picture of acridid behavior and the underlying mechanisms involved. Integration of this kind is probably rarely achieved by teamwork. Perhaps the most we can hope for is the emergence of another Sir Boris Uvarov.

Several particularly interesting aspects of physiology and development are presented in this section. Ellis, for example, summarizes the evidence that phase transformation in *Schistocerca gregaria* requires several generations; since the eggs of crowded females are larger than those of solitary females, and since the rearing conditions of the fathers are immaterial, one assumes that the phase transformation is mediated in part through cytoplasmic inheritance. However, N. J. Nolte has shown that rearing conditions have genotypic effects as well. He presents data showing that chiasma frequency in *Locusta pardalina* males is appreciably higher in individuals raised under crowded conditions and undergoing phase transformation. He suggests that since it is just such individuals that migrate and encounter unpredictable conditions for egg-laying, physiological or developmental control of chiasma frequency by individual locusts may be an evolved mechanism for increasing variability in the offspring.

The largest section of this book deals with population studies and is divided into four subsections treating factors affecting distributions and population fluctuations and the detection and prediction of population increases. Since, in species displaying phase variation, it is the gregarious, migratory morphs that are economic pests, much attention is given to determining which aspects of the environment influence the transition from solitary to gregarious phase and to detecting incipient swarms.

The sections devoted to an evaluation of the economic impact of grasshoppers on range and crop lands stress the fact that these insects continue to be economically important even though major outbreaks have not occurred in the last five or six years. Since the factors resulting in reduced populations and swarming behavior are not understood, there is at present no way to recognize and modify outbreak conditions should they recur. P. T. Haskell, present director of COPR, therefore urges international and national control organizations to devote more resources to long-term ecological research than to short-term, stopgap control research.

This is an important contribution to the study of grasshopper biology. The book will be useful in both basic and applied insect research and should be of interest to a wide variety of insect biologists.

DANIEL OTTE
Department of Zoology, University of Texas, Austin

Atomic Processes

Hyperfine Interactions in Excited Nuclei. Proceedings of a conference, Rehovot and Jerusalem, Israel, Sept. 1970. GVIROL GOLDRING and RAFAEL KALISH, Eds. Gordon and Breach, New York, 1971. In four volumes. Vol. 1, xxviii pp. + pp. 1–360, illus.; vol. 2, xxviii pp. + pp. 361–732, illus.; vol. 3, xxvii pp. + pp. 733–984, illus.; vol. 4, xxviii pp. + pp. 985–1354, illus. $27.50 each.

The origin of the name "hyperfine interaction" dates back about 75 years to the time when Michelson and others first looked at atomic spectral lines with the high resolution of their newly developed interferometers. They discovered that many spectral lines possess a structure much finer still than the usual fine structure, and hence the name hyperfine structure. At that time the nucleus had not yet been discovered. Subsequent developments have shown that this structure is attributable to the influence of the nucleus on its surrounding electrons. From these delicate and remote beginnings the study of hyperfine interactions has indeed blossomed, especially in recent years, to the point where the proceedings of the recent Rehovot Conference on the subject is a four-volume work.

What are the reasons for this surge of activity? Of course the Mössbauer effect continues to play a prominent and fruitful role in this field. However, in reading through these volumes I was especially impressed by two things: the great usefulness of heavy-ion beams from accelerators, and the remarkable interaction of a diversity of disciplines. The present and potential usefulness of heavy-ion beams is reflected in the proceedings by the inclusion of such papers as an account of radiation damage from ion implantation (D. Dautreppe), a lucid discussion of the use of channeling phenomena to discover the location of impurity atoms in crystals (B. Deutch), and a comprehensive review of the static quadrupole moment of the 2+ state in ^{114}Cd by the Coulomb excitation reorientation effect (U. Smilansky).

The diversity of disciplines contributing to this field is recognized by the participants themselves, and the salutary result is a number of papers of high pedagogical quality. Some examples are the review of mesic atoms (S. Devons), the evaluation of isomer shifts (G. Kalvius), and the review of spin-rotation, stroboscopy, and dynamic perturbations (E. Rechnagel).

The alluring feature of heavy-ion beams is the possibility of simultaneously exciting the nucleus and its atomic electrons. The large linear momentum imparted to the residual atom in such a collision can literally tear the atom apart. A large number of the electrons are completely removed from the atom, and those that remain may be put into unusual states of excitation involving high angular momenta and simultaneous excitation of several electrons. One can then study the interaction of this strongly perturbed atom with its excited nucleus. Another useful parameter is the lifetime of the excited nucleus. The lifetime can be varied from seconds to subpicoseconds. Finally, the large momentum makes it possible to implant the atom into a solid where one can study solid state effects. The proceedings cover a number of possibilities; recoil into vacuum (R. Nordhagen), recoil into gases (G. Sprouse), recoil into ferromagnetic materials (R. Borchers), and recoil into nonmagnetic metals (B. Herskind).

In the last volume there are several valuable tables summarizing what is known about changes in nuclear radius, values of hyperfine fields, and nuclear moments (about 700 references). This volume also presents an interesting discussion by I. Talmi on the subject of the theoretical implications, especially from a nuclear-shell-model point of view, of this substantial collection of values for nuclear moments of ground and excited states.

PAUL STELSON
Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Books Received

Abstract Automata. Peter H. Starke. Translated from the German edition (Berlin, 1969). North-Holland, Amsterdam; Elsevier, New York, 1972. 420 pp., illus. Cloth, $28.75; paper, $17.95.

Adolescence. A Psychological Perspective. Dorothy Rogers. Brooks/Cole, Monterey, Calif., 1972. x, 238 pp., illus. Paper, $4.50.

Advances in Gerontological Research. Vol. 4. Bernard L. Strehler, Ed. Academic

(Continued on page 1020)