## Colonial Animals

**Advances in Bryozoology**. Proceedings of a conference, Woods Hole, Mass., Sept. 1977. G. P. LARWOOD and M. B. ABBOTT, Eds. Published for the Systematics Association by Academic Press, New York, 1979. xvi, 642 pp., illus. $61.

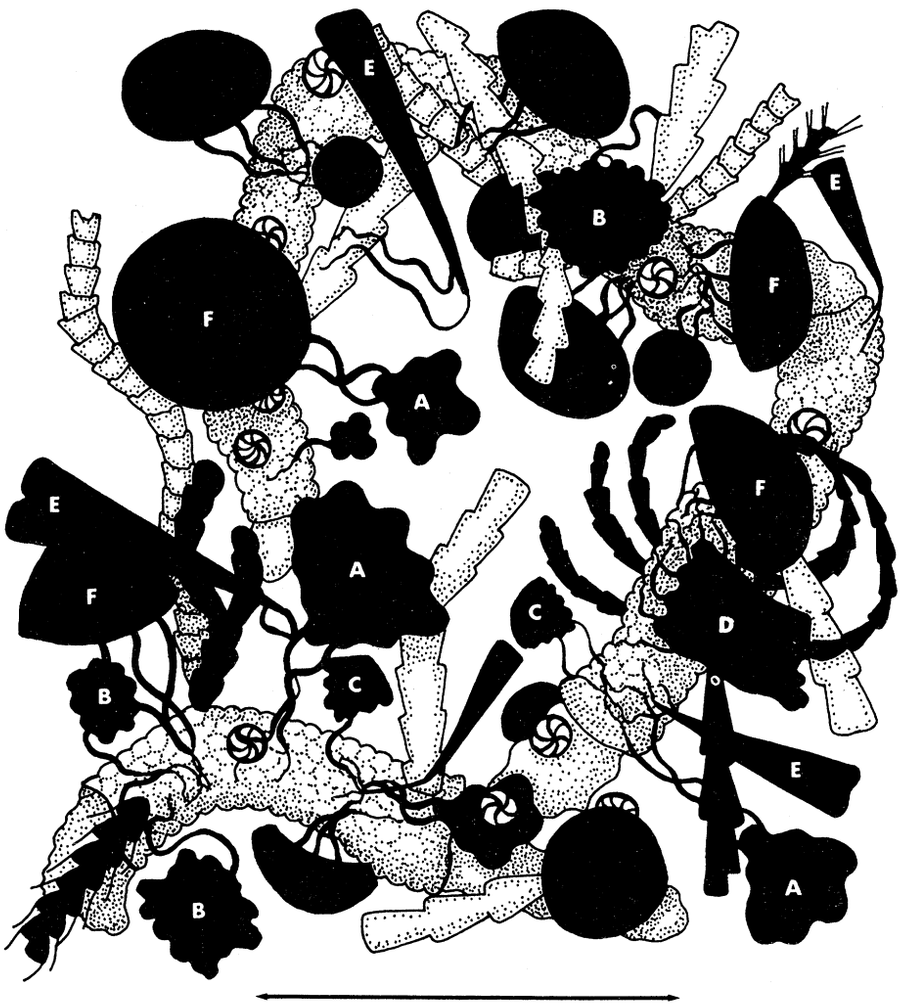
Bryozoans are aquatic, bottom-dwelling animals that form colonies of zooids by budding. About 4000 recent species have been described, some of which are economically important as fouling organisms. This volume contains 38 papers from the fourth conference of the International Bryozoology Association. The literature on bryozoans has been widely scattered, and along with the proceedings of previous conferences this volume makes readily available a great deal of information on diverse trends of research on this group. The topics include genetics, cytology, skeletal structure and architecture, statoblast structure and germination, growth, feeding, colony form, and other aspects of ecology, as well as taxonomic and faunal work. Such a diverse array defies thematic classification. Reviewed below are aspects of natural history and functional biology likely to be of some general interest.

Bryozoan feeding behavior ranges from passive filtration by individual polypides to highly patterned behavior in which groups of polypides produce coordinated, colony-wide feeding currents. In the latter case, excurrent "chimneys" are regularly spaced over the colony surface and vary in diameter between species with the size of lophophore (filtering organ). Lophophores may even form "cages" around an unwanted particle, which is then passed from lophophore to lophophore until reaching an excurrent chimney where it is finally ejected. The degree of integration in feeding varies rather predictably with colony growth form and spacing of the feeding zooids. How such behaviors might differ over the life of colonies is unknown. This question is important because in many species budding patterns, zooid orientations, and sizes and dispositions of polymorphic zooids may all change markedly throughout colony growth.

