effects of the fluctuations in women's status in the American scientific scene, as well as the social and personal obstacles that lay in their paths. Many men, such as Amos Rennselaer, helped from deep conviction; many women, such as Dean Laura Gill of Columbia, hindered — equally from deep convictions. With humour and barbed shaft, Margaret Rossiter has provided a book that, in fact or analysis, in reference or bibliography, is a splendid and totally satisfying feast, whetting the appetite for the next volume that will bring the record from 1940 up to the present day.

Beyond the present who can say what new pressures may influence the status of women in science, whether in Europe or in America? There are some who argue that the position is now getting worse again as the pendulum swings once more. Rossiter's wry comment on the early pioneers was true in the nineteenth century and in the prime of Barbara McClintock's life in the 1930s: "If one wishes to introduce seemingly radical reforms it helps to be personally discreet and socially conservative". There is no reason to suppose that it is not true now. *Plus ça change...* □

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Place for a quiet revolution

Derek A. Roe

The Middle Stone Age at Klasies River Mouth in South Africa.

By Ronald Singer and John Wymer.
University of Chicago Press: 1982.
Pp. 231. \$30, £24.

FROM time to time, discoveries are made which radically change our perception of some segment of the past. It happened, for example, in the 1960s, when potassium-argon dating suddenly almost doubled the Lower Palaeolithic time-scale and the estimated age of the Plio-Pleistocene boundary. Over the past 15 years, there has been an almost as drastic if rather more gradual reappraisal of the age and status of the sub-Saharan Middle Stone Age (MSA). Klasies River Mouth, on the Tzitzikama coast of South Africa, is one of the crucial sites in this quiet revolution, and this volume gives a definitive account of the archaeological, geological and environmental research carried out at the group of caves and rock-shelters there. Hitherto, only the fauna and sediment stratigraphy had been reported on, so this publication had been eagerly awaited.

The conventional view of the MSA of southern Africa, virtually unchallenged even ten years ago, made it broadly contemporary with the Upper Palaeolithic of the Northern Hemisphere, beginning perhaps in the 30,000s and possibly lasting until the end of the Pleistocene. True, the stone tools did mostly resemble those of the much earlier Middle Palaeolithic in the north, where many people would have called them "Levalloisian" or "Mousterian"

without a second thought, but it was assumed that in southernmost Africa there had been no "real" Upper Palaeolithic and old techniques would therefore have lasted on. The extent of the reappraisal is that we now see the MSA as well established by 120,000 years ago, perhaps substantially earlier; in most places it must have ended well before the date when it was previously assumed to begin. It has therefore become a chronological as well as a technological equivalent of the northern Middle Palaeolithic, which makes excellent sense. The South African Late Stone Age, incidentally, has expanded to fill most of the gap, but that is another story.

The role of Klasies in all this has been to provide by far the longest and richest MSA sequence, with its earliest stage closely related to a marine transgression of "Last Interglacial" age, almost certainly of oxygen isotope stage 5e (120–130,000 years ago). The caves and shelters are interpreted in combination to yield a remarkable single sequence, including an unbroken succession of deposits no less than 18 metres deep, with signs that a further 6 metres may have been lost by erosion. More MSA deposits follow, before a long break, which may exceed 50,000 years; afterwards, "strandloper" middens accumulated, rather late in the Late Stone Age. The Middle Stone Age sequence is divided into MSA I–IV, the four stages showing only minor variations in their tool-kits, which were based on the production of flakes and flake-blades from prepared cores. The erosional break referred to above comes between MSA III and IV. But between MSA II and III comes a substantial and important occurrence of what is called Howieson's Poort material — a strikingly different and forward-looking industry, with smaller and narrower flake-blades, probably punch-struck, many of them worked into

Years BP	Environment	Archaeology
c. 2,500	Sea level near present. Dry climate.	LSA II shell midden
c. 4,700	Sea level near present. Cave damp.	LSA I shell midden
c. 5,000 	Major stalagmite formation. Erosion of external midden and front of cave deposits. Sea near present level.	No occupation
c. 65,000 c. 70,000	Major drop in sea level: oxygen isotope stage 4. Wet. Aeolian sand covers the cave deposits.	Sparse occupation of MSA IV
c. 80,000	Dry	MSA III
c. 95,000	Sea near present level. Cooler and dry.	Howieson's Poort industry
c. 105,000	Sea level at 4–5 m O.D.	MSA II
c. 115,000	Sea near present level.	MSA II
c. 120,000	Slight fall in sea level.	Initial occupation of MSA I, with <i>Homo sapiens sapiens</i>
c. 125,000	Main cave eroded or re-modelled at time of major transgression of 6–8 m sea (oxygen isotope substage 5e).	No occupation

Klasies River Mouth, Eastern Cape Province, South Africa. Time scale based on relative sea levels, environmental interpretation and external stratigraphic inferences by Karl W. Butzer, correlated against major archaeological divisions by John Wymer. The Middle Stone Age (MSA) of South Africa is based on production of substantial flake-blades from prepared cores, resembling the Levallois technique as found in Europe, the Levant and North Africa. The Howieson's Poort is a semi-microlithic industry with small scrapers, graters and various backed blade types. It is the earliest known industry of this kind, with certain technological similarities to the Upper Palaeolithic industries of Europe and western Asia which go back to c. 35–40,000 years ago.

