bution and by appeals to national pride. The principal recommendation of the Weir committee was the establishment of a state-financed Central Electricity Board (CEB) with authority to build and operate a national power grid and to promote greater efficiency and scale among the suppliers. The CEB enabling legislation won bipartisan Conservative and Labour support and was passed in 1926.

Under the effective leadership of Sir Andrew Duncan, the CEB adopted a strategy of personal consultation rather than public hearings and made concessions when necessary to avoid confrontation. Opposition to the steel transmission towers, known in Britain as pylons, on esthetic grounds was countered by engaging an architect to design towers that could be spaced widely in the hope that "they might somehow be able to create classical catenary curves as delicate and appealing as those of a suspension bridge" (p. 117). Paintings were commissioned depicting the pylons in an attractive setting, and lines were sometimes rerouted or placed underground. The Minister of Transport answered opponents of placing pylons on the Sussex Downs by asserting that "they have a sense of majesty of their own and the cables stretching between them over the countryside gives one a sense of power, in the service of the people, marching over many miles of country" (p. 118). The timing of the grid construction proved fortunate as the project provided a needed economic stimulus during the depression of the 1930's.

In a chapter on the "electrification of the home," Hannah examines some of the efforts that were made to stimulate increased electrical consumption in Britain. The Electrical Development Association (EDA) founded in 1919 used films such as "Edward and Eda" to promote greater use of electric appliances and rural electrification (p. 204). The EDA's "Wizard in the Wall" advertising campaign encouraged the installation of domestic wall outlets. The Electric Association for Women (EAW) was organized in 1924 and supported financially by the CEB and the utilities. The EAW under the leadership of Caroline Haslett, a trained engineer, was a strong advocate of "electrical housecraft" and educated women in the use of appliances (p. 205). An Emile Zola quotation displayed at the EAW headquarters stated that "the day must come when electricity will be for everyone, as the waters of the rivers and the wind of heaven. It should not merely be supplied, but lavished, that men may use it at their will, as the air they breathe" (p. 186). Electric space heating was promoted by pricing below incremental costs, a strategy that proved ill-advised when it proved difficult for the grid to meet demand during winter load peaks. Pricing policies that gave erroneous signals to consumers contributed to a serious fuel crisis in 1947 as an unanticipated consequence of the "virtuous spiral of economic progress through the interaction of decreasing costs and rising sales" became evident (p. 161).

The long debate between the advocates of public and private electric enterprise was effectively terminated by the total nationalization of the industry on vesting day, 1 April 1948. Hannah is now engaged in writing a sequel that will explore the history of the industry since 1948.

Hannah's pioneering study suggests the need for equally sophisticated investigations of the history of electrical power and policy for other countries, including the United States. A fruitful comparative analysis with American efforts to establish "Super Power" and "Giant Power" grids during the 1920's and the more successful TVA experiment of the 1930's might be undertaken. It might be illuminating also to compare the pattern that culminated in the nationalization of the electric supply industry with the pattern in such earlier cases as the telegraph and the telephone industries, which also were nationalized in Britain following long debates over the virtues of private versus public enterprise.

JAMES E. BRITTAIN
Department of Social Sciences, Georgia Institute of Technology, Atlanta 30332

Astrophysics

Infrared Astronomy. Proceedings of a NATO Advanced Study Institute, Erice, Sicily, July 1977. GIANCARLO SETTI and GIOVANNI G. FAZIO, Eds. Reidel, Boston, 1979 (distributor, Kluwer Boston, Higham, Mass.). viii, 354 pp., illus. $39. NATO Advanced Study Institutes Series C, vol. 38.

This volume of symposium proceedings contains 13 lectures and three seminars on topics of current interest in infrared astronomy. The aim of the volume is to acquaint students and researchers with the many advances and future prospects in this exciting branch of astronomy. Considering the breadth, impact, and potential of infrared astronomy, it is not at all surprising that the book is only moderately successful in fulfilling this goal.

