game. The new arrivals are, of course, behavioral ecologists, and in *Gulls and Plovers* Barnard and Thompson summarize the results of six years' work on the winter association of these three species.

Behavioral ecology and its intellectual parents ethology and ecology have a long-standing fascination with flocking birds. Three central ideas have been used to explain virtually all of the great variety of flocking systems: a feeding benefit, an increase in protection from predators, and information gain of some sort. Flocks have been seen as adaptive for one or more of these reasons, and the benefits of flocking have been assumed to be shared among all the flock members, even if they belonged to different species. The basic ideas are so simple that it has been a perplexing problem to imagine how such a diversity of types of flocks has arisen. But as with so many other subjects, the study of bird flocks underwent a decisive change in the 1970's under the influence of "gene thinking," and it proved a powerful insight that members of single or mixed-species flocks need not share a mutual benefit but instead can often be expected to join flocks to exploit others. The recent literature has many papers that develop this theme.

Nowhere are these ideas and the manner in which they influence the main flocking themes of feeding, predation, and information as fully developed as in this book. The relationships between these species turn out to be largely parasitic, with golden plovers exploiting the food-finding abilities of the lapwings and gulls exploiting both plovers by stealing prey. In turn, plovers use the gulls as sentinels. Barnard and Thompson explore many facets of this assocation in extensive detail, using a combination of observational and experimental techniques.

My main criticism is over a matter of omission. The implicit idea of a game, in the sense that gulls and plovers are playing an evolutionary game against each other (and themselves), barely receives any mention. This is puzzling, for it was a major theme of a recent volume edited by Barnard (*Producers and Scroungers: Strategies of Exploitation and Parasitism*, Croom Helm, 1984). The idea of a game is important because what the scroungers do depends on what the producers are doing and vice versa. This seems a promising direction for further research, and it is a pity it has not been followed up here.

The underlying story in this book is how the approach to questions about behavior has changed in the past decade. "In one way, this book is about three species of bird feeding on some fields in Nottinghamshire. In another, it is about the interaction between ecology, social behavior and predation. That a study of the former can lead to conclusions about the latter is a reflection of the recent, dramatic increase in our understanding of the evolution of animal behavior, an increase which stems from an integration of ideas from population biology, evolutionary theory and ethology." Those are the first three sentences of the book, and they sum it up very concisely.

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Letters about Science

Gentlemen of Science. Early Correspondence of the British Association for the Advancement of Science. JACK MORRELL and ARNOLD THACKRAY, Eds. Royal Historical Society, London, 1984 (distributor, Boydell and Brewer, Woodbridge, Suffolk, U.K.). viii, 382 pp. £10. Camden Fourth Series, vol. 30.

Scientific institutions, once they become established and successful, tend to acquire a spurious inevitability. The "British Ass.," forerunner of and model for the AAAS, is no exception. Founded in 1831, the BAAS grew in its first decade or two into such an influential scientific forum that in retrospect its success seemed natural and predictable. In reality, its foundation and the shape it took in its early years were the result of intensive argument and negotiation among a group of men with widely divergent aims and interests. Its course of development and even its survival were anything but predictable.

The story is one that has immense intrinsic interest for an understanding of the scientific enterprise and of the social role of the scientist in the modern world. It has been analyzed in fascinating detail by Morrell and Thackray in their earlier book, *Gentlemen of Science: Early Years of the British Association for the Advancement of Science* (Oxford University Press, 1981), which has already become a classic of its kind in the history of science. The present book has the same title, but its subtitle indicates its complementary character. It prints nearly 300 private letters, the most revealing of the thousands utilized in the earlier book, to illustrate the processes of social interaction by which the BAAS came into existence and developed its distinctive pattern of activities.

It would be difficult to exaggerate the importance of correspondence as a medium of scientific exchange in an age without telephones; and it is fortunate that fluent and forceful letter-writing was a routine accomplishment at that time in the social strata from which science drew its strength. The letters printed here are not only valuable source material for the historian of early 19th-century science; they also make fascinating reading for anyone who is sensitive to the way things get done in the modern scientific world. For on the human level the contrasts between the 1830's and the 1980's are much less striking than might be expected. In these letters we find traces of many familiar tensions: arguments soaked in self-interest or expressed in terms of high-minded altruism; conflicts between the entrenched individualism of established leaders and the collectivist visions of lesser mortals; arguments about the proper qualifications of those with authority to speak and decide in the name of science; and conflicts over the desirable degree of patronage, direction, or even control of science by the state.

What gives piquancy to our reading of these issues, as they were debated among Morrell and Thackray's British "gentlemen of science," is that the explosive expansion of science and technology in the subsequent century and a half was not inevitable to them. The issues were still wide open, or at least were felt to be; there appeared to be many alternative directions that the scientific enterprise might take; and the "cultivators of science"—even the word "scientist" in its modern anglophone sense had yet to be coined when the BAAS was founded—believed with good reason that their actions could influence those directions decisively.

These letters should perhaps be required bedside reading for those responsible for modern science policy; certainly any practicing scientist with a sense of history will find them entertaining, instructive, and absorbing.

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Books Received

Collisionless Shocks in the Heliosphere. A Tutorial Review. Robert G. Stone and Bruce T. Tsurutani, Eds. American Geophysical Union, Washington, DC, 1985. viii, 115 pp., illus. $18. Geophysical Monograph 34.

Collisionless Shocks in the Heliosphere. Reviews of Current Research. Bruce T. Tsurutani and Robert G. Stone, Eds. American Geophysical Union, Washington, DC, 1985. vi, 303 pp., illus. $36. Geophysical Monograph 35.

The Coming Revolution in Agriculture. Harold Willis. Published by the author, P.O. Box 692, Wisconsin Dells, WI, 1985. xii, 223 pp., illus. Paper, $8.95.

An Ecosystem Approach to Aquatic Ecology. Mirror Lake and Its Environment. Gene E. Likens, Ed. Springer-Verlag, New York, 1985. xiv, 516 pp., illus. $49.

Elementary Particles. I. S. Hughes. 2nd ed. Cambridge University Press, New York, 1985. xvi, 349 pp., illus. $49.50; paper, $19.95.