phenomenon, justifies the choice of seabirds for study of the relations between energetics and environmental resource availability.

The first chapter, by Rahn and Whittow, summarizes so effectively the state of knowledge of seabird energetics, breeding biology, population dynamics, and economic relations to the fishing and guano industries that the rest of the book is almost unnecessary. The other chapters are arranged logically from the egg to the population: costs of egg formation and incubation behavior, embryonic growth rates and thermal tolerances, energetics of adult breeding behavior, temperature regulation, flight and terrestrial locomotion, and finally population energetics and impacts on marine resources.

Because research on seabirds began in earnest only 20 years ago and many species spend most of their adult life at sea, where observations of their activities is difficult, some chapters have few data on seabirds to present and rely mainly on studies of other birds, even chickens. Other chapters on more completely studied topics reveal some fascinating differences between seabirds and other species: prolonged incubation periods of Procellariformes, production of stomach oils for feeding of nestlings, and embryonic and nestling tolerances of periodic feeding and neglect by attending adults. These features, particularly prolonged incubation periods, invite questions concerning the selective pressures underlying their evolution, and I would have liked to see the authors abandon all caution and advance some testable hypotheses.

The construction of ecological models is complicated by a lack of precise measurements on energetics of free-ranging birds and population sizes of both birds and prey and by arguments about the degree of complexity such models require to be accurate. However, the estimates are intriguing and invite further effort. For instance, seabirds may consume about 7.8 million tons of prey each year worldwide and may return annually about 7700 tons of excrement just to the marine system off Newfoundland alone.

Though this book may stimulate few controversies, it provides a solid summary of the state of current knowledge and a stimulus for further research. It should prove informative reading for physiologists, ecologists, ornithologists, and anyone else who enjoys seafood.

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Synthesizing Data

Summing Up. The Science of Reviewing Research. RICHARD J. LIGHT and DAVID B. PILLEMER. Harvard University Press, Cambridge, Mass., 1984. xvi, 191 pp., illus. $17.50; paper, $7.95.

Until recently, reviews of social science research on a given subject have been qualitative and judgmental because individual investigations are typically characterized by specific conditions of unknown pertinence to the effect or relationship of interest. In the last decade, however, methods have been developed for systematically integrating the findings of diverse studies. These new procedures—often called meta-analysis—are of vital importance to the scientist, for whom the matter of interpreting prior findings is at least as critical as the task of generating additional results. The productions of such integrative procedures may also be essential to the policy-maker, who in making a decision may need to use simplified accounts of what is known about several research areas. Policymakers are likely to be concerned primarily with the effects of treatments: surgical, drug, educational, psychotherapeutic, and so on. Others interested in summaries of research on treatments include those who manage treatment programs and those who may be treated by them.

For a problem in social science, the pertinent research literature is usually more diverse than that for one in natural science. There is great variation in procedures, both measuring operations and experimental manipulations or treatments. Hence, with few research studies being replicated very closely, exact reproduction of findings is rare.

Light and Pillemer not only provide an excellent introduction to the new systematic methods for summing up and analyzing bodies of research but also examine the standard qualitative type of review, assessing the strengths and weaknesses of each approach. They recommend a synthesis combining the two. The book provides guidance to professionals who want to undertake research reviews and to policy-makers who must evaluate the adequacy of such reviews. Since they are writing for broad audiences, the authors cannot provide a manual for those undertaking quantitative reviews, but such people can adequately prepare for such a task by using the literature cited. Although the authors occasionally bring up the need for evaluating the quality of the research plan in each research report, they do not include quality as a possible criterion for excluding reports from a review. (Perhaps they believe there is not enough consensus in such judgments.)

This lucid book has many fine characteristics. The authors stress the analysis of the variation in findings across studies to uncover factors associated with successful and unsuccessful treatments and to seek the boundary conditions for each conclusion drawn. They examine the problem of publication bias: Positive results are more likely to be submitted for publication and published; negative findings may be buried in file drawers. The authors emphasize clear and precise conceptualization, especially in the formulation of the question to which the review is addressed.

Problems of conceptualization and operationalization are pervasive in social science and in the study of treatments. The authors show that reviewers must determine exactly what the treatment was and how much it varied from one study to another. They discuss the matter of multiple outcomes of any treatment, including side effects and immediate versus long-term effects. Neglected, however, is the problem of inferring from an empirical measurement to the conceptualized goal of the treatment. No one index adequately indicates quality of life after heart surgery. No one score is sufficient to assess even one aim of psychotherapy. But what set of measuring operations or what weighted index represents the construal of the desired outcome?

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