A large portion of the book is devoted to the exciting topic of star formation. The heart of this work is a number of lectures on the physical processes in such regions: "Physics and astrophysics of interstellar dust" by J. M. Greenberg, "Physics of molecular clouds from millimeter wave line observations" by P. M. Solomon, "Star formation and related topics" by R. B. Larson, and "Theoretical aspects of the infrared emission from HII regions" by N. Panagia. These, together with contributions by P. G. Mezger ("Interstellar matter") and B. G. Elmegreen ("Shock induced star formation"), constitute an excellent foundation for the study of the earliest stages of stellar evolution. While there is inevitable overlap between them, these contributions give a very broad look at our present understanding of the conditions, physical processes, and evolution of such regions.

On the other hand, the book has a paucity of papers on infrared observations related to star formation. The only observational contribution on this subject is "Infrared observations of HII regions" by G. G. Fazio, in which some observations at 100 micrometers are reviewed and interpreted.

The second major topic of the volume is diffuse background radiation. M. S. Longair presents an excellent theoretical discussion of the cosmic background radiation and the potential of infrared millimeter observations of such radiation. A second excellent contribution, "Cosmic background: measurements of the spectrum" by P. E. Clegg, presents a very clear discussion of radio, millimeter, and submillimeter observations and their implications. A third contribution, "Infrared astronomical background radiation" by M. Harwit, briefly discusses the possible sources of diffuse radiation in the infrared and the inherent difficulties in making measurements of the radiation and contains an excellent set of references. Together, these three papers constitute an excellent review of the subject.

Another paper devoted to the review and discussion of infrared observations is "Infrared emission of the galactic center and extragalactic sources" by G. Rieke. This topic is evolving rapidly, and Rieke has done a good job of summarizing the present status of infrared observations of normal galaxies, quasars, and Seyfert galaxies and their interpretation.

The third major topic of *Infrared Astronomy* is observational techniques. In the basic contribution on the subject by P. Lena, atmospheric properties (absorption, emission, noise, and seeing) are discussed, along with a brief dis-

cussion of detectors and a somewhat biased and incomplete look at spatial interferometry techniques in the infrared. A very general overview of spectroscopic techniques is given by Harwit. Again, the paper contains an excellent set of references with informative annotations. In addition, V. Daneu *et al.* present a seminar on the design of a four-color bolometer system, and A. F. M. Moorwood discusses the potential for infrared observations from space and some proposed projects for making such observations. Although many of the projects he discusses are still in the planning stages, with details of the designs likely to change, the paper describes a wide variety of approaches and opportunities for infrared astronomy from space.

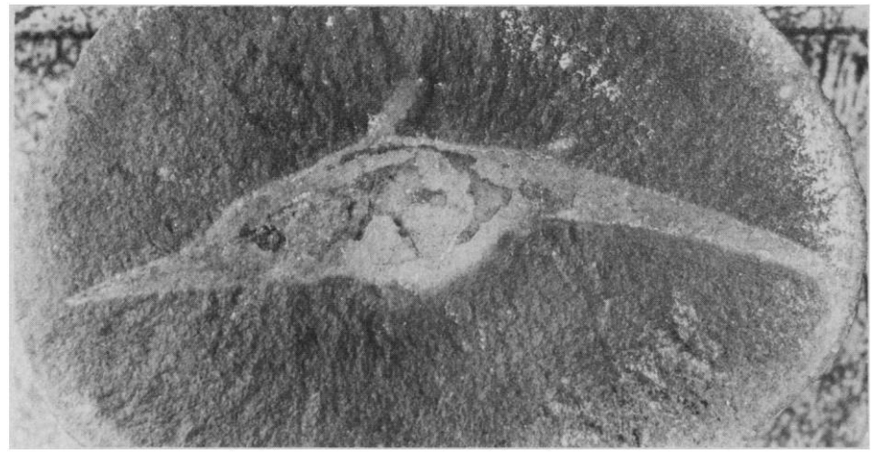
In summary, the strength of the book lies in the emphasis on basic physical processes associated with regions and conditions of star formation and cosmic background radiation. For students and researchers interested in these subjects, the book would be valuable. The weakness of the book is clearly in its coverage of recent infrared observational results. There are many very interesting studies in high- and low-resolution spectroscopy, photometry, and mapping at a wide variety of spatial resolutions that are not included in the volume. For this reason *Infrared Astronomy* does not succeed in its goal of acquainting students and researchers with the exciting recent results and prospects in infrared astronomy.

