ESTUARIES

Inaugural Meeting

from a Correspondent

THE inaugural meeting of the Estuarine and Brackish Water Biological Association was held at the Zoological Society of London on October 13. After the formal founding of the association by Dr D. S. Ranwell (NERC Coastal Ecology Research Station), it was announced that the steering committee would act as the first council and that the constitution would be approved at the first annual general meeting in April 1972. Some participants suggested that the word "biological" should be deleted from the name of the association, because the association plans to encourage an interdisciplinary approach to studies of estuaries. Mr R. Bassindale (University of Bristol) serves as the first president and Dr R. S. K. Barnes (Central Electricity Research Laboratories, Fawley, Southampton) is the secretary, from whom full details of membership may be obtained.

A symposium on the estuarine environment was held during the remainder of the meeting. The symposium was opened by Professor W. D. P. Stewart (University of Dundee), who reviewed the sites of estuaries in the United Kingdom and estuarine research projects which are in progress. Professor Stewart stressed the importance of estuaries in relation to man's activities and the need to develop management policies and a strategy for research.

Professor L. C. Beadle (University of Newcastle upon Tyne) discussed physiological adjustments shown by organisms in relation to extreme fluctuations of ionic conditions which may occur in estuaries. He stressed the need for information on the time which organisms take to adjust to salinity stress, how this affects growth rates and the extent to which changes in ionic fluxes may be used as indicators of salinity stress before more adverse effects of stress on organisms are apparent.

Mr A. J. Phillips (Central Electricity Research Laboratories, Fawley) stressed that although there is a considerable body of scattered information on the chemistry of estuaries, there is a lack of guiding principles. He also emphasized the differences in the chemistry of sea water and river water, not only in relation to ionic activities but also in relation to different ionic species present in the two types of solution. He suggested that the amounts of trace elements present in sea water and estuarine water may be underestimated by the use of some methods, because a fraction of these elements is bound to particulate matter carried in suspension. The particulate matter tends to flocculate in the presence of high salinities.

The last speaker in the morning, Dr

K. R. Dyer (University of Southampton), spoke on sedimentation in estuaries. Salinity levels are extremely important, besides topography, current flow and volume of water, in determining rates of sedimentation. Various degrees of mixing may occur between river and sea waters, resulting in the formation of completely stratified to completely mixed bodies of water. The principal minerals in sediments are illite, montmorillonite and kaolinite which have different fall velocities that in part are dependent on temperature and salinity. A mean sedimentation rate for estuaries in Britain is approximately 0.2 cm per annum. Under some conditions, fluid muds are present close to the bottom of estuaries which during ebb and flow tides may give rise to peaks in turbidity.

In the afternoon, Dr R. L. Jefferies (University of East Anglia) reviewed the research on salt marshes. He emphasized the high net productivity of marshes and suggested that plants growing under high salinities are often perennial, show vegetative reproduction and have a limited but rapid growth period. He also discussed the possibility of assaying adaptive enzymes such as nitrate reductase in plants in an attempt to measure the level of nitrate-nitrogen available for plant growth in enriched estuaries.

Dr P. R. Walne (Ministry of Agricul-

ture Shellfish Laboratories) spoke on the importance of estuaries to commercial fisheries. He concentrated on the shellfish industry which has an annual turnover of £0.5 million in Britain and examined methods for improving yield such as the moving of shellfish or encouraging sprat to settle.

Dr H. Milne (University of Aberdeen) examined the trophic relations at the upper end of the food chain in an unpolluted estuary, the Ythan in Aberdeenshire. Although the results are preliminary, he has been able to determine the annual energy budget of mussel populations in commercial beds and to show that predation by birds together with loss of energy as a result of metabolism during the winter cause the principal reductions of energy in the standing crop.

Mr M. J. Barrett (Water Pollution Research Laboratory, Stevenage) discussed changes in the oxygen levels in the waters of the Thames during a period of 80 years and how in the past 15 years conditions have improved so that anaerobic reaches are no longer present.

In the closing contribution, Professor D. R. Arthur (King's College, London) emphasized the need for interdisciplinary studies on estuaries and stressed the approach used by systems analysts in gaining a better understanding of estuarine systems.

Dilatons and Gravity

IN the continuing attempt to establish connexions between the microscopic and macroscopic worlds of physics, it is becoming fashionable to explore gravitation from the standpoint of elementary particle physics; and in next Monday's *Nature Physical Science*, Y. Fujii of the University of Tokyo describes a contribution to this approach. The starting point of his work is the prediction of the Goldstone theorem that the invariance of the world under scale transformations (dilatations) can be realized physically by the existence of a massless boson, known here as the "dilaton". Any breaking of scale invariance results in a non-zero mass κ for the dilaton, with a consequent finite range κ^{-1} for any physical effects. If the dilaton is now coupled to gravity, it would manifest itself by a modification of the usual Newtonian force law in the range κ^{-1} . The choice of κ is entirely arbitrary, but a characteristic mass may be constructed from gravitational and elementary particle parameters, and this leads to values of κ^{-1} of a few km or less.

Fujii's concern is to devise experiments to detect any such short range non-Newtonian component, if it exists. Several suggestions are made for laboratory and larger scale searches for this component. The chief difficulty with

all these experiments is to achieve sufficient sensitivity. The most direct method—the Cavendish experiment in its refined form—could almost detect a component with $\kappa^{-1} \sim 10$ m. An amusing terrestrial experiment is also suggested in which the change in gravity due to the lowering of the water level in a large semicircular reservoir is measured. Other terrestrial approaches would be to compare the size of the Earth as measured by astrogeodetic techniques with the radius calculated from the gravitational force at the Earth's surface. Or the variation of gravity with altitude could be explored. Although astrophysical considerations might be expected to be the most appropriate for testing gravitational theories, only one extra-terrestrial experiment is mentioned, that of observing the behaviour of artificial lunar satellites which orbit close to the surface of the Moon and would be perturbed by a short range force.

Unfortunately, in all these large scale experiments it is impossible to make correct allowances for the many other complicated effects, such as those due to inhomogeneities beneath the terrestrial and lunar surfaces. Nevertheless, Fujii places present limits on κ^{-1} of either between 10 m and 1 km, or less than 1 cm.