Bryozoans exhibit a diversity of life habits previously unsuspected or poorly understood. Truly remarkable are the abundant (20,000 per square meter), minute (usually less than 1 millimeter), sediment-dwelling colonies which live "rooted" to sand grains, foraminifera, or worm tubes in depths below 100 meters. Rootlets are highly specialized polymorphic zooids. Their functions seem to include attachment, elevation, and perhaps repositioning of colonies through differential growth.

Skeletal wall structure and zooid morphology continue to be a major focus of paleontologists, especially those interested in Paleozoic groups. In addition to its obvious taxonomic value, this work has helped to unravel how these creatures grew and functioned, and thus is basic to understanding their colony forms. Particularly intriguing are the bizarre, helical *Archimedes*, which apparently proliferated asexually by colony fragmentation, a phenomenon of widespread occurrence among many colonial animal groups. Unfortunately, the reproduction of the plates in the book is so bad as to seriously diminish the value of many other fine morphological accounts of, for example, the cytology of the colonial nervous system. This is especially disturbing given the high quality of the original photographs shown at the conference.

The quality of the papers is terribly uneven; many are well-written, useful sources of highly specialized information, but many others are poorly organized and far too long. I doubt that anyone but a conscience-stricken reviewer would wade through 27 pages to discover that hook-shaped spines probably function as hooks. Likewise, 22 pages is a lot in which to say that spherical colonies are spherical because they rolled around on the bottom. Worse still are a number of pseudo-ecological papers that could never be published in refereed ecological journals. Neither do descriptions of new species belong in such a publication. Just




"Semidiagrammatic and simplified sketch, showing abundance and diversity of bryozoans from sample off Gabo [Island] Victoria (Australian Museum E66.342). Bryozoan colonies in silhouette, shape of hydroids, polychaete tubes etc. stippled." *A*, "*Stichopora*-like" species; *B*, *Sphaeropora fossa* (Haswell); *C*, *Conescharellina* spp; *D*, *Corbulipora oriparma Wass*; *E*, *Melicerita* sp; *F*, *Australiana bifenestrata* Powell. Scale 10 millimeters. [From P. L. Cook, "Mode of life of small, rooted 'sand fauna' colonies of Bryozoa," in *Advances in Bryozoology*]

a bit of editorial zeal could have shortened an expensive book by 200 pages. Despite much good material, the overall quality is well below that of previous proceedings, including the useful volume edited by Larwood six years ago. Series have a way of unchecked self-perpetuation. This one badly needs outside review.

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## Galactic Research

**The Large-Scale Characteristics of the Galaxy**. Papers from a symposium, College Park, Md., June 1978. W. B. BURTON, Ed. Reidel, Boston, 1979. xviii, 612 pp., illus. Cloth, $73.50; paper, $38.65. International Astronomical Union Symposium No. 84.

Twenty-five years ago, with the aim of coordinating galactic research, the International Astronomical Union held its first symposium. The present symposium, with 180 participants, demonstrates that the field is still vital and that it has matured. As evidence of maturity, the discussions emphasize the Milky Way as a galaxy, as stellar astronomers now speak of the sun as a star. One observer admits poignantly that the comparison is painful because he is forced to disregard most of the detailed observations of the nucleus of our galaxy.

Our galaxy emerges as a normal spiral (type Sbc), similar to the spiral galaxies of the same type in the Virgo cluster (some 15 to 20 megaparsecs distant). The sun is now thought to be about 8.5 kiloparsecs from the center, rotating with a velocity of 225 kilometers per second.

The major components of our galaxy are the disk, with a mass of about $8 \times 10^{10}$ solar masses and a density that decreases exponentially with distance from the center; a spheroidal (bulge) component, with a mass comparable to or smaller than that of the disk and a density that decreases as the cube of the distance from the center; and an invisible halo (or dark corona), with a mass of more than ten times that of the disk and a density that decreases as the square of the distance out to a cutoff radius estimated to be in the range 50 to 335 kiloparsecs. In external galaxies, the dark halo is tracked by calculating the gravitational attraction that is required to balance the centrifugal force measured from the rotational velocity of neutral hydrogen. For geometric reasons, this is not possible for our own galaxy, and a careful study of high-latitude objects (globular clusters or RR Lyrae stars) and galactic satellites will be necessary to pin down the extent of the halo.

Our nucleus seems relatively quiet and does not contain a dead quasar (that is, a $10^8$-solar-mass black hole). Interior to 1.5 kiloparsecs, there is a gas disk or bar tilted by 22° to the plane of the galaxy (a puzzle). In addition to stars, the disk contains hot gas ($10^6$ K), warm gas ($10^3$ to $10^4$ K), and cold clouds ($10^1$ to $10^2$ K). The energy balance of these various components is still not understood. There are giant molecular clouds with masses as high as $3 \times 10^6$ solar masses which, in total, contribute $3 \times 10^9$ solar masses. Their collapse time is short (only $3 \times 10^6$ years), and if they all collapsed and made stars they would yield 1000 solar masses of new stars a year. In fact, only 3 solar masses of new stars are made a year, so we have another puzzle.

