. ISBN 0-521-38633-0.
STEPHEN J. CECI: *On Intelligence . . . More or Less: A Bio-ecological Treatise on Intellectual Development*. Century Psychology Series. Prentice-Hall, Englewood Cliffs, NJ (1989). £42.80. Hardback. ISBN 13-634205-1.

These three books on intelligence illustrate the confusion that still persists in the field of cognitive ability, its measurement, and its theoretical conceptions. Easiest to review in this context is the slim volume contributed by Kline.

This is an interesting and well-written book which might well form the basis of a course on intelligence. It is well organized, reviews most of the relevant evidence, and might be regarded for the most part as embodying a consensus of experts in the field. If there are a number of criticisms, these do not detract from the general excellence of the work.

Kline follows Cattell in using fluid and crystallized ability as two higher-order factors, rather than following the logic of confirmatory factor analysis and more particularly multi-dimensional scaling (it is not even discussed) in identifying fluid intelligence with *g*. This failure complicates the account, and makes the concept of intelligence less intelligible. Kline is somewhat dismissive of the work on reaction time and inspection time, but his account is not up to date, and seriously underestimates the relationships obtained, particularly for a more complex form of RT, such as the Odd-Man-Out paradigm, and others. When several different RT measures are combined, rather high correlations up to 0.6 and above can be obtained with IQ. The same is true of inspection time, where the best available estimate for random samples of the population is a correlation of 0.5 between RT and IQ. Combining RT and IT raises the correlation with IQ to 0.7 or thereabouts. Kline seriously underestimates the true values.

Kline's account of creativity leaves out a considerable amount of evidence that this is a personality trait rather than a cognitive one, correlating quite highly with psychoticism (H. Eysenck, *The Roots of Creativity*, Roeper Review, 1983, 5, 10-12).

Kline fails to discuss sex differences, an interesting and socially important field. He tells the reader that he will not deal with racial differences, but then devotes 2 pages to doing so in a desultory and uncritical manner. He is right in saying that educational, social and employment decisions should always be made on an individual basis, not a racial one. This admirable stance leaves out two facts. First, American practices of affirmative action are based on race, and make unwarranted assumptions about racial differences; hence these are socially important. Second, should a bank loan millions to a country with an average IQ (however caused) of 80, or another of 110? Shareholders might like to know the facts.

A serious omission in the book is a discussion of fundamental theories of intellectual functioning, such as those of Campbell, Furneaux and Simonton. Nor is there any detailed discussion, as perhaps there ought to be, of theories relating error-free transmission of information to speed of mental functioning, and through this to intelligence. The book is strongest on the psychometric arguments, and weakest on theory. However, a good teacher can supply the latter more readily than the former, and hence the book will be useful as a teaching device.

Sternberg's is an interesting and important book, and like most of Sternberg's writings it is clear, well referenced and suggestive. It also has many faults, starting with the very title. A metaphor, according to my dictionary, is "a figure of speech in which a word or phrase is applied to an object that it does not literally denote in order to imply a resemblance". This is hardly what Sternberg has in mind; his meaning is much more clearly described in terms of the sub-title of the book: "Conceptions of the Nature of Intelligence". Here, too, I think he is wrong; what he deals with are not different conceptions of the nature of intelligence, but rather different problems in the elucidation of the meaning of the term. Sternberg contrasts six 'metaphors' as if they were in some sense contradictory, but this of course is by no means so. All sciences have to grapple with the taxonomic problem (he calls it "the geographic metaphor"); they also confront the causal problem (the biological metaphor), questions about specific causal links between the two (the computational metaphor); questions about the specific applicability of the developing theories in special circumstances (the anthropological metaphor), and so on. There is nothing special about intelligence in all this, and no contradiction. We obviously have to find out first of all something about the taxonomy of cognitive performance before we can look at the development, the biological structures underlying them, the nervous functions mediating them, etc. To imply a form of antagonism between different 'metaphors', and suggest that different people start with different metaphors, is fundamentally mistaken. Different people are interested in different areas, but that does not make them (and the theories that they generate) antagonistic. I have done work on the 'geographic' and the 'biological' metaphors, but I have no difficulties in accepting the 'anthropological' metaphor, which tells me that fundamental, biological intelligence (*g*), leads one to learn different things in different cultures, or find different expression in different cultures.

In addition to this fundamental fault, there are many specific points on which Sternberg invites criticism. He states in his preface that he attempted to bring together into a systematic and comprehensive framework all of the major theories of human intelligence; there is no mention in this book, however, of one of the most fundamental and challenging, namely that proposed by Furneaux, Campbell and Simonton. He discusses Boring's operational definition that "intelligence is what a test tests"; however, his critical discussion does not concern itself at all with the most powerful argument in favour of such a definition, namely that tests have different loadings on the general factor, and that these loadings agree very well with theories such as Spearman's. In other words, the tests are not arbitrarily selected, but form a highly specific pattern (low rank of matrices of intercorrelations) which makes sense in terms of the theory when tested by confirmatory factor analysis, or by multidimensional scaling.

