

Evolution of algal ultrastructure

THE green algae are now generally accepted as the evolutionary progenitors of land plants and this book* is an attempt to discuss evolutionary trends within green algae on the basis of cell ultrastructure. After a general introduction, six chapters are devoted to a detailed examination of the ultrastructure, cell division and reproduction of an order of the Chlorophyta. Within each order a restricted number of genera are used to illustrate the diversity of cell structure and reproduction. This approach, although suffering from the potential hazard that the genera selected may not be representative of their order, has been necessary because of the lack of sufficient ultrastructure studies of many green algae. The description of each genus is accompanied by numerous light photomicrographs and electron micrographs (both transmission and scanning), many previously unpublished, which are of consistent good quality and well reproduced. The profusion of photographs accompanying some genera has unfortunately resulted in a loss of synchrony between the text and relevant photomicrographs, such that the reader is obliged to constantly refer to figures several pages distant from the text.

The final chapter is devoted to a discussion of possible evolutionary trends within the green algae by comparison of certain ultrastructural characters. It commences with a list of suppositions concerning primitive and advanced characteristics. The unicellular condition, the possession of basal bodies, flagella, a closed centric spindle, a phycoplast and cell division by furrowing, are deemed to be primitive features, whereas it is suggested that evolutionary advancement can be detected by a colonial tendency, a phragmoplast and cytokinesis by way of cell-plate formation. It is on the basis of the presence or absence of these characters that theoretical evolutionary lines are constructed.

The acceptance of a chlamydomonad cell as the ancestral type of all the green algae is disputed and the hypothesis advanced that this type of cell was the progenitor only of phycoplast-containing green algae. It is argued that the archetypal cell of the other green algae was more like that of

Pedinomonas (Prasinophyceae). From this ancestral flagellate unicell there developed the filamentous form along two distinct lines. The siphonous line (that is the coenocytic condition) is seen as an evolutionary *cul-de-sac*, whereas evolution by way of ulotrichalean types is suggested as the line leading to the bryophytes and eventually higher land plants.

The arguments for these proposed evolutionary lines are well presented, although occasionally repetitive, and the importance of ultrastructural evidence for evolutionary trends, and also taxonomic classification, is strongly emphasised. The main criticism of this significant work must surely be its price. This has presumably resulted from the inclusion of almost 800 individual photomicrographs, but must place this book well beyond the financial reach not only of students but also of many individual research workers.

T. W. Ford



A grimace in an adult female rhesus monkey. Taken from *Primate Behavior: Developments in Field and Laboratory Research*, volume 4, edited by Leonard A. Rosenblum. Pp. viii + 407. (Academic: New York and London, July 1975.) \$29.50; £14.15.

Evolutionary sex

THIS is an excellent little book† on a big subject. One would think that a topic of such great interest would by now have been adequately understood. On the contrary, within the past few years the evolutionary reasons for the phenomena of sex have become increasingly anomalous.

A few years ago it was suggested that the very existence of sexual reproduction constituted a paradox.

For if an organism reproduces by meiosis and recombination with a partner, it 'throws away' half of its genes. An organism that reproduced asexually would have twice the number of its genes represented in the next generation than a sexual one. For sexuality to be selected, an organism would have to possess twice the fitness of asexual ones, and this seems too high.

Presumably, stimulated by this apparent paradox, Williams has undertaken a series of conceptual studies that show how and why this does not really follow. Some of his models are quite convincing, and we are relieved to learn that there are a number of situations in which the fitness of the sexual creatures is high enough to enable sex to evolve. He does not, however, manage to come up with a very satisfactory explanation of why so many sexual organisms exist that do not fit the model. The explanation he proposes is historical accident. He argues that the present-day organisms that should not be sexual are descended from ones that should, and the change for some reason was irreversible. This may be so, but perhaps more adequate hypotheses are in order.

In addition to the big problem, William discusses a number of other issues in the evolution of sex and of hermaphroditism, masculinity and femininity, and some issues in group selection. A number of these matters are given only cursory treatment. For instance, sexual selection is not covered, although sexual dimorphism is reproduction. These include aspects touched on. And the topic of hermaphroditism is made to seem more simple than it really is. I would have appreciated a somewhat longer discussion of these peripheral issues, with more empirical support. Indeed, the lack of facts has been a major drawback in the literature. Although Williams has considered the facts seriously, the reader will perhaps feel a need for more data.

If the facts do not accord with theory, one corrects the theory. Williams's book substantially increases the opportunities for both theoretical and empirical research. Perhaps evolutionary biology is going through a stage like that in astronomy when the epicycles began to become an embarrassment. The time may be ripe for a bolder approach to the subject, and for "theories more pleasing to the mind."

Michael T. Ghiselin

**Green Algae: Structure, Reproduction and Evolution in Selected Genera*. By Jeremy D. Pickett-Heaps. Pp. vii + 606. (Sinauer: Sunderland, Massachusetts; Freeman: Reading, July 1975.) £23.40.

†*Sex and Evolution*. By George C. Williams. Pp. x + 201. (Princeton University Press, 1975.) \$13.50.