"semi-microlithic" tools such as crescents and trapezes. The stratigraphic position of this material is unequivocal. Discussion of the dating and geological correlations of the Klasies sequence allows for "long" and "short" chronologies at this stage; the shorter reading would make the Howieson's Poort industry 30–50,000 years old, but the authors prefer a longer chronology, which would entail an even more surprising age of c. 95,000. When work at Klasies River Mouth began, the few Howieson's Poort occurrences known were regarded as transitional between the Middle and Late Stone Ages.

In spite of Upper Pleistocene marine fluctuations, the site remained on or near the coast throughout the MSA; its long abandonment after MSA IV probably corresponds to the main regression of the Last Glaciation. The MSA levels document in detail the evidently highly successful

results achieved at Klasies River Mouth, which may indicate the importance of this publication. Excavation at Klasies began in 1966 and marks, with the work of certain others at about that time, the start of a new and extremely fruitful period in South African archaeology, which has since seen many excavations of high quality, backed by painstaking and imaginative laboratory work of many kinds. A tremendous amount of new information has been won, with consequent radical changes in our understanding of the local sequence over

almost the whole prehistoric period. The surge forward is continuing and there will be much more to come even during the present decade. Meanwhile, Ronald Singer, John Wymer and their colleagues are to be congratulated on their achievements at Klasies River Mouth, so clearly set out in this handsome and well-illustrated volume. □

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Changing our perception of the past — the Klasies River Mouth cave and shelter complex.

human exploitation of coastal resources, for which there is little evidence anywhere from earlier sites. Collecting of shellfish predominated; marine mammals and sea birds were hunted and stranded fish taken, but there seems to have been no regular fishing.

Various hominid remains also came from the MSA levels: no burials, alas, but quite a worthwhile aggregate of bits and pieces. The authors are satisfied not merely that *Homo sapiens sapiens* was established in this area by the end of the MSA, but also that he made the earliest MSA industry at the site. If so, we presumably see here the earliest representatives of that sub-species yet discovered; their presence in southernmost Africa so early will clearly need to be taken into account in all theories of the final stages of human evolution further north. Sadly, no hominid remains occurred with the Howieson's Poort industries, which present a classic interpretive dilemma: do the innovative changes in the tool-kits represent indigenous adaptations to new ecological circumstances, or do they imply a new and intrusive population? The authors clearly prefer the latter interpretation, and associated hominid material might have offered decisive evidence.

These, then, are some of the far-reaching

Shaking behaviour

Chi-Yu King

When the Snakes Awake: Animals and Earthquake Prediction.

By Helmut Tributsch.

MIT Press: 1982. Pp.248. \$27, £18.

REPORTS of strange behaviour by animals shortly before earthquakes are common. For example, cats picked up kittens and left houses; dogs barked madly; pigs bit each other; fish jumped out of water; and snakes awoke from hibernation, crawled from their burrows and, in some cases, froze to death on snow-covered surfaces.

Until recent years such reports and suggestions that abnormal behaviour might be related to earthquakes were largely ignored by Western scientists, primarily because most of the observations were anecdotal in nature and made by people who were not scientifically trained and might have been biased by the excitement after the earthquakes. Besides, it was not clear how animals could sense the coming of an earthquake, while human beings and their instruments commonly could not.

However, as more and more observations of this kind were made known, a small but growing number of scientists began to examine the possibility of animals' earthquake premonition. In 1976 and 1979, the US Geological Survey, the Government agency in charge of the national earthquake-hazard-reduction programme in the United States, convened two separate scientific conferences on this topic. In China, abnormal animal behaviour not only was observed by numerous people before earthquakes but also has actually been used as one of the very few methods to predict earthquakes on a short-term (hours to days) basis since the 1966 Xingtai earthquake.

One of the scientists who have been recently intrigued by this phenomenon is Helmut Tributsch, a physical chemist, who learned of abnormal animal behaviour from the survivors of the 1976 Friuli earthquake that destroyed his home village in northern Italy. He then diligently searched the literature and collected anecdotal reports on 77 other earthquakes. His findings are presented in *When the Snakes*

Awake, originally published in German in 1978. In the book he also describes observations of several other phenomena thought to precede earthquakes — fog, lights and sounds — and discusses various hypotheses. On the basis of the available circumstantial evidence, he makes a strong argument for the attribution of these phenomena to an increase in the number of electrostatically charged particles in the atmosphere, generated by the tectonically stressed crust.

Written for laymen as well as the scientist, the book contains some simplified geophysical statements that may not be rigorous enough for the experts. Seismologists, for example, will probably be annoyed by Tributsch's frequent use of the words "force", "intensity" and "strength" interchangeably with "magnitude" in describing the size of earthquakes; volcanologists may disagree with the statement that "volcanic eruptions are special cases of earthquake activity" (p.55); and physicists will be dissatisfied by the absence of direct evidence for the postulated release of charged aerosols from the crust and by the absence of a credible mechanism to account for such a process. In addition, more consideration should probably have been given to the possibility that animals react to several geophysical and geochemical stimuli, and of a tectonically induced increase in the outgassing rate before earthquakes. Production in the biosphere of a significant amount of deep-earth gas, which differs considerably in chemical composition from the normal atmosphere — less oxygen and more methane, water vapour and radon — seems to be quite capable of causing not only most of the above-mentioned pre-earthquake phenomena but in addition the postulated charged-aerosol increase itself.

Irrespective of the above-mentioned criticisms, this book is, to my knowledge, the most comprehensive treatment on the subject in English; Tributsch's writing is rational, lucid and interesting. I expect that the book will stimulate further studies by scientists, as well as catch the attention of the general public living in earthquake-prone countries. □

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