F. C. GILLETT
Kitt Peak National Observatory, Tucson, Arizona 85726

A Pennsylvanian Biota

Mazon Creek Fossils. Papers from a symposium, Ann Arbor, Mich., May 1978. MATTHEW H. NITECKI, Ed. Academic Press, New York, 1979. xviii, 582 pp., illus. $29.50.

In the Pennsylvanian a river discharging south into a sea in what is now northeast Illinois built a delta that supported a diverse assembly of plants and freshwater or terrestrial animals on its subaerial parts and, in its interdistributary embayments and farther offshore, a distinctive invertebrate fauna. During floods or storms, turbid distributary water spilled over or through levees, and mud and sand built out as crevass splays into interdistributary bays, inundating the coal swamps at their heads and quickly entombing the transported remains not only of terrestrial inhabitants of various delta-plain environments but also of marine organisms that lived in the bays or were swept into them during the storm. Before compaction of the crevass-splay deposits, many of the buried organisms accumulated a protective crust of iron carbonate (or siderite), which protected them from compression as the muds compacted and acted as the nucleus for accretion of further siderite. From these concretions, collected for a century along Mazon Creek and elsewhere in northeast Illinois by paleontologists, have come remarkably well-preserved representatives of nearly 700 plant and animal species—the celebrated Mazon Creek biota.



Similihariotta dabasinskasi, new genus and new species. "This specimen, being very immature, shows virtually nothing of its skeleton. . . . [Its] outline. . . recalls very definitely the modern chimaeroid *Hariotta* with its elongated rostrum, short and stout thorax and the long, slender, pointed tail. . . . Whether this is . . . a Paleozoic member of the genus *Hariotta* cannot be resolved on the basis of this single specimen. The possibility should not be ruled out, however, merely because of the great difference in geologic age; after all, lampreys not greatly different from the modern ones also occur in this fauna. . . . On the other hand, greatly elongated rostra appear to have been fashionable in the Pennsylvanian . . . and it is thus also possible that the overall shape of *Similihariotta* constitutes a convergence with the modern forms." [From R. Zangerl's contribution to *Mazon Creek Fossils*]

Mazon Creek fossils have been described in some 270 papers, but the volume at hand is surely the best current source of information on the Mazon Creek biota. Matthew Nitecki and Alan Horowitz summarize previous research. Charles Shabica discusses deltaic sedimentation and concludes that a low-gradient model operating under static sea-level conditions approximates conditions of formation of the concretion-bearing Francis Creek Shale. Gordon Baird summarizes the lithology of, and distribution of fossils in, the Francis Creek Shale; and Bertram Woodland, Richard Stenstrom, and James Schopf comment on the origin of the Francis Creek concretions. Schopf also describes methods of preparing Mazon Creek concretions to maximize study of enclosed plant materials. Hermann Pfefferkorn notes that the Mazon Creek flora owes its high diversity to extensive natural sampling of several deltaic subenvironments in which living conditions were ideal and is likely of Late Westphalian D age.

Merrill Foster's suggestion that *Tullimonstrum gregarium* is a heteropod gastropod and his interpretation of the objects informally termed "blobs" as scyphozoan coelenterates (jellyfish) merit attention from other specialists. Daniel Fisher's morphological-behavioral analysis of *Euproops danae*, a common Mazon Creek horseshoe crab, also deserves close scrutiny, for it leads to the unsettling suggestion that subaerial activity may have been "part of the behavioral repertoire of *E. danae*, and euproopids in general." Rainer Zangerl's description of five new species (of four new genera) of cartilaginous fishes and David Bardack's general summary of Mazon Creek fishes suggest there are still many things to be learned about this amazing biota. And, finally, John Bolt parlays information from some well-preserved Mazon Creek amphibians into, progressively, a consideration of amphibian life-history strategies and a discussion of the implication of these for functional morphology.

The book is well made. It contains much that is new and excellent summaries of a lot that is not and has few errors. The volume is a substantial tribute to Eugene Richardson, of the Field Museum, to whom it is dedicated.

WALTER C. SWEET
Department of Geology and Mineralogy, Ohio State University, Columbus 43210