cellent mass and energy budgets of corn by such men as the editor of the present volume—but found little. Recent exciting work is not represented or synthesized in the manner one has grown to expect from the AAAS imprint.

Some papers indeed are interesting. Several that use energy budgets illustrate one of the unifying themes of climatology, but many are out of place in a hard-cover book. Some apparently were written in innocence of relevant work in other countries; some attempt to review a problem without controlling the primary literature; others report investigations that plainly are not yet finished. Some look curiously as if they had been written before Geiger published his great work in 1927. Few papers are informed by theory.

Such difficulties are common in symposia (though only to a minor degree in two recent symposia on agricultural climatology in Australia and England), and it is preferable to dwell on useful points. One is the evidence of a trend to consider all parameters of the environment of plants and animals, including those not taken into 19th-century meteorology. Solar radiation is such a neglected parameter, still not a part of synoptic reporting networks, though it is an important energy-exchange process. Radiation data are used profitably in the study by Newman *et al.* comparing growth of oranges in different parts of the United States, in Bond's study of heat loads on cattle and hogs in field environments, in McDowell's study of energy input-output relations of cattle, and in Fritschen and Nixon's description of effects of irrigation in small-scale climates. Fritts employs radiation data in the best-reasoned statement I have yet seen on the possible connections of environment and tree-ring widths, with leaf temperature as the critical intermediary.

Although the book does not epitomize present knowledge in the field, it does present one important statement about the future—Whittaker's warning to stop fooling with systems we don't yet understand. While he is, perhaps, needlessly impressed by the claims of weather-"control" operators, he is right in saying that weather modification, whatever it may turn out to be, is too important to be left to one profession. Meteorology, dealing with atmospheric perturbations that move downstream and soon die, may too easily accept disturbances in systems at the atmosphere-earth interface, which, as Whittaker points out, have long lives, may become unstable, and do not obligingly move elsewhere. The cloud-seeder, in fact, reminds one of an amateur chess player, boldly advancing his queen into a complicated terrain for an immediate profit or just to see what might happen, while Whittaker might be the kibitzer looking into the flinty countenance of the master across the board and thinking, "Well, maybe so at first. . . . What's the next exchange? . . . And the next? Let's hold on a second. . . ."

This book, disappointing in some ways, does bring us, in a place of emphasis, this warning of the vulnerability of systems at the earth's surface to sudden changes in their environment, and reminds us of our ignorance of their connection with that environment.

DAVID H. MILLER
Department of Geography,
University of Wisconsin–Milwaukee,
Milwaukee

Organic Photochemistry

Reactivity of the Photoexcited Organic Molecule. Solvay Institute of Chemistry. Proceedings of the 13th conference on chemistry, Brussels, Oct. 1965. Interscience (Wiley), New York, 1967. x + 350 pp., illus. $15.

This volume is an excellent state-of-the-art collection of reviews covering the full range of vantage points toward organic photochemistry, from that of the preparative organic chemist to that of the theoretical kineticist concerned with the details of the crossing of potential energy surfaces. Although a wide variety of reactions is discussed, each presentation is written from the point of view of one or more unifying themes. Each is followed by a lively discussion which sharpens the issues of greatest controversy.

Stereochemical factors are stressed by Yang in discussing the type of product observed in photochemical solution reactions of ketones, but the importance of subtler features of the reaction profile is recognized in that note is taken of the differential ease of hydrogen abstraction from a primary as compared with a secondary carbon. Hammond centers attention on sensitization and shows the usefulness of this technique for distinguishing between singlet and triplet reaction paths and for demonstrating the differential excitation of different geometrical isomers in the butadiene series, not always equilibrated in the excited state. Dauben, in dealing with the intramolecular photochemistry of butadiene, shows the applicability of the Woodward-Hoffman symmetry rules of electrocyclic reactions. Havinga and Daudel both discuss the importance of pi-electron densities in predicting reactivity and orientation influences in excited states of aromatics. Porter raises questions about the significance of excited state charge densities in cases, such as heterolytic substitution, where the atomic rearrangement does not occur during the lifetime of the excited state; and he places as a matter of greatest urgency the understanding of the internal conversion process and the subsequent vibrational relaxation, during the course of which most photochemical reactions probably proceed. Schmidt's review shows the powerful technique of solid state photochemistry in which advantage is taken of polymorphism and of crystal structure variation within homologous series, especially in the acrylic acids, to learn the steric requirements for forming the transition state in bimolecular reactions.

Coulson's contribution on detailed descriptions of excited state energies and shapes points up the limited successes achieved for very small molecules with the help of Walsh correlation diagrams, molecular orbital calculations, symmetry arguments, the Hellman-Feynman theorem, and experimental resolution of rotational structure in vibronic spectra. At the same time, the reader experiences frustration at the realization that we are far from the point of having good theoretical descriptions of the excited states of organic molecules of practical interest. Perhaps newer developments not discussed in this volume, such as electron correlation calculations, flexible molecular orbital procedures incorporating both sigma- and pi-electrons for medium-sized molecules, or still others, will provide the breakthrough in keeping theory and experiment in pace with each other in the next decade. Porter summarizes the general state of affairs in hoping that new methods, both experimental and theoretical, "should, over the next few years, narrow the gap to the point where our ignorance of excited state reactivity is no greater than our ignorance of reactivity in the normal ground state."

J. L. ROSENBERG
Department of Chemistry,
University of Pittsburgh,
Pittsburgh, Pennsylvania