Vignette: Fond Hopes

He seemed reluctant to leave. He turned to her. "Claire," he said hesitantly, "there's . . . there's something I'd like to ask you."

"Yes? she answered in a choked voice. To her annoyance her heart had begun to beat very rapidly.

He looked down at his hands. "Would you—that is, later, of course, after this is all over . . . " He stopped and gazed at her anxiously; then the words came tumbling out.

"If we went down to Amargosa some time, could you take photographs of the *Scirpus validus?* Color photographs? See, then I could send them to the Herbarium in Berkeley, and if they confirm my identification, I'll get a citation in the new Jepson *Flora.*"

—*The Bulrush Murders: A Botanical Mystery* by Rebecca Rothenberg (Mysterious Press)

but without participation from the mainland Chinese. Not until 1982 was an arrangement successfully made for adhering organizations in both Nanjing and Taipei to participate in the Union.

As Goldberg wrote, "Scientists active in international organizations must confront the problem of how to serve their countries' political interests without violating the statutes of the union."

Blaauw's *History of the IAU* provides a convenient archival reference work for finding past meeting sites, lists of officers, and the evolution of the IAU's rules, resources, and administrative structures. The broader canvas on which the most significant histories are written is only hinted at here, in the accounts of the exclusivist origin of the IAU and of the question of China's membership. What was the role of the Astronomische Gesellschaft and other astronomical societies in the era just before World War I? How did the International Solar Union, often considered a preliminary organization to the IAU, figure in this history? Are there examples of how the IAU actually fostered astronomical discoveries? How did the IAU legitimate its authoritarian role in establishing astronomical nomenclature? Such questions remain to be researched.

While historians of astronomy may believe that the "real" history of the IAU is still to be written, they surely owe a high debt of gratitude to Blaauw not only for providing this well-documented outline but for giving the IAU archives a high visibility and for taking the steps to ensure their preservation.

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High-Tech Partnership

International Cooperation in Space. The Example of the European Space Agency. ROGER M. BONNET and VITTORIO MANNO. Harvard University Press, Cambridge, MA, 1994. xii, 163 pp., illus. $39.95 or £29.95.

This book, whose authors are both actively involved in the European space effort, has three main objectives: first, to describe the activities of the European Space Agency (ESA), the intergovernmental organization responsible for Europe's collaborative civilian space effort; second, to explain ESA's science program, with particular reference to the place in it of international cooperation; and third, to identify the terms on which Europeans will collaborate with potential partners in the future, terms that have been shaped by a number of somewhat unhappy experiences in the past, notably with the United States.

ESA's science program is driven from the "bottom up"; that is, the scientists in the organization's 15 member states themselves decide what lines of research to follow and what experiments are best suited to them. This is primarily because, unlike those supported by NASA, scientists in universities and national research organizations have to appeal to their relevant home authorities for money to build their experimental equipment. ESA usually only pays for the common facilities (the satellite itself, which is contracted out to industry, the launcher, and so on). The agency is therefore necessarily reactive to the wishes of its scientific constituency. These are funneled from advisory groups up through a system of committees to the supreme governing body, the Council. Though scientific considerations dominate the first stage of the decision-making process, financial, industrial, and "political" considerations progressively come into play as priorities are set and choices made.

Since the mid-1970s fundamental science has enjoyed a secure if relatively small part of ESA's overall budget. Member states are obliged to contribute to the science program, which today takes some 13 percent (about $390 million) of ESA's overall budget. Funding is to be increased by 5 percent annually for about the next decade to support the so-called Horizon 2000 long-term plan, Europe's first really coordinated cluster of missions satisfying the wishes of its scientific community.

On the industrial front, ESA operates on a principle of "fair return." The member states see the agency as an arm of industrial policy and demand that the money that they spend on its programs be ploughed back into their national space industries. Governments have become increasingly emphatic that there should be a strict correlation between "input" and "output," particularly in projects involving the development of advanced technologies. This policy, the authors point out, is not well received by major contractors or in countries with important national space programs like France and Germany. It is also a policy that is being closely watched by the European Union in Brussels, who see it as potentially in conflict with the trade liberalization demanded by the Single European Act.

