the furnace. The best way of avoiding these errors, he said, is to record the data oneself, or to control the recording. This makes it especially necessary for the research worker to have technical knowledge of the industry he is studying. Mr. Beer thought the use of automatic recording devices to be necessary if human error is to be eliminated.

In the afternoon, Mr. W. F. Luttrell (National Institute of Economic and Social Research) described his methods of collecting economic data. He said that the sending of questionnaires is useful only for collecting figures already kept in an agreed form, and even then visits to firms are often necessary. In all other cases data must be gathered personally. Mr. Luttrell starts to work in a firm by making a list of all the records which can possibly bear on the matter being investigated. Where the records do not show what is wanted, it is often possible to get it from the notebooks in which the data were first recorded; but these may have been destroyed. The notebooks are also useful for test checks—to show how the records derived from them are compiled. The cost records of firms are seldom suitable for research as they stand; it is quite common, for example, for overhead costs to be allocated in an arbitrary and distorting way, perhaps by a fixed percentage addition to labour costs. A further source of bias is the greater readiness of firms to give information about successes than about failures. The last session was opened by Mr. J. D. Handyside (National Institute of Industrial Psychology), who stressed the large amount of work involved in the various methods of avoiding errors suggested by other speakers.

The conference as a whole showed that a methodology of research on industry has grown up which cuts across the normal boundaries of a number of disciplines. It also showed that the data produced by industry to-day are not sufficiently accurate to be worthy of the elaborate methods developed by theoretical statisticians.

SIPHONOPHORA OF THE INDIAN OCEAN

STRUCTURE and taxonomy of the Coelenterata continue to interest zoologists even in this period when the concern of the majority is experimental. Since the War three major monographs have been published in Great Britain alone. The life-work of the late Cyril Crossland culminated in his report (edited by A. K. Totton) on the Madreporaria, Hydrocorallinae, Heliopora and Tubipora of the Great Barrier Reef Expedition. Following in the footsteps of Ellis, Forbes, Allman, Hincks and Browne, E. S. Russell has produced his admirable "Medusae of the British Isles". Now A. K. Totton renders no less service by the work here reviewed*.

Opportunity has been taken not only to study and report on collections made by the *Discovery II* in 1935, 1950 and 1951, but also those made by the *John Murray* and other expeditions since 1933, eight collections in all. We gain some idea of the labour involved, and so of the stimulating enthusiasm inspired initially by study of H. B. Bigelow's 'Albatros' Report on the Siphonophora. "For many years now", the author informs us, "I have been occupied with the laborious task of picking out hundreds of thousands of fragmentary specimens from plankton samples and of trying to form some idea of how many species are represented, and then attempting to apply old specific names and, where none are available, giving new ones". And again, "One may search for a very long time before being lucky enough to find a really well-preserved specimen, or a larval or other much desired stage, of some particular species. . . . There is also the inherent difficulty of dealing with fragmentary specimens. Again, many of the species occur in two phases. . . .". Meanwhile in the Discovery collections alone there are thousands of still unexamined plankton hauls.

The suspected wide distribution of Siphonophores is confirmed; no species would appear confined to the Indian Ocean or, apart from purely antarctic species, excluded from it. There is great restriction of species within the Red Sea, as there is in the Mediterranean in comparison with the Atlantic, and probably for similar reasons, namely, outflow of deep water over the sill and high minimum temperatures in deep water.

Attempts to interpret the extraordinary complexity of structure in the Siphonophores, on the success of which must depend final conclusions about classification, raise what are among the most perplexing, if not *the* most perplexing, problems in zoology. The fantastic development of polymorphism probably involves, apart from precocious budding, both neoteny and early manifestation in ontogeny of structures or individuals which appeared late in phylogeny. Totton pays tribute to the morphological acumen of Garstang, who made fundamental contributions by revealing that the 'medusome' theory of Haeckel is untenable and that the pelagic habit of the Siphonophores probably represents prolongation of an actinula-like larval phase.

Unfortunately Garstang failed to realize the extent of the dissimilarity between the Chondrophora (= Disconanthae) comprising *Velella*, *Porpita* and *Porpema* and the Siphonophora (= Siphonanthae). As Totton clearly shows, these represent distinct orders, not suborders. The former are really floating Tubulariid hydroid-phases of inconspicuous Codonid medusae. The ancestral Siphonophora, on the other hand, had probably a larval polypoid stage and an adult medusoid stage, both, in various structural manifestations, eventually making simultaneous appearance in the same colony.

This is a beautifully produced report, admirably illustrated by text-figures and plates, a credit alike to author and to publisher. C. M. YONGE

* Discovery Reports. Vol. 27: Siphonophora of the Indian Ocean, together with Systematic and Biological Notes on Related Specimens from other Oceans. By A. K. Totton. Pp. 1–162+plates 1–12. (Cambridge: At the University Press, 1954.) 60*s*. net.

THE CYTOCHROME *b* COMPONENT OF CHLOROPLASTS

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DAVENPORT[1] isolated etiolated chloroplasts from barley seedlings grown in the dark and observed in them the spectrum of cytochrome *f*. As the chloroplasts in this case are developed to a size