

Less than total recall

Stuart Sutherland

Human Memory: Theory and Practice. By Alan Baddeley. *Erlbaum: 1990. Pp. 515. Hbk £25, \$39.95; pbk £11.95, \$19.95.*

A RECENT dictionary defines "Boxology" as "The construction and ostentatious display of meaningless flow diagrams as a substitute for thought". *Human Memory* contains some splendid examples. One has sixteen arrows connecting thirteen boxes, which are given such labels as encoding, recoding, conversion, cognitive environment, original engram and recollective experience. Even so, the author admits, the diagram is "a simplified version of the original". Just how the processes subsumed in each box are carried out, we are not told.

The main point of the diagram is that if anyone wants to recall material presented on a particular occasion he needs not only to remember the material but to have associated it with that occasion. Everyone already knows the word 'cold', but not everyone dragooned into being a subject in a psychologist's laboratory will recall that it was one of the fifty words read out to him there. Indeed, as Endel Tulving showed in a famous recent experiment on memory, the subject may fail even to recognize a word as part of the ensemble presented if given the wrong cue for retrieval, while being able to recall it if given an appropriate reminder of the occasion. (This finding was thought remarkable because normally recognition is much superior to recall.) The principle that one can remember what happened on a given occasion only if the events have been associated with it may well strike readers as rather obvious, but apparently it came as a surprise to workers in memory: it has been given the grandiose title "synergistic memory theory".

Baddeley does a competent job of expounding such experiments. He lays considerable stress on what he calls "theories", though for the most part they are vague speculations little better than dressed-up common sense. Work on human memory seems to make little progress, although this is not for want of effort, if one counts effort in man-hours rather than in intellectual exertion. There is still no clear answer to that old examination chestnut "Why do we forget?" Is it that the traces laid down in the nervous system (presumably changes in connectivity at synapses) decay spontaneously with time? Is it because material learned more recently changes the connections made in previous learning and hence makes it harder to retrieve the original material? Or do new traces fade more quickly than old ones so that if the mater-

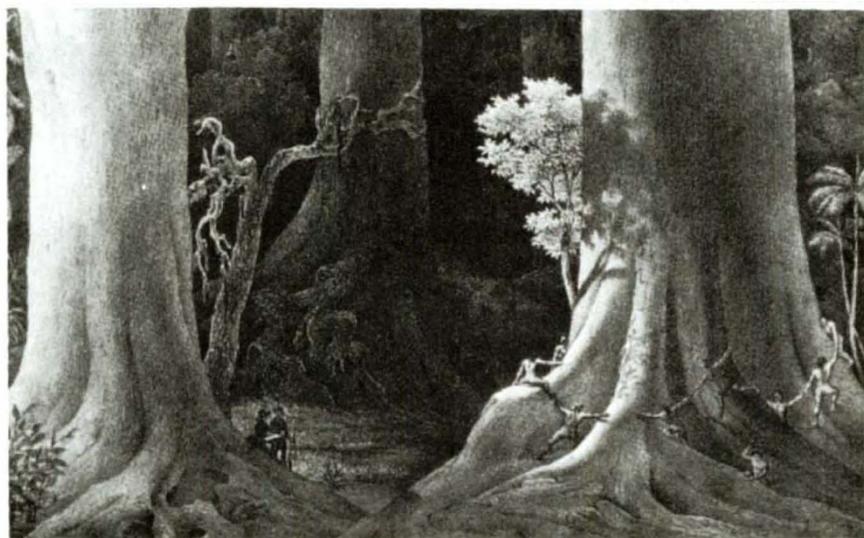
ial to be learned is similar to that already learned, the earlier material comes to overshadow the later? Are memories preserved only as a result of calling them to mind periodically? Or was Freud right in thinking that anything unacceptable to the ego is repressed and hence unavailable at a conscious level?

We do not know whether spontaneous decay of memory traces occurs, but we have known for many years that forgetting is increased by learning similar material either before or after that on which a person is tested. Baddeley is sceptical about repression, but points out that people asked to remember events from their early life remember a greater number of pleasant than unpleasant ones — but he fails to note that perhaps there really are more pleasant than unpleasant events. Not surprisingly, there is a tendency to recall more sad events when one is unhappy than when happy, and to colour one's interpretation of previous events with the current sadness. Oddly, there is little or no change in the number of happy events recalled depending on one's mood, though one may doubt how far laboratory manipulations really succeed in inducing either sadness or happiness.

Baddeley has curiously little to say about one of the most interesting recent

discoveries in memory research. Explicit memory is the deliberate recollection of an experience, whereas implicit memory is the influencing of a response by a previous experience without the person knowing that he is being influenced. For example, if someone has recently read a list of words including the term 'clock', and is then asked to fill in the missing letters in 'clo--', he is much more likely to respond to 'clock' than 'close' even though he has no conscious recollection of having seen the word 'clock'. Such implicit memory differs from explicit memory in several ways, some of which are as follows. Changing the modality in which the word is presented, from, for example, vision to hearing, has no effect on explicit memory but decreases implicit memory. Asking subjects to process words at a high level, for example by thinking of their meaning rather than just their sound, improves explicit memory, but has no effect on implicit memory. The rate at which words are forgotten is very different (in rather complex ways) for the two kinds of memory. Learning new but similar material impairs explicit but not implicit memory. The two kinds of memory appear to be entirely separate because there is almost no correlation between success on the same item in an implicit and explicit memory task. Although Baddeley ignores these striking results, which are relevant to consciousness, he does mention that many amnesics with little or no explicit memory have comparatively intact implicit memory.