"Political" considerations impinge on ESA's activities in other ways. Countries that have big national space programs and feel constrained by the principle of fair return repeatedly question the role and purpose of the European effort. They are held in check by the benefits it brings, by the pressure from industries in smaller countries that cannot hope to stay in space without ESA, and by a general will to keep the European "family" intact.

International collaboration is of increasing importance in the post–Cold War era, when superpower rivalry can no longer prime the space effort. It is also crucial for science, which tends to be the Cinderella of space agencies even as the cost and complexity of its missions increase. And though U.S.-European collaboration in space can, overall, be said to have been harmonious, the authors stress that very real problems in the past have left a legacy of resentment in Europe.

The main source of the problem is the different funding mechanisms on the two sides of the Atlantic. In Europe a mission is adopted along with a cost-to-completion commitment, subject to certain safeguards.

In the United States, by contrast, projects easily fall prey to annual budget reviews made in the light of cost increases and changes in the priorities of the administration and incoming presidents. This was particularly the case in the Reagan era, when the United States more or less unilaterally canceled its share of a joint Solar-Polar mission. In the authors' view, the same attitudes have tended to prevail over the space station where "the rule of the *fait accompli* was the basic management practice" in the dealings of the United States with her partners (p. 111). The authors are emphatic that unless this attitude changes—and there are encouraging signs that it will—Europe will be less and less inclined to collaborate with the United States in large-scale technical cooperative projects.

Bonnet and Manno have written a timely and important book. On occasion they may be faulted for being overhasty in their presentation of material—but this is only to be expected of a work written in their vanishingly small "spare time." It is a pity, too, that they did not build a full description of the Horizon 2000 program into the body of their text. At the same time they are to be commended for their courage in raising contentious issues and, in particular, in alerting all those involved in international collaboration in space as to how their European partners expect to be treated in the future.

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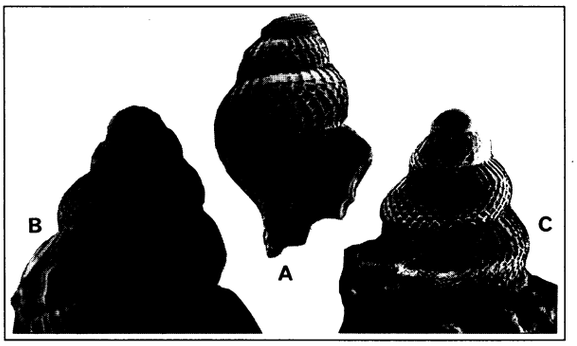
Offspring in the Sea

The Bio-Physics of Marine Larval Dispersal. P. W. SAMMARCO and M. L. HERON, Eds. American Geophysical Union, Washington, DC, 1994. xiv, 352 pp., illus. $42; to AGU members, $29.40. Coastal and Estuarine Studies, 45. From a conference, Thredbo, New South Wales, Feb. 1990.

Reproduction, Larval Biology, and Recruitment of the Deep-Sea Benthos. CRAIG M. YOUNG and KEVIN J. ECKELBARGER, Eds. Columbia University Press, New York, 1994. xvi, 336 pp., illus. $95 or £60. From a symposium, Atlanta, GA, Dec. 1991.

