astrophysics has a great future in space and the Space Telescope is the next logical step in optical astronomy; the scientific aspect of remote sensing of the earth will be emphasised more, while considerable thought should be given to studying the planets from earth orbiting telescopes.

Representatives from the European Space Agency (ESA) and NASA who joined the speakers for the panel discussion sounded optimistic about the future of space science in the total programme. ESA has a new science advisory structure to optimise the science input in the programme planning. NASA views space exploration closely tied to the biological imperative—the challenge of the unknown—and therefore a vigorous programme of space science and exploration has been and will be supported by the American public. A large Space Telescope, high energy observatories, probes to planets and a possible sample return from Mars may be the highlights of the US space science programme in the next decade. It appeared from the statements of the Soviet representatives that the Soviet emphasis on Venus will continue. In space astronomy, radio interferometry may be emphasised and in magnetospheric physics, active experiments to understand plasma interactions. An earth surface mineral resources survey was also mentioned by the Soviet scientists.

What was really accomplished at this Symposium is not clear and apparently not many people expected much to happen either: of the 600 or so participants at this year's COSPAR, the audience for this Symposium probably never reached the 100 mark. □

Trees in the tropics

from P. B. Tomlinson

The Fourth Cabot Symposium held at Harvard Forest, Harvard University, April 26–30 had as its subject Tropical Trees as Living Systems.

An appreciation of the need for an understanding of tropical forests in terms of the individual diversity of tree species was the theme of the Symposium. The enormity of this task is indicated by the floristic diversity of woody plants in the tropics. In Malaysia, for example, M. E. D. Poore (*J. Ecol.*, **56**, 143–196; 1968) found in a survey of 23.0 ha, 2,773 tree-sized individuals with a trunk girth greater than 91 cm, representing 375 species, 139 genera and 52 families. To obtain an equivalent diversity in a temperate flora one would have to map an area equal to a quarter of the United States. The systematic assessment of tropical tree floras is still incomplete, while most aspects of structure, growth, function, reproduction, and ecology remain uninvestigated. Generalisations about the biology of woody plants are still determined with temperate trees in mind; the more balanced view which might be obtained if tropical species were better understood has yet to be established. Consequently the uniqueness of this symposium was its examination of the tree as an individual, with a focus on many functional processes, and its attempt to deal mainly with tropical examples. The programme was so arranged that a gradual progression from a detailed consideration of construction and physiology led naturally to an appreciation of the tropical forest as a complex of interacting and highly diverse units. The result was an overview of our current understanding of aspects of the biology of tropical trees and the proceedings which are to be published should stimulate research on woody plants in the tropics.

Early sessions dealt with evolution, genetic diversity, and especially morphological patterns of organisation. The broad perspectives sought were indicated by the opening discussion of palaeobotanical evidence for the evolutionary origin of tropical trees and forests by J. Doyle (University of Michigan) which made the point that a better understanding of functional morphological relationships of leaf architecture would permit more conclusive palaeontological evaluation of theories of vegetative evolution in angiosperms. It was, therefore, appropriate that there should be a subsequent discussion of the adaptive significance of compound leaves by T. Givnish (Harvard University). This kind of interaction occurred throughout the meeting.

Tree architecture provided a framework for ample discussion, with emphasis on different kinds of trunk-branch axis differentiation in producing optimum patterns of leaf arrangement. The way in which the tree can often be regarded as a modular composition of equivalent units was emphasised by M.-F. Prévost (ORSTOM, Apiodoumé, Ivory Coast). Of the many examples of crown construction presented, none was more distinctive than that of the genus *Araucaria*. In New Caledonia J. M. Veillon (ORSTOM, Noumea) showed that most species produced repeating crowns since the first generation of branches developed by the trunk is succeeded by two or more subsequent ones originating from late-developing branches, the successive crowns overlapping each other like a nest of coffee tables. The need for a better appreciation of the complex hormonal control of branch expression was emphasised by A. Longman (Unit of Tree Biology, Institute of Terrestrial Ecology, Edinburgh) and G. Browning (University of Wales, Aberystwyth) but no better indication of the resulting regularity which is possible was found than in the quantitative analysis of *Terminalia* by J. B. Fisher (Fairchild Tropical Garden, Miami). This represents the first such precise analysis of a crown form familiar to tropical travellers and further demonstrated another common theme of the symposium, that quite simple methods and approaches can generate important new ideas. At the same time modern technology has its place, as was shown by R. Borchert (University of Kansas) whose computer simulation of shoot extension, based on known examples, suggests the existence of endogenous control of rhythms of shoot extension. Tropical trees are not necessarily subject to marked seasonal variation in climate and why shoot growth is usually not continuous is intriguing.

In the area of reproductive biology F. Ng (Forest Research Institute, Kepong) showed a greater diversity of seedling morphology in the tropics than the terminology devised for temperate trees can accommodate, with the obvious ecological implication of successful tree establishment as the basis for his study. The strategies that tropical trees have evolved in the evasion of seed predators were discussed by D. H. Janzen (University of Michigan). Predator pressure can be enormous and it was reassuring that J. Sarukhán (Universidad Nacional Autónoma de Mexico) could find survivors enough to make demographic studies of continuing populations of forest trees.

The several speakers who attempted an analysis of the forest itself were unanimous in presenting it as a dynamic system. R. A. A. Oldeman (Mission ORSTOM, Ecuador) provided a provocative view of the forest as a population of trees whose developing architecture was the result of their individual ability to adapt to available energy levels through repeated cycles of growth. A contribution in which the data had been collected by University students (P. A. Ashton, University of Aberdeen) was particularly welcome since the tropical rain forest is an ideal training ground for future ecologists.

In all, 28 speakers from 13 countries participated. Such an overview is timely in view of the current rapid destruction of tropical forests, which was commented on repeatedly. At present the rate of increase in our understanding of tropical ecosystems is far exceeded by the rate of their destruction. Any corrective influence is appropriate. □