carries the seeds of its own destruction is interesting and deserves close examination.

The market system relies on consensus in the form of legal constraints to discourage behavior that is personally advantageous but socially disruptive—speeders and embezzlers are fined or jailed, for instance. Similarly, the community obtains the desired output of common goods like public parks by collective decisions to impose taxes on all.

Hirsch argues that this system contains the seeds of its own destruction, since the personal incentive system tends to undermine socially constructive attitudes like cooperativeness, fairness, or personal morality. Enforcement costs thus tend to rise, and more resources are needed to hold disruptive activities at any given level. As a consequence, the intermediate product "costs of maintaining the fabric of society" rises, absorbing more resources and leaving fewer for the production of socially beneficial goods and services.

If society could count on community mores or religious constraints to induce people to refrain from disruptive activities, instead of having to use resources for that purpose, social welfare would be higher. Thus, internalizing these desirable behavioral norms is seen by Hirsch as a more efficient way to produce public good than having to use resources to make disruptive behavior unattractive on grounds of self-interest.

It is hard to quarrel with the general tenor of the argument. Clearly, a society in which everyone voluntarily refrains from littering, stealing, and tax evasion is more efficient than one in which billions of dollars are required to achieve the same outcome. The same argument, of course, holds for the production of goods that are public in a world rather than a national sense—protection against aggression being the obvious case in point. If no nation acted in an aggressive manner toward other nations because aggressive behavior was regarded as unethical or immoral, hundreds of billions of dollars worth of military goods and services could be dispensed with and no one would be the poorer for it.

The principal difficulty with the argument, as I see it, is not that Hirsch's portrayal of society is inaccurate but that the attempt to link the rising costs of providing public goods with the dynamics of the market system is tenuous. Moreover, it is not clear to me that human behavior has actually become more self-interested and self-centered and less socially responsible than it was in simpler times. What has happened over many decades is that attitudes toward the punishment of transgressions have shifted markedly. As a consequence of a more humanitarian view of how societal transgressors should be treated, penalties have become less draconian and thus we have made it more profitable to act in an antisocial way.

Thus, while I think it is true that the cost of producing various public goods has risen substantially, I am much less sure that it has risen because continued operation of a market-exchange economy has eroded societal norms, ethical constraints, and religious attitudes. In short, by pointing to the substitution of resource costs for internalized constraints as a way of maintaining the social fabric, Hirsch has correctly portrayed an important dimension of social welfare. But why this has taken place is something of a puzzle, and Hirsch is not persuasive in blaming it all on the market economy.

The presumption that Hirsch has identified a problem but not a viable solution is strengthened by reading the last section of the book. Here, the tight analysis of much of the book dissolves into a combination of wishful thinking and recommendations of conventional fiscal incentives—for example, the suggestion that the attractiveness of jobs that combine high pay with power and prestige be reduced by taxing pay differentials as a way of decreasing the attractiveness of scarce educational opportunities that lead to jobs that are high-paying, interesting, and at the top of the hierarchical pyramid. Similarly, Hirsch appears to call for measures designed to produce a leveling of opportunities available to members of society—the presumption being that the success of the haves, which cannot be shared by all the have-nots, would create less social tension if it were less conspicuous by way of being less successful.

One final note on a characteristic of *Social Limits to Growth* that seems to me not one of its strengths: the book is almost devoid of empirical data on actual performance of economic systems, actual distributions or changes in distributions over time, actual perceptions of well-being, or other relevant matters. While Hirsch has drawn on a few numbers gleaned from empirical or statistical studies, the gleanings are sporadic. A second shortcoming is the occasional misrepresentation of what other social scientists—particularly economists—believe. For example, I would not recognize modern wage theory in Hirsch's formulations of it.

Despite these blemishes, Hirsch has written a provocative book. It can be read with profit by anyone interested in the nature of modern industrial society, the characteristics of some of its problems, and the alternatives it may have to choose among.

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Coastal Habitats

The Coastline. A Contribution to Our Understanding of Its Ecology and Physiography in Relation to Land-Use and Management and the Pressures to Which It Is Subject. R. S. K. BARNES, Ed. Wiley-Interscience, New York, 1977. xii, 356 pp., illus. $28.50.

The primary goal of this book is to provide an ecological basis for decision-making by coastal zone managers. It is a collection of 15 chapters written by 13 British and two European scientific authorities. Each chapter attempts to summarize for a different coastal environment, such as salt marshes, shingle foreshores, and sand dunes, the following aspects of the environment: fundamental ecological and geomorphological processes; ecologically sensitive or special features and the pressures to which they are subject; methods of study; usage; and recommended conservation and management policies.

There is a wide range in the quality of the articles, with five adequately achieving the goal of the book and most of the rest falling short. The illustrations are generally abominable. Two chapters have no illustrations at all. Many chapters are dated, and some contain too much editorializing and too little data. In some instances, the authors' discussions of pollution problems are unbalanced, with overemphasis on their own pet pollutant.