One unusual feature in what is basically a textbook on memory is the account of the application of work on learning to the



Land of the giants — early European travellers came back with over-awed and exaggerated descriptions of tropical rain forests; the engraving above (originally from *Flora Brasiliensis*, 1840) shows an artist's impression of a scene in the Atlantic coastal forest of Brazil and is reproduced from *An Introduction to Tropical Rain Forests* by T. C. Whitmore. This book describes the rain forests, their structure and dynamics, flora and fauna, and discusses their value to mankind and our impact on them. With examples taken from all parts of the humid tropics, the book is aimed at the general reader. Published by Oxford University Press, price is £35 (hbk), £16.95 (pbk). □

treatment of the mentally disordered. This section is, however, skimmed and as Baddeley himself remarks "the conclusions that I draw . . . are, therefore, inevitably superficial". A second innovation is a chapter on treatment for amnesic patients, but the results are meagre. Persuading these people to associate names with visual imagery helps them remember the names, while their memory for the substance of a passage of text can be improved by the PQRS technique (preview the material; question to find the salient points; read carefully; state the main features of the text; and finally test oneself by checking memory for the text against it). Both techniques are of course known to help unaffected people a little, although they are based on common sense rather than psychological findings.

Although lacking in excitement, the book is for the most part competently written, provided you can bear the repeated misuse of the expression "as such". The same cannot be said for the index, which is a disgrace. The contents are not memorable: only readers adept at the PQRS technique are likely to commit them to mind. □

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Forcing the tissue

R. H. T. Edwards

Skeletal Muscle in Health and Disease. A Textbook of Muscle Physiology. By D. A. Jones and J. M. Round. *Manchester University Press: 1990. Pp. 221. Hbk £29.95, \$49.95. Pbk £9.95, \$17.95.*

FOR hundreds of years, skeletal muscle has presented an intriguing challenge to those interested in understanding the generation of force and other physiological and metabolic properties of this tissue. The principal models that are the basis of our understanding of skeletal muscle structure, function and chemistry are largely derived from studies of muscle isolated from various animals. Over the past 20 years, the growth of methods of chemical analyses of needle biopsy samples and electrical stimulation techniques has been quite remarkable, allowing human muscle to be studied to something approaching a degree of precision similar to work on isolated muscle. The authors of this book have distilled in their short volume a wealth of experience in developing and applying techniques for the study of human muscle in health and disease.

The strength of the didactic account of the subject given here lies in the fact that both authors are laboratory researchers who have worked in clinical departments, with the result that discussions on basic mechanisms are extended to man by, for example, descriptions of a cross-section of muscle obtained by X-ray computerized tomography and a wealth of (admittedly monochrome) photomicrographs of muscle in various pathological states. The account of muscle structure and function is greatly helped by illustrations of the structure and inter-relations of particular cellular components. Classical muscle physiology is concisely but authoritatively covered with a profusion of specific examples on different isolated muscle preparations.

The growth and development of muscle and the implications for athletic performance lead on to an up-to-date account of modern concepts of physical training. This account is particularly interesting in view of the authors' own observations on the relationship between cross-sectional area measured by X-ray tomography and the increase in maximal isometric strength with training. Force has long been known to be proportional to cross-sectional area of muscle, but it has not been at all clear how muscles can become stronger with little or no increase in cross-sectional area. The authors suggest that tethering by new connective tissue increases force through

a reduction in effective fibre length. Also of interest to athletic performance is the section on the adaptations for endurance exercise, which covers well-documented work carried out in Scandinavia, the United Kingdom and in North America on the energy supply processes for muscular activity.

The sections on fatigue and pain are those in which the authors make their most original contributions. Their account of the complexities of the mechanisms underlying fatigue in isolated muscle and in human subjects is commendably clear and concise. Vigorous muscular activity is always at risk of causing muscle damage or pain, and it is refreshing to see the systematic analysis of the mechanisms underlying these based on experimental observations.

In the final section, the authors consider the reactions of muscle not only to mechanical damage but also to the consequences of disease. Muscle as a specialized tissue responds to insult in relatively few ways. What is seen as compatible with a particular clinical diagnosis comprises both primary features and (often more obviously) secondary adaptations to damage or compensatory use. Jones and Round provide examples of these adaptive responses obtained from biopsies from people with Duchenne muscular dystrophy, spinal muscular atrophy and inflammatory muscle diseases.

The value of percutaneous muscle biopsy as a tool to give a 'life vision' (*Bios, Opsi*) to supplement the physiological and metabolic study of human muscle disease is obvious. The recent, rapid increase in our knowledge of the muscular dystrophies obtained from molecular-biology methods is summarized here for Duchenne and Becker muscular dystrophies, together with reference to the possible physiological role of the cytoskeletal protein dystrophin which is absent in people with these types of muscular dystrophy.

This text is likely to become a standard for student courses on cell biology, physiology, sports sciences and research methods in physiotherapy. The book deserves a wider readership, however, as an exciting introduction to the rapidly expanding field of muscle biology and how it has influenced our understanding of human muscle performance and the pathophysiology of muscle disease. □

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■ Some of the techniques mentioned above are covered in *Scanning Electron Microscopy, X-Ray Microanalysis, and Analytical Electron Microscopy*, new from Plenum. This laboratory workbook, by Charles E. Lyman *et al.*, provides exercises for students developed at courses held annually for the past few years at Lehigh University. Spiral bound, price is \$29.95. □

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