and his lucid and authoritative writing conveys the excitement of the field. Human migration patterns in ancient times, the causes of terrible epidemics in the distant past, and many similar questions can now be defined by DNA analysis.

Because DNA decomposes by chemical decay with time, it has not been possible to extend molecular analysis into the very distant past, beyond about 100,000 years. However, the development of ultrasensitive sequencing methods for proteins, which are more stable, might push the time barrier a little further. The oldest DNA fragments yet recovered are short stretches of mitochondrial DNA from woolly mammoths and mastodons. Not surprisingly, their DNA sequences show great similarities to modern elephants. But the interesting fact has emerged that there were many quite distinct types of mammoths, and so elephants represent merely a small remnant of a once-great pattern of diversity.

The retrieval of DNA sequences from Neanderthal bones, slightly less old than the mammoths, has been a particular triumph in this field of research, and has greatly elucidated the distinct differences between early humans and Neanderthals. A decade ago, before it was realized that DNA cannot be preserved for millions of years and contamination with modern DNA is a major technical problem, there were several overly optimistic reports on the apparent recovery of DNA from insects entombed in amber and other potential sources more than 100 million years old.

The recovery of DNA from a dinosaur bone made the headlines in both the scientific and daily press. It was followed by the dampening discovery that this particular DNA sequence was identical with a piece of human junk DNA, a fragment of mitochondrial DNA that had found its way to the cell nucleus and been integrated as a pseudogene during evolution. It is not often that molecu-

lar biology turns into farce, but in the published discussion that attempted to explain this amazing finding, the possibilities were raised that a roving dinosaur had entered the laboratory and contaminated a piece of equipment, or that in the distant past intercourse had taken place between a dinosaur and a human individual. Jones recounts the absurd story totally straight.

The contamination problem remains the greatest difficulty in this dynamic new area of research. In a recent conversation with one of the leaders of research into ancient DNA, I was told how he had handed a famous palaeontologist a brownish, ancient human skull from a museum collection with a query as to whether the skull had been coated with varnish. The palaeontologist gripped the skull with both hands, stretched out his tongue, licked the top of the skull and decided from the taste that the skull indeed had been varnished. In the process, large amounts of modern human DNA would have been transferred to the skull, hampering any future search for traces of remaining ancient DNA fragments. Perhaps archaeologists should change their field techniques and use sterilized instruments, protective clothing, plastic gloves and face masks during their digs.

The book's final chapters describe how the molecule hunt continues. Jones is more circumspect and less authoritative here dealing with microbiological problems, in particular with regard to recent bizarre claims that very ancient bacterial spores might be revived. It requires considerable wishful thinking to believe that bacteria recovered from an excavated fossil or salt crystal are as old as the fossil itself, especially if the bacteria are common extant ones. The only credible way to retrieve very ancient inherited information would be by identifying a slowly propagating organism, halted in its evolution and possessing unique properties clearly not shared by other existing species.

Perhaps some cold and hostile ecological niche, with a reducing, anoxic environment similar to that of Earth a couple of billion years ago, continues to shelter a lurking primitive microorganism that has retained an inefficient early version of the genetic code, or even a chemical precursor form of modern DNA. The isolation and propagation of such a molecular coelacanth would be received with astonishment even by the scientific world, and would teach us much about the origins of life.

The chances of finding something may not be great, but very little work has been done on anaerobic systems from this point of view. In fact, the odds seem rather better than those on the futile and costly search for life on Mars.

Tomas Lindahl is at the Clare Hall Laboratories, Imperial Cancer Research Fund, South Mimms EN6 3LD, UK.

Modern values in post-modernism

The One Culture?

A Conversation about Science

edited by Jay A. Labinger & Harry Collins
Chicago University Press: 2001. 322 pp.
\$17, £12 (pbk)

John Ziman

Without a doubt, people ought to have a better understanding of the status of scientific knowledge. Yet most scientists know little — and care even less — about the 'science wars'. This courteous exchange of views between a few of the active partisans may help them to resolve some of their mutual misconceptions, but does little to enlighten the ignorant eavesdropper. What is all the argy-bargy about?

The bogey word, and one that is not much mentioned in *The One Culture*, is 'post-modernism'. Despite all the intellectual atrocities committed in its name, this was a legitimate reaction against the doctrine of 'modernism'. It questioned the idea that formal rationality was the sure way to happiness, goodness and beauty. At first, the 'culture wars' raging in the arts and humanities seemed of no concern to natural scientists, but the post-modernists also unmasked many social pathologies that claimed 'scientific' authority. Science itself, the traditional stronghold of modernism, became a strategic target of their critique.

The gates of the citadel were inadvertently opened by Thomas Kuhn in 1962. His admirable historical study of scientific revolutions could be read as a scholarly justification for complete metaphysical relativism. He seemed to be saying that apparently secure scientific knowledge was never more than the collective opinion of a particular social group, and could thus be debunked by reference to the views of other groups. Philosophically speaking (as several of the contributors to *The One Culture* point out), total scepticism is old hat, and essentially vacuous. Nevertheless, it remains the principal (unsmart) weapon in the 'science wars', and is not adequately countered by equally naive mantras (also uttered here) that scientific knowledge is really, really true.

