

Thomson points out that many groups of vertebrates have developed a mechanism which allows prey to be enclosed from above and below simultaneously, and suggests that this is the primary function of the intra-cranial joint.

In the Dipnoi, the respiratory pumping movements cannot be aided by movements of the cheek, palate and cranium such as occur in the other two groups, for the upper jaw and palate are fused to the braincase and there is no joint in either the dermal roof or the endocranium. To compensate for this, the pumping ability of the opercular apparatus seems to have been greatly increased: Thomson points out that the operculum of the Devonian dipnoan *Dipterus* is as long as the rest of the head. Though the early lungfish seem to have relied primarily on aquatic respiration, the progressive reduction in the size of the operculum in later dipnoans seems to represent an increased dependence on aerial respiration—Thomson notes that the operculum is relatively much smaller in those living lungfish which rely predominantly on the lungs, and larger in *Neoceratodus* which normally uses the gills alone.

The sarcopterygian fin, which has a single main axis of skeletal units and a muscular base, is highly mobile and can be used for walking along the bottom. As long as most of the weight of the body is supported by water, the pectoral fin can also be used for raising the anterior part of the body off the ground. This function would also aid aerial ventilation of the lungs, which would otherwise be compressed by the weight of the body. These locomotor and respiratory functions were obviously important in the evolution of the land vertebrates, but Thomson points out that they would only have been possible in forms in which the pectoral fins were inserted ventro-laterally, rather than high on the flank as in *Latimeria*.

Both fossil and living sarcopterygians seem to have been essentially tropical fishes. Thomson notes that many pre-Cenozoic freshwater sarcopterygian genera are found in both North America and Eurasia, and that the living South American and African lungfish are closely related. He suggests that this provides further evidence that the distribution of these freshwater genera was not restricted by the presence of an Atlantic Ocean prior to the Late Mesozoic at the earliest.

Thomson finally discusses the biology and relationships of the sarcopterygian groups. All three groups are already specialized when they are first known, in the Devonian. All three normally lived in shallow waters, the Rhipidistia in freshwater and the coelacanth almost always in the sea. The coelacanth and rhipidistians were both predatory groups, but, while all the coelacanth seem to have been relatively slow swimmers, some of the rhipidistians became quite fast and active. The dipnoans were usually slow swimmers, living near the bottom and feeding on detritus; they seem always to have lived in conditions where oxygen was (at least seasonally) in short supply.

that marine technology has "arrived". The exhibition was opened on February 17 by the Minister of Technology, Mr Wedgwood Benn. A necessarily cursory survey indicated that 100 per cent of both exhibitors and visitors thought that it was an outstanding success. There were 200 exhibitors of whom 140 came from overseas, and more than 10,000 visitors, most of whom were working in oceanology. Exhibitors who had had grave doubts about the return they would get from the considerable expense of hiring, equipping and manning a stand seem to have been agreeably surprised by the number of serious enquiries received. The exhibition was in fact the first genuinely international exhibition specializing in equipment for marine technology.

Perhaps a brief explanation is required of the word "oceanology"—a slightly confusing term. In the early days it was often used synonymously with "oceanography" to mean marine science, and is still the official word for this in the Soviet Union. It is now often used to mean marine technology, and although it has no precise definition, is usually taken to exclude conventional naval architecture. Its scope is perhaps best indicated by the titles of technical sessions in the conference; oceanographic instruments and data handling; offshore minerals technology; engineering in the ocean; underwater observation and communication; man in the sea; diving technology and pollution.

There was so much of interest in the exhibition that it is invidious to pick out particular items but some general impressions could be gained. The Russian equipment, although well made, was less sophisticated than its western equivalents. The Japanese are producing some equipment of advanced design for fishery research and operation, but tend to be concentrating in other fields on fairly conventional equipment. German equipment, as might be expected, tends to be beautifully made. The US equipment is highly sophisticated and covers an enormous field of applications, while French exhibits showed a strong bias towards the offshore petroleum industry.

Britain was naturally well represented, with perhaps a third of the space. It was obvious that Britain is at last waking up to the importance of this field, and there is already enough money being spent to maintain a considerable commercial activity. The British Government alone is now spending £13 million a year on marine science and technology, and large sums are being spent on work at sea by the petroleum, gravel, civil engineering and other industries. The British stands showed equipment as advanced as anything in the world, and it was particularly heartening to see the excellent display of marine instrumentation by such firms as Plessey (UK) Ltd and Underwater and Marine Equipment Ltd. It was also clear that Britain is at last making an effort to catch up with the Americans and to a lesser extent the French in offshore mineral surveying and engineering.

#### MARINE BIOLOGY

### Corals and Coral Reefs

from a Correspondent

A SYMPOSIUM on corals and coral reefs, organized by the Marine Biological Association of India, was held at the Central Marine Fisheries Research Institute,

#### OCEANOLOGY

### Marine Science on Show

from a Correspondent

THE chief impression of the exhibition and conference, Oceanology International '69 at Brighton last week, is