Nevertheless, the book presents enough new material and stays on target successfully enough (because of the rigid format) to warrant its purchase by coastal zone managers as well as by marine scientists interested in some of the specific environments. The chapter on earth cliffs by V. J. May is the most original contribution in the book, being based in large part on May's personal experience. He presents a thoughtful, practical approach to dealing with earth cliff erosion problems. A. Nelson-Smith gives a well rounded summary of estuaries, which is accompanied by a detailed reference list of European studies. However, he tends to overemphasize oil pollution in his dis-

cussion. The other informative chapters are the chapters on salt marshes (by W. G. Beeftink), lagoons (by G. Colombo), and sand dunes (by L. A. Boorman). Another strength of the book is the breadth of coverage of environments. The chapters on reclaimed land and the submaritime fringe cover important areas usually omitted from this type of discussion.

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Descriptive Statistics

Exploratory Data Analysis. JOHN W. TUKEY. Addison-Wesley, Reading, Mass., 1977. xvi, 688 pp., illus. $17.95.

Descriptive statistics involves the use of graphical techniques and measures of location and scale to explore data, find anomalies, display patterns of association, and show what one has found. It is thus an essential tool for every statistician and every empirically minded scientist. New approaches to descriptive statistics, although rare, are potentially extremely important.

John Tukey, a statistician of the first rank, has set himself the task of seeing what insights into descriptive statistics might be gained from modern statistical thinking. He has created a body of new methods, many of which are potentially useful. *Exploratory Data Analysis* is a first extensive report on these new methods. Tukey distinguishes between exploratory and confirmatory data analysis. His concern in the exploratory phase is to examine the data from many points of view, as a detective might, to see what overall patterns they suggest. In the second, confirmatory phase, the apparent patterns are examined more closely to see if they withstand rigorous statistical scrutiny.

Because many of the ideas in descriptive statistics are seemingly simple, a writer is tempted to present them in an overly elementary form. Unfortunately Tukey has yielded to this temptation. He is therefore unable in this volume to tell his more sophisticated readers what he is really thinking about. We are told a great deal about what the methods are but all too little about their properties and when to use which. Thus this volume has severe limitations as a research monograph.

As an elementary textbook, the book also suffers. Despite the use of many different sizes of type, major points are often lost under a mass of detail. For example, in the review of chapter 11 circling of negative numbers is given equal weight with examination of residuals. In chapter 1 we learn how to place our finger to count numbers the Tukey way. This level of detail is boring and unnecessary and makes the book baffling as a textbook. Several professors who have used it as a textbook say they would not do so again.

There is also the matter of its vocabulary. Tukey delights in making up new words, whether necessary or not. Thus the lower quartile becomes the "lower hinge," the upper quartile the "upper hinge," and the interquartile range the "hinge spread." This new vocabulary is a burden to professors and, more particularly, to students, who will be expected to be able to read and perhaps write papers involving statistics after leaving a statistics course. From this book they will know little of the common vocabulary and much that is idiosyncratic to Tukey.

A third group of potential readers, empirical workers in scientific fields, may find the book somewhat more useful. They are, however, likely to be put off by the unfamiliar vocabulary and mystified by the question when and why to use which techniques. Among the techniques they might find most useful are the analysis of the family of power transformations (particularly exhibit 21 of chapter 6, p. 198) and the analysis of two-way plots (especially exhibit 7 of chapter 10, p. 349). They should be ready to do a lot of work to understand those techniques, however.

What we have, then, is a statistical cookbook, with dishes new to both teacher and student. There are almost no published technical papers in which this new statistical cuisine can be tasted. The consequence is that the flavoring done by amateur chefs is bound to be off, and much statistical mischief can ensue. I would prefer that Tukey and his group had opened a few restaurants, publishing papers that would have been subject to review by epicures, before going into the mass cookbook market. A few such papers, particularly three by Tukey (*1*), and a few other recent books (*2*) dealing with exploratory data analysis have appeared, and a useful review of the subject can be found in a forthcoming paper by Leinhardt and Wasserman (*3*).

Despite all its weaknesses, both as a research monograph and as a textbook, there is very important and novel business going on in the book under review. Tukey suggests a freedom of approach to data that is bound to be liberating. "Try things," he continually suggests, "plot your data differently. Maybe transform. Keep looking." This spirit is already influential in statistics and is likely to become more so. It's a pity that this book does not do a better job of explaining such an important point of view.

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Avian Pests

Granivorous Birds in Ecosystems. Their Evolution, Populations, Energetics, Adaptations, Impact and Control. JAN PINOWSKI and S. CHARLES KENDEIGH, Eds. Cambridge University Press, New York, 1978. xxii, 432 pp., illus. $41. International Biological Programme 12.

Each year birds damage millions of dollars worth of crops, particularly grains. Among the culprits, the house sparrow (*Passer domesticus*), widely distributed in Europe and Asia and introduced to most of the western world, poses the biggest threat. Others include the red-winged blackbird of North America and the red-billed dioch of southern Africa. For more than a decade, these species and some of their relatives have been subjects of intensive studies of evolution, population dynamics, and production, coordinated by the Working Group on Granivorous Birds of the Section on Terrestrial Productivity of the International Biological Program. The present volume, edited by J. Pinowski of Poland and S. C. Kendeigh of the United States, summarizes and synthesizes these studies.

Granivorous Birds in Ecosystems is a model of coordinated and integrated research by independently funded investigators. Although granivorous birds, principally the house sparrow, are the main source of data and the subjects of the