More constructively, Kuhn was drawing attention to the social factors that influence the production of scientific knowledge. Strangely, this influence had been systematically denied by philosophers. Perhaps they were so focused on the hypothetical ideal of finally revealing scientific truth that they felt they could overlook the messy human processes along the way. Unfortunately, scientific knowledge is always on the road, so its current state is inevitably affected by where it is or has just come from — that is, by the ideas and interpersonal communications of

the researchers and research institutions that produce it.

Most participants in the debate agree that science has nothing to fear from a closer study of its social features. Indeed, they accept that it is only by understanding the creative and critical practices by which scientists cooperate and compete that we can fully appreciate the status of scientific knowledge — the extraordinary reliability of some parts of it and the horrible uncertainty of much of the rest. How come, then, that sociology is widely perceived as 'anti-science'?

This conversation doesn't resolve the puzzle. In the book, the so-called 'sociology of scientific knowledge', or SSK, fills the stage. But despite their self-proclaimed relativism, its proponents repeatedly insist that they too are faithful supporters of the scientific enterprise. In any case, the innocent reader should not accept their claim to be speaking for the whole field of 'science studies'. As the admirably broad-minded contributions of Michael Lynch and Steven Shapin show, SSK is actually only one of the many guerilla bands that operate in this wide-open academic territory.

What the SSKers say again and again in this rambling conversation is that their relativism is strictly "methodological". As their avowed leader Harry Collins puts it, they are carrying out an "amoral analysis", in which they "leave the scientists to decide on the truth" while "recording the argument without taking sides". The practices and beliefs associated with a research project in physics should be treated "symmetrically" with those associated with, say, the casting of a horoscope or the detection of a witch among the Azande of Sudan. Indeed, the adherents of SSK say that they are just ethnographers, like Edward Evans-Pritchard, who adopted a similar stance in order to demonstrate the innate rationality of pre-scientific cultural systems.

Unfortunately, as most social scientists

now acknowledge, this highly desirable objectivity is nowhere near attainable. The conversation does not include any sociologists or ethnographers outside the narrow speciality of the sociobiology of science, so it is never pointed out that outsiders don't necessarily have a clearer view of a culture than the people who live inside it. In practice, methodological relativism shades into rhetorical affectation, dangerously compromising the sincerity of the 'science studier' in the eyes of the 'studied scientist'. Thus, to preserve a semblance of consistency, SSK overbalances into full metaphysical relativism, where its pro-science protestations sound very thin.

What has SSK actually taught us? Principally, it has shown us that scientific research is 'really' just like any other human activity. Big deal! In fact, this unsurprising outcome was written into the initial script. SSK aims to tell everyone what they should know about science, but aborts its own mission by perversely bracketing out the social peculiarities that differentiate science from other modes of knowledge production. Thus, it has nothing to say about the practices that seem to make scientific knowledge so remarkably reliable for certain purposes.

SSK is just too conceptually limited to answer the questioning title of this muddled, muddling book. The 'pro-science' conversationalists here are all physical scientists, so they fail to see that the natural world has many different aspects, each inspiring a somewhat different scientific culture. Or should one say that the natural and human sciences, including SSK itself, are all subcultures of modernism, all challenged by the post-modern critique, and all really on the same side in the science wars?

John Ziman is at 27 Little London Green, Oakley, Aylesbury HP18 9QL, UK. His most recent book is *Real Science: What It Is and What It Means* (Cambridge University Press).

A life of good taste

Fine Wines and Fish Oils: The Life of Hugh Macdonald Sinclair

by Jeannette Ewin

Oxford University Press: 2001. 240 pp. £25

Tom Sanders

The nutritionist Hugh Sinclair (1910–90) was the archetypal Oxford don: erudite, urbane but disorganized, and an accomplished and witty speaker with an astonishing repertoire of nutritional anecdotes. This biography, however, which borders on being a hagiography, focuses on Sinclair's work, particularly his Oxford Nutrition Survey, his role in stimulating research on essential fatty acids and his unsuccessful struggle to establish a department of nutrition at Oxford University.

Sinclair's father was an elderly army colonel, who died when Sinclair was at boarding-school, and his mother, a member of the wealthy Scottish aristocracy, lived with him until her death in 1969. Sinclair was proud of his ancestral heritage and was an inveterate snob. Educated at Winchester and Oxford, he cultivated a taste for entertaining and fine wines while at Magdalen College. Having purchased life membership of the Middlesex Cricket Club aged nineteen, and inveigled himself into membership of the Athenaeum Club, Sinclair had a sound base from which to network with the influential scientists and magnates of his day. He read widely, travelled extensively and was able to meet some of the world's great nutritional scientists. Indeed, it could be said that he spent more time travelling and attending conferences than doing research.

Sinclair was director of the Oxford Nutrition Survey, which aimed to assess the prevalence of malnutrition among the British population. As it evolved, the survey grew more complex and became embellished by numerous studies of dietary interventions, generating enormous amounts of social, clinical and biochemical data. In 1943, during a critical phase of the survey, Sinclair absented himself for three months to attend scientific meetings and visit colleagues in the United States and Canada. He failed to work out how the accumulating data could be analysed, and the survey remained unanalysed and unpublished in his lifetime.

In 1945, Sinclair was given the rank of brigadier and sent to Holland and Germany to work as part of a team assessing the nutritional status of the Dutch and German populations. For this work he received the Medal of Freedom with Silver Palm from the United States.

While touring Canada in 1943, Sinclair met Group-Captain Tisdale of the Royal Canadian Air Force, who invited him the