On some issues Sternberg is less than informative, particularly when he discusses the 'biological' metaphor. He discusses EEG measurement as related to intelligence, but never mentions much the most important and impressive work in that

field, namely that of Gasser and his associates. Dealing with the Hendricksons' work on the evoked potential and scores on the WAIS, he does not mention the most important finding, namely that the factor loadings on the 11 scales of the WAIS correlated almost perfectly with the AEP correlations with these scales. He does not mention studies of positron emission tomography, throwing important light on the energy definition of intelligence. Clearly, his heart isn't in it. Neglecting to mention the most powerful findings in favour of a given approach devalues arguments against that approach.

Sternberg sometimes seems to believe that dispute exists where in fact agreement has been reached. He does not seem to realize that Spearman and Thurstone finally agreed at the taxonomic level, postulating both a general factor and primary abilities; thus Spearman and Jones' book in which Spearman agreed to such a compromise is not mentioned. Sometimes Sternberg's arguments seem to make no sense. He says that mental tests are based on a view that intelligence is primarily something internal to the individual. It is, he says, at least metaphorically, inside the head. But tests need not make this assumption according to him. Tests based on the anthropological metaphor will need to be tailored, not just translated or adjusted, to the culture in which the testing is taking place. However, there is no contradiction. Of course, intelligence must be based on something inside the head, but they obviously must also take into account what the individual has learnt, what his culture consists of, and what it regards as proper. The implied contradiction does not really exist. I know no-one who would contest this point.

In talking about the implications of the metaphorical approach, Sternberg fails to note the most important contributions that could be made by the biological approach. It would help us to learn a great deal more about the development of intelligence; e.g. EEG recordings predictive of intelligence have been made at the age of 36 hr in neonates. Queries regarding the deterioration of intelligence with age could now be answered in an objective fashion. These and many other possibilities are disregarded by Sternberg.

When discussing group differences, he states that we should be sceptical of the results "because their very existence is predicated on the basis of the geographic metaphor, and, in particular, its instantiation through conventional psychometric tests". But, of course, psychometricians are fully aware of this, and, as in Jensen's book on test bias, test the applicability of the 'geographic metaphor' before coming to any conclusions. This routine precaution surely should have been mentioned before expressing 'scepticism'.

One of the most disappointing chapters is one dealing with "The seminal views of Galton and Binet". As I have often pointed out, they are the protagonists of very different points of view, starting with the very conception of intelligence which for Galton was a unitary kind of concept, whereas Binet regarded it as a statistical artefact; namely, the average of a number of separate abilities. This vital difference, which informed most of what they had to say and influenced their choice of measuring instrument, is not even mentioned by Sternberg.

It is true, as Sternberg says, that "most research on intelligence has followed neither the map model nor the method of factor analysis". But this is not because they had "to find a new model, find a new method, or both". It is because a firm taxonomic basis has been laid, and we can now more confidently address other problems.

These are only some of the criticisms that might be made of the book, but they should not prevent psychologists interested in intelligence (and who is not?) from reading it and forming their own opinions. Sternberg is always interesting to read, however much one may disagree with his biases and preconceptions, and he often has new things to say which made the reader think. This is an important qualification, and even where he goes wrong occasionally he does succeed in raising questions that cry out for an answer. Two-and-a-half cheers for a book that might have become a standard text but just misses.

We now come to a book that is both the most ambitious and the most seriously flawed. Ceci claims to disprove the major existing theories, and to put in their place what he calls a 'bio-ecological' theory. This 'theory' is rather difficult to understand, largely because Ceci has taken to extremes the old advice to lecturers: "Tell 'em what you're going to tell 'em; then tell 'em what you told 'em." This may work in a lecture, but in a book the middle portion should be much more prominent than the preceding and subsequent ones; however, in Ceci's book it is not. He keeps telling us that he is going to slaughter the theory of *g*, or the genetic assumptions related to it, but when we come to the meat of the arguments, there is not much to be found.

Considering *g*, Ceci writes a great deal about the 'positive manifold', but his main criticism seems inappropriate. He adduces evidence that some people are very good at certain jobs, e.g. success at predicting post-time odds at the racetracks, almost regardless of IQ. One can only reply "So what?" There is ample experimental evidence that through appropriate training anyone with average intelligence can be trained to improve his performance on *g*-loaded tasks, such as repeating numbers or words, by over 1000%. In one such study (repeating words) performance rose from an average of 3 out of 40 to one of over 30. Overlearning, constant practice, high motivation, relevant mnemonics and other tricks can boost specific performances sky-high; this does not begin to touch the notion of *g*.