Beyond 15 kiloparsecs, the disk is warped (like the brim of a Stetson). It is attractive to suppose that it was distorted in a tidal encounter with a nearby companion, but quantitatively it has been difficult to establish that scenario, and so "why the warp" remains another puzzle.

At high latitudes, hydrogen clouds are falling onto our galaxy with velocities approaching 500 kilometers a second. Where they come from is unknown.

Our galaxy is a member of the "local group," which is dominated by it and Andromeda, although the group has at least 28 members. By comparing our galaxy with external galaxies in rich clusters (which have thousands of members), we hope to learn how the environment influences the development of a galaxy.

Should you read the book? Yes, if you are professionally interested in galaxies. (This is not a book for the layperson.) Should you buy the book? You will be buying a lot of relatively short-lived material. A third of the 104 contributions are two pages or less (essentially abstracts), and more than half are less than five pages (with discussions). If only the invited reviews had been included (with perhaps abstracts of the contributed papers published separately), the book would have been smaller and cheaper, and then would have been rated a "best buy."

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## Books Received

**Alternative Development Strategies and Appropriate Technology**. Science Policy for an Equitable World Order. Romesh K. Diwan and Dennis Livingston. Pergamon, New York, 1979. xiv, 258 pp. $19.50. Pergamon Policy Studies on the New International Economic Order, 30.

**Ammonia**. Committee on Medical and Biologic Effects of Environmental Pollutants, National Research Council, University Park Press, Baltimore, 1979. xvi, 384 pp., illus. Paper, $22.50.

**The Analysis of Social Interactions**. Methods, Issues, and Illustrations. Robert B. Cairns, Ed. Erlbaum, Hillsdale, N.J., 1979 (distributor, Halsted [Wiley], New York), xii, 244 pp. $16.50.

**Analytical Methods for Glycerol**. M. R. F. Ashworth with a chapter by A. A. Newman. A. A. Newman, Ed. Academic Press, New York, 1979. xii, 258 pp., illus. $48.50.

**Analytic Medicine**. Vol. 1, Conventions. Graham Rabey. University Park Press, Baltimore, 1979. vii, 76 pp. illus. $14.95.

**Analytical Profiles of Drug Substances**. Vol. 8. Klaus Florey and seven others, Eds. Academic Press, New York, 1979. x, 558 pp., illus. $28.

**Animal Marking**. Recognition Marking of Animals in Research. Papers from a conference, London, July 1977. Bernard Stonehouse, Ed. Macmillan, London, 1978 (U.S. distributor, University Park Press, Baltimore), viii, 258 pp. illus. $37.50.

**Annual Reports in Medicinal Chemistry**. Vol. 14. Hans-Jürgen Hess, Ed. Academic Press, New York, 1979. x, 358 pp. illus. Paper, $19.50.

**Annual Reports in Organic Synthesis—1978**. L. G. Wade, Jr., and Martin J. O'Donnell, Eds. Academic Press, New York, 1979. xii, 354 pp., illus. $15.

**Annual Review of Astronomy and Astrophysics**. Vol. 17. Geoffrey Burbidge, David Layzer, and John G. Phillips, Eds. Annual Reviews, Palo Alto, Calif., 1979. x, 586 pp., illus. $17.

**Annual Review of Microbiology**. Vol. 33. Mortimer P. Starr, John L. Ingraham, and Sidney Raffel, Eds. Annual Reviews, Palo Alto, Calif., 1979. xii, 702 pp. $17.

**Applied Biology**. Vol. 4. T. H. Coaker, Ed. Academic Press, New York, 1979. x, 286 pp., illus. $34.

**Applied Optics and Optical Engineering**. Vol. 7. Robert R. Shannon and James C. Wyant, Eds. Academic Press, New York, 1979. xviii, 344 pp., illus. $36.

**Arthritis**. The New Treatments. Julian Freeman. Contemporary Books, Chicago, 1979. xvi, 158 pp. $8.95.

**Biogeochemistry of Estuarine Sediments**. Proceedings of a workshop, Melreux, Belgium, Nov. 1976. Unesco, Paris, 1978 (U.S. distributor, Unipub, New York). 294 pp., illus. Paper, $15.50.

**Biology of the Kinetoplastida**. Vol. 2. W. H. R. Lumsden and D. A. Evans, Eds. Academic Press, New York, 1979. xxii, 738 pp., illus. $94.50.

**Biomedical Engineering and Data Processing in Pneumonology**. Papers from a conference, Titisee, Germany, Oct. 1978. H. Matthys and five others, Eds. Karger, Basel, 1979. xii, 322 pp., illus. $75.75. Progress in Respiration Research, vol. 11.

**Carbohydrate Metabolism in Pregnancy and**