nucleotide has an important function in the nervous system; indeed, Rasmussen (*Science*, **170**, 404; 1970) suggests that it has a role whenever there is inter-cellular communication. He points out that elements common to both neural and humoral transmission are: calcium ions, cyclic AMP, intracellular microtubules, microfilaments, secretory vesicles and protein kinases. He elaborates this suggestion in order to postulate a common origin, followed by divergent evolution, of neural and humoral signalling systems.

In the light of this it is interesting that Goodwin and Cohen (*J. Theoret. Biol.*, **25**, 49; 1969) suggested that the nervous system itself might have evolved from a developmental control system needed for the precise ordering of cellular events in embryogenesis. This suggestion gains weight with the growing evidence for the involvement of cyclic AMP in neural processes (H. McIlwain, *Nature*, **226**, 803; 1970; *Neurosciences Research Program Bulletin*, **8**, 221; 1970). In the only developmental control system that has so far been analysed in any detail, cyclic AMP also acts as an intermediary. In this case it is the chemotactic attractant controlling the aggregation of some cellular slime moulds (Konijn, Barkley *et al.*, *Amer. Naturalist*, **102**, 225; 1968). All the elements Rasmussen mentions, with the exception of vesicles, have been observed in this developmental control system, and so the suggestion of a common origin for developmental control systems and neural and humoral systems may not be too far fetched. In any case, a general theory of biological signalling processes in which excitation occurs through membranes is clearly developing.

In Rasmussen's model there are two fundamental intermediary signalling agents, cyclic AMP and calcium ions. Both are increased by membrane excitation of the enzyme adenyl cyclase which converts ATP to cyclic AMP. An increase in cyclic AMP activates phosphorylating enzymes which make products that are sensitive to calcium ions. The structure of these products can be changed by calcium ions, leading, for example, to contraction, or to a change in their interactions with other cellular components, allowing, for example, release of vesicle-containing transmitters. Calcium ions can also affect their own rate of transport through the cell membrane. In a similar way it has been postulated that the reception of cyclic AMP by aggregating slime mould amoebae can initiate amoeboid movement, the release of a further cyclic AMP signal and, eventually, differentiation.

ENVIRONMENT

Conservation in the Tropics

from a Correspondent

THE trials which beset ecologists working in the tropics were aired on October 21, when the Tropical Ecology Group of the British Ecological Society met in London. The complexities of tropical ecosystems were well described by Dr J. S. Weir (University of Leicester), discussing elephants, termite mounds, diversity and stability in savanna ecosystems. Some *Macrotermes* mounds contain concentrations of biogenic resources (such as minerals and water) and have ecological attributes (such as thermal stability, well aerated soil and refuge from fire and flood) which maintain a diverse

and specialized flora and fauna. Stability is theoretically associated with species diversity in tropical ecosystems. These mounds, which may be very old (more than 700 years in one dated case), form mosaics of high species diversity, and their destruction is likely to have far reaching effects on the savanna ecosystem. Recent studies have shown that *Macrotermes* has deserted its mounds in areas of National Parks where there are large numbers of elephants; the reasons for this are not yet clear, but seem to be related to the damage which the elephants cause to the habitat.

Dr M. E. D. Poore (Nature Conservancy) pointed out that sustained use of a natural resource may be compatible with the conservation of an ecosystem, but that when land use is intensified these aims often cease to be compatible and very careful planning is essential. The best balance must be struck between human needs and the resources available; imbalances should not be introduced into the system until it is known how to control them, and it is important to maintain freedom of choice.

In Western Malaysia, Dr A. G. Marshall (University of Aberdeen) said, the virgin rain forest is being increasingly exploited and destroyed as a consequence of the rapid growth of human population and economic development. Conservation is no new idea there, but there is no organization to coordinate efforts. One delegate pointed out that air photographs suggest that one-third of the rain forest of Borneo has been destroyed since the Second World War. In Brazil, although the number of National Parks and designated protected areas has been increased recently, as Mr I. R. Bishop (University of Leicester) showed, it is extremely difficult to enforce conservation laws in remote areas. A large scale road building programme is leading to the destruction of Amazonian forest at an alarming pace, and farmers are moving in, often ahead of the road, to clear the very diversified forest with the intention of replacing it with a monoculture of grass for cattle. The extreme poverty of nutrient salts in the soils means that the land is likely to deteriorate rapidly after the removal of forest cover.

The priorities, problems and practice of the conservation of natural resources in tropical Africa were discussed by Drs M. J. Coe (Animal Ecology Research Group, Oxford) and M. J. Delany (University of Southampton), who found that there has been a great increase in the number of field biologists there in the past ten to fifteen years. But efforts badly need to be coordinated, both between workers with similar interests in different territories and between people traditionally thought to have conflicting interests. Even within one country departments may have conflicting policies, for example with respect to the conservation of game or its control for medical or veterinary reasons. In the francophone territories, recently visited by Dr C. H. Fry (University of Aberdeen), much has depended on the enthusiasm of a few individuals. Certain schemes call for regional consideration, such as a suggested river diversion for hydroelectric power which might lead to desiccation of much of Lake Chad. Clearly the need for more ecological work in tropical areas is urgent, and a meeting is being planned to consider ways of encouraging and helping with this. Not only are scientific studies and the coordination of accumulated data required, but there is still often a need for the authorities to be made aware of the importance of sound ecological advice.