minor, perhaps) is extremely thorough. There is also good coverage of the bionomics of North American *Melanoplus* species. Grasshopper ecology, biogeography, and population dynamics are fields in which Soviet entomologists have made outstanding contributions, and these are dealt with thoroughly in this volume, illuminated by the author's firsthand knowledge of the situation in the field.

The book is very much the man himself. Uvarov, despite his 50 years in Britain, remained intellectually a representative of the classical tradition of Russian entomology as it developed in the early years of the century, before it became influenced by genetics, biochemistry, and modern theoretical ecology. To these influences he remained impervious. Thus in some ways his book has a slightly old-fashioned flavor. Moreover, it is, so to speak, a locust's-eye view of "acridology," without comparisons with other insects. The study of locusts, for Uvarov, had much to contribute to general entomology, but the converse was not true.

Uvarov's name will always be associated with two concepts of basic importance in connection with locust plagues—*phase transformation* (from the solitary to the gregarious state) and *outbreak areas*. It is consequently natural that these should be fully dealt with in this book. The idea that swarms originate from localized "outbreak areas," where mass breeding occurs, proved extremely fruitful in the control of *Locusta migratoria*, which has a major outbreak area in the deltaic region of the Niger river in the Republic of Mali. Unfortunately, the concept has rather limited applicability to the desert locust, the number one locust scourge of the Old World.

One of the most interesting features of the book is the history of the development and recession of plagues of *Schistocerca* (1948–1963) and *Nomadacris* (1930–1945), illustrated by maps based on the work of Z. Waloff, Morant, and Symmons. Other maps illustrate the movements of swarms of the various species in relation to climate, seasons, and meteorological conditions.

The final chapter, a general discussion of the problems of locust control, is an expanded version of a paper delivered by Uvarov to the 13th International Congress of Entomology in Moscow in 1968 and originally published in Russian. The salient points of the argument are: (i) the considerable successes of direct insecticidal control measures in Africa and western Asia have been no more than palliatives, and the basic problem remains; (ii) the ultimate solution, different for each pest species, must be the regulation of the population dynamics of the species by deliberate modification of key ecological factors; (iii) new economic problems are continually arising, owing to the development of local grasshopper species into unexpected pests as new agricultural practices in tropical and subtropical countries lead to modification of the general ecology.

Outstanding as an organizer of the overall strategy of locust control, Uvarov never lost his vision that a broad biological approach would eventually reduce populations of these oldest insect competitors of man to a bearable level. He was interested in any facts or ideas that might contribute to that end but impatient of biochemical, physiological, or genetic research which he did not understand and whose relevance to the economic problem was unclear. Speaking of laboratory research on locusts he makes this characteristic comment (p. 531): "Many of these studies throw some light on what actually occurs in nature, but most of them are divorced from reality." For him "reality" was always African peasant holdings devastated by locust swarms, crops wiped out, malnutrition and starvation. Speaking of the present reviewer, he is reported to have said on one occasion: "So—B. is going to work with White! Well, B. is mad, White is mad—*something interesting* may come of it!" That mixture of broad- and narrow-mindedness, of optimism and pessimism, of conservatism and foresight, was the essence of Uvarov's thinking and is the background from which this carefully researched, extensively documented book was written.

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Fused Cells

Cell Hybrids. NILS R. RINGERTZ and ROBERT E. SAVAGE. Academic Press, New York, 1976. xiv, 366 pp., illus. $29.50.

Fusion of somatic cells from different animals and plants to form intra- and interspecific hybrid cells has become an important procedure in cell biology, genetics, virology, tumor research, developmental biology, and comparative studies. In addition, practical uses for somatic cell hybrids are now emerging in medicine and agriculture. Short monographs and several review articles have appeared earlier concentrating on various aspects of cell hybridization research. The present volume integrates the many subdivisions of the field. It is designed to present a broad but detailed view of the methodology of cell fusion as well as the major developments in the applications of somatic cell hybrids. Since the literature of the subject is increasing rapidly, the authors have chosen to present highlights in the majority of instances, and deal more briefly with topics such as gene mapping that have been reviewed extensively elsewhere. Over a thousand references prior to 1976 are cited in the book.

After a historical account of the study of multinucleated and hybrid cells, there are chapters that discuss spontaneous and virus-induced cell fusion, the mechanism of cell fusion, cell fusion at different stages of the cell cycle, heterokaryons, and cell fusion with cellular fragments. These chapters, which constitute roughly half the volume, lay the methodological groundwork for the isolation of proliferating long-term somatic cell hybrids.

Chromosome patterns and phenotypic expression of gene markers in multiplying mononucleate hybrid cells are then discussed. The various chromosome banding techniques and patterns of gene expression in cells with inputs from two genomes are summarized. An interesting but not extensive chapter on the characteristics of organelles in hybrid cells is included. The remainder of the book deals with the important subjects of gene mapping and genetic complementation, analysis of malignancy, and viral infection and rescue in cell hybrids. The book concludes with a useful and timely chapter on the properties and applications of plant cell hybrids.

The goal of the authors was to present their subject so that it could be understood by those with a "basic training in biology." They have succeeded in this. With a glossary as an aid and a brief introduction at the beginning of each chapter, the book need not be read sequentially.

Cell hybrid research is expanding rapidly and is much too broad to permit inclusion of all the fine points and interesting references in a volume the size of this one. The authors have been quite successful in selecting their material. The book is well illustrated and includes many facts assimilated in tabular form. *Cell Hybrids* will be an important source book not only for the graduate student, but also for the investigator with an interest in the subject.

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