reproduced photographs that carry the day. Many of the photographs are in color stereo pairs, and a folding viewer is included. Pertinent information is conveniently tabulated in the appendix.

In his introduction to one of the 25 chapters, H. E. Edgerton writes, "The photographic process excels all others for the collection and storage of information. It is not a matter of chance, therefore, that great effort has been put into the design, development, and exploitation of camera systems." Hardly anyone will disagree with this premise, yet running through many of the contributions is a mildly defensive attitude that seems unnecessary in view of the profusive insights and results presented. Where the merits of photography are dealt with, however, there is general agreement that in the cases of biological and most geological studies, to be most productive, photographic techniques should be supplemented with (or be supplemental to) the conventional sampling methods of grab, dredge, and core.

The "great effort," with a few notable exceptions, has been centered at institutions concentrated on the northeast Atlantic seaboard, and the book is essentially their family album, with contributions from a few West Coast and British cousins.

About 40 percent of the pages deal with instrumentation, methodology, and representative examples of applications (including identification of World War II wrecks and the search for the sunken submarine U.S.S. *Thresher*). Approximately 10 percent of the pages present the results of physical studies of currents and light scattering, and the remaining 50 percent are about equally divided between geological and biological studies. There is, of course, some overlap between these areas. Individually, some of the pieces are brief to the point of superficiality; others stand as major contributions to our knowledge of the geological and biological deep-sea environment; and a few are redundant, although the retelling fits in well here. But as a whole, the book hangs together remarkably well, with a harmonious mix achieved in large part by logical chapter organization and adequate cross references added by the editor. This book should be of considerable interest to geologists and paleontologists who specialize in sedimentary-rock stratigraphy and the fossil record. Many of the sedimentary features seen on the sea floor (for example, current and oscillatory ripples) and the numerous tracks, trails, and burrows of marine organisms have been preserved in the rocks of the continents. The evidence of deep currents in so many areas has disposed of the old idea in geology that ripple marks are evidence of shallow water. Paleoecologists will find the photographs of modern ecology niches instructive in their study of fossil faunas. There is something here, however, for all oceanographers and a wealth of material for textbook and liaison writers. With its spacious (20 by 28 centimeters) imperial octavo, two-column-page format the book may not fit comfortably on all office bookshelves, but it will not sit long on library shelves.

Aside from the obvious advantages of such collected works over scattered journal articles, it provides space for what most editors and referees generally and rightfully consider nonessential background. The pathway to technological success is a street of broken dreams, littered with discarded instrument carcasses, and oceanography, like any other science, has a history of at least as many experiments that failed as that succeeded. It is refreshing to see some of this in print. For example, the authors of the introductory historical chapter, M. Ewing, J. L. Worzel, and A. C. Vine, give us fascinating insight into their pioneering efforts, failures, and successes with equipment, sponsoring agencies, and ship captains. The editor, J. B. Hersey, in his chapter on the manipulation of deep-sea cameras, takes the space to caution against paying out cable at rates in excess of the freefall terminal velocity of the attached camera, and then parenthetically adds that "in early experience with cameras, this speed was sometimes exceeded, with resulting cable tangles of fantastic complexity!" I have heard more organic words used to describe the results of this common accident, but none so carefully chosen.

During the several years this book has been in press, the art has gone on, with a trend, as prognosticated by several authors, toward increased use of deep submersible vehicles as photographic platforms. An indication of the time lag involved is given by the last chapter, which deals with a study done from the now Smithsonian-bound *Trieste* I.

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Insect Genetics

Genetics of Insect Vectors of Disease. Edited for the World Health Organization by J. W. WRIGHT and R. PAL. Elsevier, New York, 1967. xx + 794 pp., illus. $67.50.

This heavy and expensive tome is filled with information which, as far as this reviewer is aware, has never before been summarized in a single book. Two-fifths of the book (eight chapters) is devoted to the genetics of mosquitoes; three chapters deal with the genetics of muscoid flies and single chapters with the genetics of cockroaches, acarines, and *Triatoma*. A section entitled Applied Genetics consists of chapters on population genetics, physiological genetics, genetics of insecticide resistance, genetics of behavior, and genetics of susceptibility to parasites. Two chapters deal with the genetic control of insect pests. The two final chapters cover the techniques of mass breeding procedures and of genetic and cytogenetic experiments and observations.

Thanks to the dedicated efforts of, among others, R. H. Baker, G. B. Craig, Jr., G. Frizzi, J. B. Kitzmiller, and H. Laven (all of whom are among the authors of this volume), several species of mosquitoes may now be counted among the genetically best-studied animals. Impressive collections of mutants and "marker strains" are now available in *Culex pipiens, Aedes aegypti, Anopheles quadrimaculatus,* and *Anopheles gambiae*. Maps of the giant chromosomes in the salivary gland cells have been made for *Anopheles atroparvus, A. freeborni, A. punctipennis, A. aztecus, A. occidentalis, A. earlei,* and *A. quadrimaculatus*. Chromosomal and genic polymorphisms have been found and studied in natural populations of several species. Complexes of closely related sibling species, morphologically distinguishable only with difficulty, have been found in *Aedes, Culex,* and especially *Anopheles*. These complexes have been extensively studied by crossing experiments, as well as by comparison of the gene arrangements in their chromosomes. Only for drosophila flies and chironomid midges are comparable data available, and, interestingly enough, the process of speciation among mosquitoes shows several peculiarities worthy of further study and thought. Peculiar cytoplasmic incompatibility has been studied in *Culex pipiens* by H. Laven. Strains of this species from Europe and from northern Africa belong to five "cross-

