similar lukewarm interest in human ecology, especially population dynamics; and the treatment of human evolution seems perfunctory.

Some articles in the first volume cover much ground and present important aspects of medicine: a long one on autoimmune disease, one on atherosclerosis, a surprisingly brief one on birth control, and one entitled "Body Fat, Menarche, and Fertility". The contents of others raise the question: who is being addressed? The articles entitled "Adipose Cell" and "Adrenal", both on topics with extensive reverberations in anthropology or psychology, are confined to specialized biochemistry and physiology, and one entitled "AIDS Epidemic (Public Health)" is, astonishingly, entirely about the United States.

The contents of these volumes suggest that, for the editors, human biology is mostly biochemistry, molecular genetics, physiology and clinical medicine, with minor excursions into psychology and other fields. Recent achievements certainly justify expanded interest in molecular and cell biology, but the accompanying greater tendency towards intense specialism is less welcome. Most of the immediate problems of human biology — matters of life and death for our families and our species — concern our interactions with our environment and with ourselves; and the mass of information in these fields requires interdisciplinary treatment.

Correspondingly, the aspects of human biology that arouse the most heated debates are those at the level of whole organisms or of ecology. Contributors to a modern encyclopaedia need not, perhaps, follow the example of the eighteenth-century *philosophes* and take a stand on such matters; but they may reasonably be expected to tell readers of disagreements and difficulties. For instance, an article with another unexpected title, "Behavior: Cooperative, Competitive, and Individualistic", presents approvingly two kinds of interpretation of human action which, many would think, are opposed. One, founded on "Darwinism", reduces humanity to genes or to a product of natural selection. The other is centred on experiments in which subjects are set tasks presenting ethical problems. The article gives no hint of relevant controversy.

No doubt many students, journalists and others, buoyed up by hope of enlightenment, will consult these firmly bound volumes for initial guidance on difficult questions. But not, I fear, for long. □

S. A. Barnett is Emeritus Professor of Zoology in the Australian National University, Box 4, GPO, Canberra, ACT 2601, Australia.

Preparing for the change

Neville J. Woolf

Principles of Adaptive Optics. By Robert K. Tyson. *Academic: 1991. Pp. 298. $49.95, £35.50.*

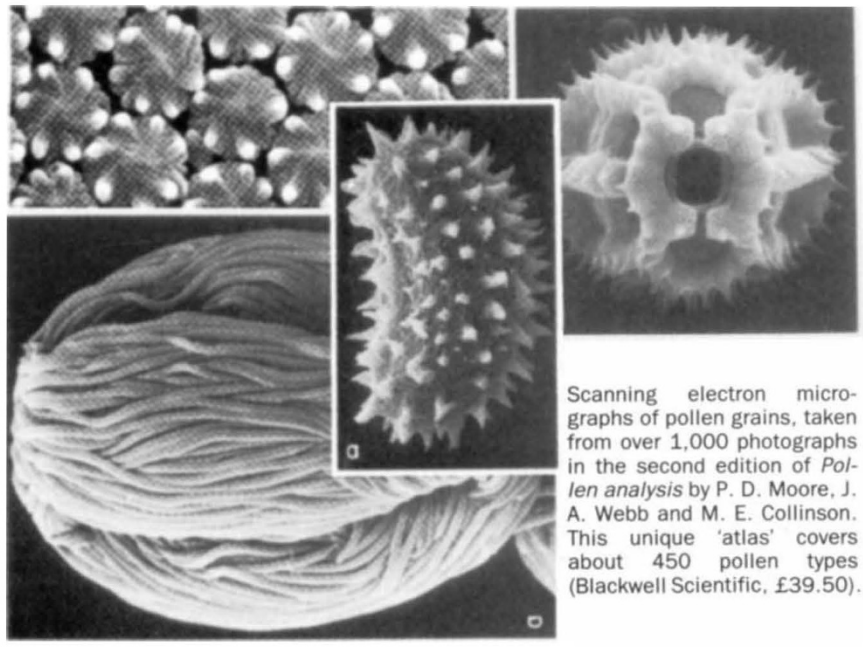
TEACHING students about how telescopes form images seems to involve a sequence of correcting for inadequate concepts. We start by teaching geometric optics, suggesting that there is no limit to magnification. We correct this false impression by teaching about wave optics and the diffraction limit. Next, we teach about atmospheric turbulence and the limits it imposes so that even large telescopes produce similar fuzzy images to small telescopes. Then we teach about short exposure and the speckled structure of images that permit the reconstruction of images up to the diffraction limit, but only for a bright-enough source. Now we have a new book that discusses how to correct the wavefront so that sharp images can be obtained up to the diffraction limit even for faint sources.

The basic idea is simple. Atmospheric disturbances result in variation in the density of air and thus its refractive index from place to place. And so a distorted wavefront arrives at the telescope. We put a deformable mirror at a pupil plane of the telescope to distort the incident wavefront so that it is reflected back as plane waves. All that is needed is to sense the wavefront disturbance and appropriately warp the mirror. Unfortunately, the disturbed air is streaming past the telescope. We need in effect to sense the shape of a large mirror and correct it, all in a millisecond, not forgetting that the original shaping took years. And the deformable mirror will not be conjugate with the entire atmosphere, so there will be only a small patch of sky corrected at any one time.

This is the first book on adaptive optics. It is intended to meet the needs of three communities: the astronomers who can afford to build their large telescopes only on the ground, yet who still need diffraction-limited performance; the military who want to know more about objects travelling at high altitude; and other military workers interested in transporting energy by laser beams, presumably to direct them at the same high-altitude objects. It is a strange mixture, ranging from those interested in detecting a few photoelectrons over several hours to those concerned that they do not burn up their equipment in the large amounts of energy involved in their work.

The first impression given by the book is that a student new to the subject has a tremendous amount of material to absorb. But then again, this is an area where the best will eventually extirpate the inferior. Much of what is here will soon be seen as irrelevant or wrong. The worst flaw to my mind is that the optician is not informed that his or her equipment, the telescope, and the building in which it is housed, possibly contribute more to the blurring of the image than does the rest of the atmosphere put together, and that correction of this

Palynological portraits



Scanning electron micrographs of pollen grains, taken from over 1,000 photographs in the second edition of *Pollen analysis* by P. D. Moore, J. A. Webb and M. E. Collinson. This unique 'atlas' covers about 450 pollen types (Blackwell Scientific, £39.50).