Ceci completely fails, here and elsewhere, to come to grips with the major arguments for *g*. He does not mention the studies of Gustafsson on confirmatory factor analysis, or of Snow on multidimensional scaling, confirming not only the notion of *g* as a statistical concept, but also Spearman's theories concerning its nature. It is difficult to take seriously a critic who shies away from even mentioning the most crucial arguments and facts favouring the theory to be criticized!

One argument strongly favoured by Ceci is that the concept of *g* as a unitary intelligence would predict what he calls "worldly success", which he measures in terms of dollars earned. The correlation is far from perfect, hence the *g* theory is disproved. But, of course, the argument is completely fallacious; as I have often pointed out, society rewards what it values, and 'brains' is not one of the most obviously prized factors. Among top earners are jazz musicians, baseball players, royalty, prostitutes, film stars, gigolos, TV personalities and many more whose IQ would at best be moderate. Worldly success does involve IQ (other things being equal, smart prostitutes do better than dull ones), but many other factors are universally recognized as making for 'success'. Ceci tries to bolster his case by quoting a study of his own, showing that at age 30 there was no correlation between IQ and earnings. He forgets to mention that doctors, lawyers, scientists, dentists and accountants only start their earning career around that age, whereas plumbers, taxi-drivers and coal-miners have already reached the highest level they are likely to reach. This refusal to recognize reality makes the whole argument slightly absurd.

One would have thought that if Ceci wanted to criticize the genetic argument he would do so on technical grounds, i.e. by stating it in its strongest terms, looking at the best evidence, and then showing weaknesses in the argument. However, he fails to mention many important sources of evidence (regression to the mean, inbreeding depression, heterosis, to mention just a few), and in particular he fails to mention the degree to which these many different approaches, subject to entirely different criticisms, agree on a common figure for heritability (as shown in detail in my book, *The Theory and Measure of Intelligence*).

Another favourite trick is to quote critics, such as Kamin or Lewontin, but without quoting the replies to such criticism. The whole treatment is desultory and not at a proper scientific level. Ceci's tendency to rely on critics, but not to go into details or allow arguments to answer the critics to be heard, comes out most beautifully in his treatment of reaction time and inspection time correlations with IQ, an important argument supporting the biological theory of intelligence. All he says is that he will not discuss this whole large body of research at all "as the problems underlying its measurements, logic and theory have been extensively reviewed and the paradigm has been found wanting". So there the reader is referred to a critique by Longstreth; of course, there is no mention of the replies to this critique, or the fact that Longstreth himself more recently obtained much the same results as everybody else, demonstrating that his criticisms were largely irrelevant. Readers who might feel inclined to take Ceci seriously may find such cavalier treatment of an important issue incredible, but worse is to come.

One of the strongest arguments for a biological theory of intelligence is the fact that irregularities of functioning in RT, averaged evoked potential measurement, speed of nerve conduction and other measures have been found to have the highest correlations with IQ, suggesting errors in transmission as a key factor in performance. The argument is, of course, subject to criticism, and so are the data; informed criticism would be most welcome. No such criticism is forthcoming, and indeed the whole argument fails to be mentioned. Such selectivity is inexcusable; readers should be able to rely on an author to present the evidence for and against a theory in a meaningful and objective fashion, and not to leave out the most relevant arguments and facts. How the readers for the Century Psychology Series allowed such a self-styled 'monograph' to appear under their aegis is difficult to comprehend; this is a famous series in which many historically important books have appeared. Heaven help the student who obtains his knowledge of intelligence from this book!

But what of the 'theory' Ceci would like to put in place of the psychometric-biological one so popular nowadays? His 'contextualist perspective' emphasises "the ecological dependency of cognitive structures, as well as their plurality and spontaneity". But does the psychometric-biological theory fail to acknowledge the context of performance? Far from it; they even base important theoretical arguments precisely on such contexts. Lynn, for example, attempts to account for differences in IQ between races, as well as differences in verbal as compared with visuo-spatial abilities, in terms of evolutionary contexts. All the workers in the field of intelligence I know are well aware of the importance of 'contexts', and the need to take them into account in cross-cultural studies. There is nothing new in Ceci's theory except its grandiose name and the uncalled-for denigrations of other theories. His 'theory' is not in fact a theory of intelligence at all; at most, it is a warning that IQ measurement of people in different cultures must take into account cultural contexts. This is hardly new, and hardly amounts to a 'theory of intelligence'. It hardly needs saying that true theories of intelligence, such as the Campbell-Furneaux-Simonton theory, are not even mentioned. This also throws an interesting light on what purports to be a book on 'intelligence'!

It should not be thought that there is nothing in the book to interest readers. There are many detailed criticisms which have to be taken seriously; there are, of course, many anomalies still in the literature which need ironing out, and Ceci does a service in pointing them out. If only he had not taken such an extreme stand, refusing to take seriously his obligation to be objective, this could have been a good and valuable contribution. As it stands, it is likely to do more harm than good.

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