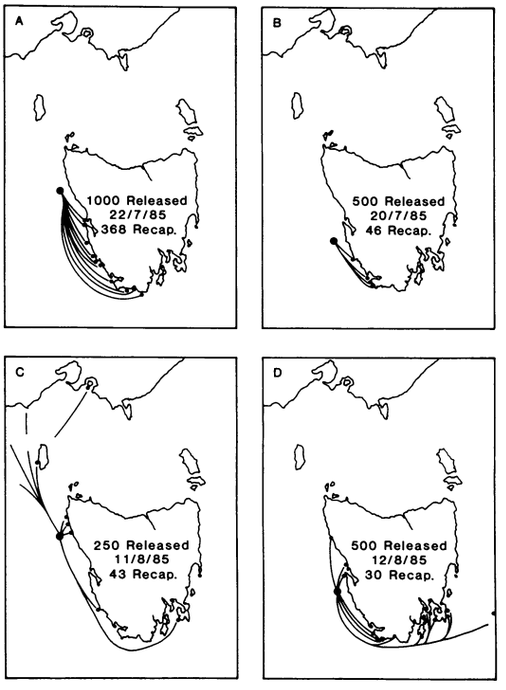
One of the most striking contrasts between marine and terrestrial animals is in processes of reproduction and recruitment. Many marine species—thousands of vertebrates and invertebrates—shed eggs, sperm, or larvae into the sea, where they develop in the plankton before assuming the adult habit.



"Daphnelline veliger and protoconchs. This type of protoconch sculpture occurs in hundreds of shallow- and deep-water turrids. A: Larva from surface plankton, SW Pacific 24°46'S, 177°13'E; water depth 4150 m; height 910 μm. B: Protoconch of *Pleurotomella bureaui*, a bathyal species from the Azores; height 745 μm. C: Protoconch of *Philbertia linearis*, Swedish west coast, shallow water; height 650 μm." [From P. Bouchet and A. Warén's paper in *Reproduction, Larval Biology, and Recruitment of the Deep-Sea Benthos*]

The array of reproductive strategies in marine organisms has intrigued and confounded biologists and ecologists for over a century, and the evolutionary forces that give rise to such strategies are still hotly debated (even by paleobiologists, who can infer modes of development for some groups on the basis of preserved morphology of larval hardparts). The two books reviewed here are important contributions to our understanding of marine larval biology, made especially valuable by emphasis on a single problem or theme, rather than being the usual diffuse collection of papers linked only by their focus on the pre-adult stage.

As its title suggests, *The Bio-Physics of Marine Larval Dispersal* is emphatically interdisciplinary. A daunting obstacle to understanding larval biology is our extreme ignorance of what happens to the gametes and larvae between release and settlement. Mortality and dispersal clearly occur, but the details are crucial here—for many species, recolonization following natural or anthropogenic disturbance depends on the ability of larvae to reach a locality in sufficient numbers to maintain a population. This volume brings together physical oceanographers and biologists to tackle the dispersal problem with considerable success. Hydrodynamics is just the beginning, including rates and patterns of diffusion, lateral and vertical transport, and how coasts and seafloor impinge on these. Added to this is biology: the patchiness of larval input imposed by distribution and timing of spawning parents, for example, and the vertical movements of the larvae, which can shift among water layers moving at different rates or in different directions. A variety of quantitative models are presented in this book for the complex interaction of physical processes and organismic behavior, relative to patterns of transport or retention of larvae in estuaries, around reefs or headlands, and across or along the continental shelf. Models are tested against field data for corals, crustaceans, scallops, fishes, and the crown-of-thorns starfish (all from Australian coasts). The result is of course not the final synthesis, but a much-improved appreciation of the important variables—and the realization that local meteorological and hydrodynamic conditions can indeed have enormous impact on larval survival or recruitment, from 99% mortality to 99% recruitment according to one analysis. Gay and Andrews's study of coral recruitment to Helix Reef off Queensland is just one concrete example: positively buoyant larvae at the



"Release and recovery points of surface drift cards deployed during the midst of the 1985 [*Macronurus*] *novaezelandiae* spawning season. The drift cards were released just inshore of the shelf-edge and at points immediately to the north and south of the apparent spawning area. (Very large numbers of newly hatched larvae were caught at both sites at the time of drift card deployment.)" [From V. D. Lyne and R. E. Thresher's paper in *The Bio-Physics of Marine Larval Dispersal*]