Meetings

Bryozoology

Three years ago, 16 zoologists and paleozoologists from nine countries met in Stockholm and founded the International Bryozoology Association (IBA). In August 1968, 46 participants (about 30 percent of the IBA membership) from 14 countries met in Milan, Italy, for their first international conference on bryozoology. Members of IBA are concerned about all aspects of the biology and paleobiology of the approximately 3500 extant species and 15,000 extinct species some of which range as far back as the Cambrian period.

The conference revealed in current work a general trend toward model-building and synthesis. The papers can be placed into three major categories: (i) ontogeny and phylogeny; (ii) paleobiogeography and biogeography; and (iii) matters of concern to all those who deal with bryozoans in teaching or research.

Category (i). Much emphasis is being given to understanding the ontogeny of skeleton formation in the extinct and extant orders. The aim is to evaluate the evolutionary significance of the different types of skeletal structures found in bryozoans.

Very impressive was a model of growth proposed for the Fenestellidae, order Cryptostomata, which includes such well known extinct genera as *Archimedes* (R. Tavener-Smith, University of Belfast). The model involved a sharp distinction between skeletal structures that are limited to individuals as compared with those that are not part of individuals, such as nodes or carinae, and are therefore colonial. The colonial calcareous deposits were hypothesized to have formed from an epidermal lining of a coelomic envelope that covered all of the outer layer of the skeleton of individuals. This coelomic space above the frontal wall would be analogous to that which occurs in certain divisions of the Cyclostomata.

An evolutionary sequence for the order Cribimorpha was outlined in which primary, secondary, and finally tertiary wall layers were formed (G. Larwood, University of Durham). The tertiary wall suggests the presence of a coelomic extension and depositing epidermis above the frontal wall of individuals, similar to that for the Cyclostomata and Cryptostomata. A model for the ontogenetic development of these wall structures must now be prepared.

Models of colonial growth are not easily prepared in the extinct order Trepostomata. A start, however, was made toward an understanding of ontogeny in three groups of lower Paleozoic "Rhombotrypid" bryozoans (R. Boardman, U.S. National Museum). A complex budding pattern was described in which zoids are not responsible for budding adjacent distal zoids, but the zoid beyond that one. The fact that these genera were chosen because of their relative simplicity among the Trepostomata suggests that much imaginative and challenging work remains before more complex patterns of growth are understood, in this, the most important of the Lower Paleozoic bryozoan orders.

Within the order Cyclostomata, current evolutionary work is chiefly concerned with evaluating variation and the importance of different biocharacters. For several years, the type and shape of brood chambers and the general mode of growth have been considered of preeminent taxonomic importance; both of these were discussed (E. Voigt, Geological Institute, Hamburg; G. Illies, Geological Institute, Karlsruhe). At the Milan meeting, however, papers on variation among brood chambers of the same colony (G. Hillmer, Geological Institute, Hamburg), on the generic identity of specimens with erect and encrusting modes of growth (K. Brood, University of Stockholm), and on a new series of biocharacters based on wall structure (O. Nye, U.S. National Museum; T. Söderqvist, University of Stockholm) showed that a drastic reevaluation was rapidly proceeding. It is too early to say how these studies will affect our understanding of the evolution of cyclostomes.

The order Cheilostomata is richer in external biocharacters than are other orders. However, the cataloging and description of these characters has proceeded ahead of an understanding of their mode of formation. As a result, the structure of skeletal walls and brood chambers has with few exceptions been viewed only in whole preparations and too often has been based almost entirely on study of calcified parts. A terminology, which only the very brave will now defend, has been uncritically used for the past 40 years to imply the origin of different wall structures. One of the basic points of the conference was that modern histological work is desperately needed so that one can judge the degree of homology or analogy among cheilostome wall structures. Preliminary results from a study of skeletal mineralogy were, however, presented (J. Rucker, U.S. Naval Oceanographic Office).

Laboratory culture experiments which open new vistas in bryozoology showed that the spines of the cheilostome genera *Conopeum* and *Membranipora* should be considered as modified zoids (D. Jebram, Kiel University). Thus support was provided for Silen's general view of 25 years ago that spines in many cases should be considered as having the ontogenetic (and phylogenetic) potentiality of forming normal zoids. In addition, other structures of *Conopeum* that bud from the frontal surface were shown to concentrate food. This could only occur by passage of nutrient material from normal zoids through the mesenchymal strands filling the interzoidal communication pores.

Polymorphic structures known as avicularia may have arisen independently in several lineages of cheilostomes. The reason for this is not known, and indeed the function of avicularia in any one species had not been documented prior to the Milan meeting. A biological role of defense against tube-building amphipods that do harm to the colony, and would do more harm were they not caught and restrained, was indicated for the birds-head type of avicularia in two species of *Bugula* (K. Kaufmann, Lehigh University). Work is now needed to determine the biological role of less specialized types of avicularia which occur in encrusting species.

The outstandng synthetic evolutionary study of the meeting dealt with how different character states evolved in unison from the Upper Cretaceous to the Recent for the Poricellariid Cheilostomata

(A. Cheetham, U.S. National Museum). This group is perhaps the most conspicuous and abundant of the lineages which developed asymmetrical, polymorphic zoids. The gradual increase in asymmetry forced changes in the arrangement and number of avicularia, position and type of brood chamber, and pattern of budding. Only a dynamic approach toward comparative morphology could have shown the way in which different character states were interrelated.

