

studies and quantum efficiency measurements, are discussed in detail. There is also a useful account of thermal processes in samples and sample depth profiling, and thickness measurements using the photoacoustic effect are considered. The final two chapters of the book are concerned with more specialized instrumental topics: photoacoustic spectroscopy at low temperatures and photoacoustic microscopy.

During the past decade studies involving the photoacoustic effect have increased dramatically and the range of instrumental methods and applications is now widespread. In producing this book, the first of its kind to deal exclusively with photoacoustics, Dr Rosenzweig has succeeded in including a discussion of all the major topics currently being investigated employing the techniques. With its wide-ranging coverage, the text will be of interest not only to those actively engaged in photoacoustic research but also to spectroscopists seeking a detailed introduction to the technique and its possible use in their own field. □

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## Earliest technology

J.A.J. Gowlett

*Premiers Outils Taillés D'Afrique.* By Hélène Roche. Pp.263. ISBN 2-901161-146. (Société d'Ethnographie, Paris: 1981.) 80F. Available from C. Klincksieck, 11 rue de Lille, Paris 7.

"FEEL good" wrote Johanson in his diary just before discovering the early hominid remains of "Lucy". It was good too that Hélène Roche, a French co-worker in the same Afar region of Ethiopia, succeeded in finding the earliest stone tools yet known (c. 2½ million years old), which now gain mention in a book of wider scope. Her book, though, is not so much the popular introduction which the title might imply, but rather a painstaking exercise in the study of early stone technology. English texts on early man abound, but a book in French is rarer, and deserves to find an audience. Central questions are approached thoughtfully: "What is the significance of the acquisition of tools in the process of hominization?" is an issue too often swept aside by currently favoured theories which stress social factors, such as food sharing, in human evolution. Here, in contrast, the flaked stone tools, which preserve sequences of individual decisions from the distant past, are seen as an important aspect in early man's progress, encouraging technical awareness, aptitude and skill.

The heart of the book is a statistically

presented examination of the manufacturing routines employed in fashioning "worked pebbles". It seems a pity that some key sites, including those at Afar, are treated only in the useful introductory chapters, and that the main study hangs on just two samples from Olduvai and two from insecurely dated sites in Morocco – but then, nobody has access to material from all the early sites.

There are some debatable points of terminology or fact (*Australopithecus africanus* has not been found at Baringo), but Roche is surely right to criticize prehistorians for continuing to use terms like "chopper" even though we now intend no functional implication.

Roche concludes that simple tools were fashioned by using only certain preferred flaking sequences, amongst a range of possible routines, thus showing a consistent human desire to "get out" a worked edge from the raw material. But could they have been made differently? Some workers will argue that a worked pebble can only end up in certain forms. Nevertheless, Roche makes perceptive points about early human conceptual abilities, and her book offers much food for thought. □

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## Notes on the birth of experimental psychology

O.L. Zangwill

*An Education in Psychology: James McKeen Cattell's Journal and Letters from Germany and England, 1880-1888.* Edited by M.M. Sokal. Pp.372. ISBN0-262-19185-7. (MIT Press: 1981.) \$30, £18.60.

WILHELM Wundt (1832-1920), an unsuccessful physiologist who held the Chair of Philosophy at the University of Leipzig for many years, is remembered as the founder of the first laboratory explicitly dedicated to the pursuit of experimental psychology. It opened in 1879 and soon began to attract graduate students from all over the world – and in particular from the United States – drawn it would seem less by the profundities of Wundt's thought than by the promise of his laboratory. Accordingly, it was to Leipzig that a 20-year-old American graduate, James McKeen Cattell, the son of a Presbyterian Minister who was also Principal of the College from which his son had graduated, directed his footsteps.

Cattell studied under Wundt for two years. He then returned to America and for a year held a teaching post at Johns Hopkins University, which however he relinquished in order to return to Leipzig and to become, largely at his own initiative, Wundt's assistant. Their work at this time was largely concerned with the measurement of reaction times, then a very popular preoccupation of psychologists and which has in recent decades regained much interest as a result of contemporary concepts of human information processing. Cattell's work was published in both German and British journals (including *Mind* and *Brain*). He obtained his doctorate at Leipzig in 1886 and spent the greater part of the next two years at St John's College, Cambridge, which has a long-standing reputation as an institution sympathetic to experimental psychology.

Cambridge had at that time no Department of Experimental Psychology and a proposal set in train by James Ward in 1877

that a psychophysics laboratory be instituted was vetoed as disrespectful to the dignity of mind. While unable to proceed further with his experiments on reaction time and associative processes, Cattell's journal and letters report exciting discussions with philosophers such as Ward and Henry Sidgwick, neurologists such as Ferrier and Hughlings Jackson and, most significant of all, the polymath Sir Francis Galton. Indeed in his year or two at Cambridge Cattell acquired from Galton a major interest in the measurement of individual differences in mental capacity which owed nothing to his years with Wundt and which did much to shape his work at Columbia in the earlier decades of this century.

This selection from Cattell's journal and letters, mostly to his parents, together with some of their replies, provides an interesting picture of the impact of Europe on a sensitive and intelligent young American psychologist in the penultimate decade of the last century. While some of his judgements, particularly on matters aesthetic, are naive in the extreme, others reflect an intellectual dedication and whole-hearted devotion to science which might well have led to much more important original research had the young author decided to act on his original plan to remain permanently in Cambridge. (As it was, Cattell's later career was largely that of an organizer of research and an academic administrator, and he cannot be rated as in the top flight of American psychologists of his period.) The material has been assembled and edited with scholarship and care, though it is perhaps a pity that many passages labelled as "gossip" have had to be excluded. If one's interest lies in the man rather than in his work, which appears to be the case here, his gossip may provide much more interesting clues to his character than the details of his work, his travels and his social encounters with the distinguished.