Culture and cognition

The Cultural Context of Learning and Thinking: An Exploration in Experimental Anthropology. By M. Cole, J. Gay, J. A. Glick and D. W. Sharp. Pp. xx+304. (Tavistock: London, June 1974.) £1.50.

THIS book is an important attack on the problem of the relation between culture and cognition. Too often in the past psychologists have travelled the world with a kit of psychometric tests, showing that on most tests "primitive" people obtain very low scores. They have concluded either that these people are innately less intelligent than those in western society, or that aspects of their environment have hindered their intellectual development. In both cases, what is posited is an intellectual deficit, a failure to develop the most powerful cognitive structures. Recently, however, a number of psychologists have argued that cognitive skills of the same order develop in all human groups; what differs between groups is the contexts in which these skills are applied. In order to assess the skills of another culture it is necessary to understand the tasks it imposes on its members. This book describes an interdisciplinary study by anthropologists, linguists and psychologists of cognitive skills in one African society.

The authors started with an educational problem; the Kpelle children in Liberia experience great difficulty with western type mathematics. Yet in their daily lives the Kpelle use quantitative operations and argue skilfully and with logic. In order to resolve this paradox the authors developed a series of experiments that would throw light on the Kpelle concept system and their methods of learning and problem solving. They first attempted to describe the Kpelle classificatory categories, and then used them in their investigations of learning, remembering, and concept formation with groups of non-literate children and adults, and primary and secondary school children.

A brief account of one investigation will give the flavour of the work. Kpelle schoolchildren seem to learn by rote, without grasping the principle involved. The authors confirmed this observation experimentally; in classical learning tests the initial recall of the Kpelle was poor, and increases with practice were negligible. These deficits seemed to be related to their failure to impose any order or structure on the material to be learned. Performance was no better when objects were substituted for words. The authors sought ways of evoking efficient performance. Attempts to improve motivation by a variety of rewards were unsuccessful; however, when the task was structured, either by

indicating the categories involved, or by embedding the words in a story, recall dramatically improved. Only the high school students could impose structure on the learning material themselves.

From these and many other experiments, and from a study of Kpelle society, the authors conclude that the non-educated Kpelle is capable of concept-based learning, inference and logical thought, but that the situations in which he applies these skills are different and more restricted than those of his high school age mate. The findings raise many questions—for example, what learning experiences are crucial in order to develop transferability of skills—and this important book should stimulate more work by educationalists and psychologists.

BARBARA TIZARD

A theoretical view of life

Molecules and Life: An Introduction to Molecular Biology. By Mikhail V. Vol'kenshtein. Translated from the Russian by Serge N. Timasheff. Pp. xiii+513. (Plenum: New York and London, 1974.) \$9.55.

MOLECULAR biologists at work may be compared to industrial archaeologists: pieces of the machinery are carefully retrieved, dusted and measured and parts of the mechanism are put together in the test tube and made to work. This sort of activity has been in full swing for fifteen years or more and has led to an impressive, though far from complete, understanding of what makes living things tick. In the background of this activity have hovered physicists and theoreticians who have been crucial in inventing and applying new methods of gathering information and, more peripherally, who have attempted to explain the properties of interesting biological components in terms of fundamental physical theory. The latter have often impressed and sometimes enlightened the less sophisticated biochemist but I would guess that they have rarely blazed pathways for molecular biology.

Academician Volkenshtein has made important contributions to our understanding of polymers and several other fields and has in recent years turned his interest to biology. One of the fruits of the latter interest is this volume—first published in the Soviet Union in 1965 and now available in revised form in English in a paperback edition. As the author says in his preface the book deals principally with the structure and function of nucleic acids and proteins but, throughout, the quest of the theoretician for regularities and generalisations is apparent. This is first manifest in the first chapter which is devoted to grand concepts such as statistical mechanics, irreversible thermodynamics

and information theory. These notions and their application to biology are explained with admirable clarity but one is left with the feeling that they are not of immediate relevance to the working molecular biologist in that they tend to disappear into abstraction. To take one example, an argument is presented in refutation of the hypothesis of the inheritance of acquired traits in terms of the proposition that no flow of information from somatic to sex cells has been detected. I am sure he is right but an experimental fact or so might have been more convincing. In similar vein, the text which is otherwise descriptive breaks into mathematical derivation and matrices and their Eigen values loom up from the pages. These may deter the biologist and it would be better to have a degree in physics or chemistry with some mathematical experience before embarking seriously on this book. But this is not meant as a criticism and more experienced workers will find much to interest and enlighten them in this book for topics not covered in similar works are given space; simple treatments of helix coil transition theory are hard to find and the sections on the genetic code and on polymer conformation are especially interesting.

Nevertheless, the graduate student entering the field for the first time and to whom I hesitate to recommend this book should beware of several errors and misleading passages. One of the more serious occurs in the chapter on protein structure. There, the idea is presented that the success that Perutz achieved in the X-ray crystallography of haemoglobin by using heavy atom derivatives had something to do with making the diffraction spots sharper and revealing the location of the hydrogen atoms, rather than being the crucial method of overcoming the phase problem that it was. In the chapter devoted to a cytological description of the living cell, no prominence is given to the distinction between prokaryotes and eukaryotes and the significance of the single sentence that says that bacteria do not have a visible nucleus is unclear.

Again, as is to be expected in a book first published in 1965, much recent work is not mentioned and hence there is little on ribosome structure, protein synthesis or the structure of tRNA, to mention just a few topics. In fact there are few references dated later than 1965 so to read this book in isolation would give a somewhat antiquated picture of the state of molecular biology. One would question the wisdom of issuing a paperback edition of a book first published nine years previously were it not for the distinctive flavour of the approach and the light it may throw on thinking on molecular biology in the Soviet Union.

E. G. RICHARDS