The understanding of the evolution and taxonomic diversity of the class Phylactolaemata, all of whose 12 genera are freshwater, seems to have reached a plateau. Much current work seems directed toward distinguishing true species from ecological varieties of a single species (J. Bushnell, University of Colorado) and toward understanding the evolutionary development and taxonomic importance of different types of statoblasts (F. Wiebach, Plön).

Category (ii). The first fossil finds were reported of five genera whose Recent (and fossil) representatives are exceedingly delicate (R. Lagaaij, Royal Dutch Shell). Genera that many zoologists would consider a priori too fragile can and do persist. Moreover, in all cases where the Recent representatives have a circumtropical distribution, the fossil specimens (from the Miocene and earlier) also had a circumtropical distribution. This was suggested to have been due to the connections between the Atlantic and Pacific oceans and the Mediterranean with the Indian Ocean during the Miocene. It is unnecessary to postulate widespread distribution by ships in explanation of the present distribution of these and probably other genera as is commonly done.

The tropical biogeographic zone, which is narrow on the east side of the Atlantic, broadens on the west and was considered to extend as far north as Cape Hatteras on the American coast (F. Maturo, University of Florida). Moreover, about 20 percent of the 246 species found between Florida and the Hudson Canyon were undescribed, indicating that significant new discoveries in continental shelf bryozoan faunas are still being made. Most high arctic species were interrupted in an otherwise circum-Arctic distribution by the Chukchi and Bering seas, for reasons not understood (N. Powell, National Museum of Canada). Probably enough data exist at the present time for someone to attempt a world view of continental shelf biogeographic provinces based on bryozoans, but such has not yet been done.

In deeper water, from 200 to 6000 m, the number of species per station decreases from a maximum of about 60 on the upper continental slope to about 10 by 1000 m and 5 by 2000 m and deeper (T. Schopf, Lehigh University). Bryozoa occur in about 25 percent of available collections, independent of depth and location, from the fine, deep-sea sediments. Bryozoa seem to be a consistent element of the deep-sea fauna.

Category (iii). A few papers dealt with matters of concern to all those who study bryozoans. The terminology of the group has been recognized for many years to be "large and fantastic . . . much of it dating from a period when the structure of the animals was not understood" [L. H. Hyman, *Invertebrates* (McGraw-Hill, New York, 1959), vol. 5]. The need to master this complicated vocabulary, in order to make sense out of the literature, seems to have hindered work on Bryozoa. The use of terms that are both precise and easily comprehensible is a problem that must be resolved by every teacher and researcher. Recognizing the importance of this, a terminology committee was established under the chairmanship of J. S. Ryland (University of Wales) to consider the original intent, history, and current meaning of words commonly used to describe parts of bryozoans. Those with terminological problems in bryozoans are invited to call such matters to the attention of the committee.

Bryozoans have many morphological features that can be measured and evaluated statistically. The presentation of at least the mean, standard deviation, and number of measurements was strongly recommended (T. Perry and R. Anstey, University of Indiana) and was supported in several papers by other workers. A small but increasing body of data is accumulating on the degree of variation within and between colonies. Given enough time, one should be able to adequately characterize variability in bryozoans.

Finally, Wiebach, citing a letter from Ernst Marcus, continued the long tradition of placing both the Entoprocta and Ectoprocta in the same phylum (Bryozoa), but this view seemed definitely to be that of a very small minority.

If all areas in which current work is being carried out had been represented at Milan, some important areas of the biology and paleobiology would still have been omitted. In addition to the problems mentioned previously, no work presently in progress seems primarily concerned with embryology, interzoidal communications, the origin of higher categories, and several aspects of physiology, especially nitrogen excretion.

The conference facilities and other generous support were provided by the Italian Oil Compay, AGIP. The conference was arranged by Enrico Annoscia (AGIP, Milan) whose untiring efforts on behalf of all participants resulted in an excellent meeting. It was unanimously decided to dedicate the conference to the memory of Ernst Marcus, a student of Bryozoa for more than 40 years, who died 30 June 1968. N. Spjeldnaes (Bergen University) was elected Association president in succession to A. Cheetham; P. L. Cook [British Museum (Natural History), London] was reelected secretary. The proceedings will be edited by Annoscia and published in an early issue of *Atti della Societa Italiana di Scienze Naturali.*

THOMAS J. M. SCHOPF
Department of Geological Sciences and *Marine Science Center, Lehigh University, Bethlehem, Pennsylvania*
J. S. RYLAND
Department of Zoology, University of Wales, Swansea, United Kingdom

Fertility and Sterility

The many problems concerning reproduction in man were discussed at length at the sixth Fertility and Sterility World Congress (Tel-Aviv, Israel, 20 to 27 May 1968). About 400 papers were presented on topics including genetic and eugenic factors of human reproduction, immunological aspects of reproduction, neurogenic and encephalic factors in reproduction, effects of long-term use of antifertility agents on reproduction, paragenetic factors in fetal loss, seminal fluid and accessory glands, recent advances in sterility, and female genital tuberculosis.

The cervix in women acts as a sperm reservoir. It is possible that cervical mucus plays a major role in sperm capacitation. Pathological changes in the cervix may inhibit sperm capacitation and cause infertility. The proteinogram of the mucus is a useful diagnostic aid in cases of cervical pathology, such as ectopia-cervicitis-endocervicitis. Kremer and Van Bruggen described the purified mucoid and unpurified bovine cervical mucus as very long, filamentous structures, 20 to 80 Å thick, often randomly