ing types" showing either unidirectional or bidirectional incompatibility; that is, the hybrids are inviable in one or both reciprocal crosses. Laven has shown the incompatibility to depend on the interaction of the cytoplasm of one with the chromosomes of the different crossing types. The causes of this phenomenon are obscure; Laven rejects as improbable the hypothesis that the properties of the cytoplasmic races may be determined by virus-like or other symbionts, but the alternative suggested by him seems no more probable.

Houseflies have also yielded interesting data, which are reviewed by R. Milani and G. Saccà. Milani's article gives a list of some 130 mutants observed in *Musca domestica,* linkage maps of its chromosomes, and data on the sharp decline of fertility that results from inbreeding. Most interesting, but still puzzling, are the observations reviewed by Saccà on the forms of the housefly, which have been variously considered separate species, subspecies, or just individual variations, and given the names *Musca domestica, vicina, nebulo, calleva,* and *curviforceps*. The first three seem to be in part phenotypic modifications induced by the environment. However, this is not the whole story; it is possible by artificial selection to obtain strains showing all these phenotypes in the same environment; strains of different geographic origins retain their different characteristics when bred in the laboratory for several generations, and converge and become similar only gradually. The other two forms, *calleva* and *curviforceps,* are restricted to Africa, and occur usually in different habitats. They produce fertile hybrids in laboratory experiments and apparently also in nature, but for some reason the gene exchange does not cause their populations to merge into a single one. More work on this is obviously needed.

The chapter by A. Spielman and J. B. Kitzmiller ably summarizes a mass of data on population genetics, and there are comparable summaries in chapters by H. A. Bender and R. E. Gaensslen on physiological genetics and by A. W. A. Brown on the genetics of insecticide resistance in many insect species studied in these respects. Theoretical and practical problems of control of populations of injurious insects by genetic methods are discussed in the three chapters of E. F. Knipling, L. E. LaChance, and C. N. Smith. The principle on which these methods are being developed is induction of enough genetic damage in the insect populations to make them decrease in size or even become extinct. One possible technique is to release in the natural habitats of a population numbers of artificially reared and sterilized individuals sufficient to have a significant impact on the reproductive potential of that population. Another possibility is induction of sterility in a large enough fraction of the individuals in the natural population itself. The sterilized individuals then compete for mates with the remaining fertile ones. Genetic control has been proven effective against some species of insect pests, but how wide its applicability may eventually be remains to be seen.

In sum, the book under review is clearly indispensable to medical entomologists, and is a mine of interesting information for other entomologists, geneticists, and evolutionists.

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Looking for Drugs That Affect Behavior

Ethnopharmacologic Search for Psychoactive Drugs. Proceedings of a symposium, San Francisco, Jan. 1967. DANIEL H. EFRON, BO HOLMSTEDT, and NATHAN S. KLINE, Eds. National Institute of Mental Health, Chevy Chase, Md., 1967 (available from Superintendent of Documents, Washington, D.C.). xxiv + 468 pp., illus. $4.

One of the uses of symposia is to expose people to types of scholarly endeavor they would ordinarily miss or actively avoid. Attendants at the symposium sponsored by the Psychopharmacology Research Branch of NIMH in January 1967 were treated to historical research, anthropological research, botanical research, chemical research, and pharmacological research. In this proceedings volume there are title pages of old books, pictures of snuff pipes and of a never-before-photographed Amazonian tribe, pictures of plants, mass spectrograms, dose-effect curves, and a few words on the history of medicine in San Francisco. Surely there was for everyone in the audience and is for all readers of the volume something of a kind they would otherwise skip.

When so diverse a group of contributors is assembled, it is important for its members to remember that its audience will be at least as diverse. In any field, most of the audience can hope to get only a glimmering of the nature of the information and the gist of the argument supporting a thesis. The definitive proof rightly demanded by specialists is for technical papers in specialty journals. To attempt too much in a symposium contribution is not to enlighten but to bore. Picking, invidiously, a single example from the present volume where this was forgotten I offer the 19 pages of gas chromatograms, mass spectograms, and captions which document the presence of indole alkaloids in South American plants.

By far the most disappointing aspect of the book is the paucity of information on the actual behavioral effects of the putative psychoactive compounds. Although D. X. Freedman gives an excellent account of the psychopharmacology (as distinct from the behavioral pharmacology) of LSD, and P. G. Waser presents his results on muscimol, and there is some information on behavioral effects of Kava, nutmeg, and some indoles, these all add up to a small part of the volume. One cannot criticize the organizers and contributors for not including information that does not exist. Yet a symposium such as this should draw attention to aspects of its topic in which ignorance is greatest and the need for more work most urgent.

The unbiased reader finishes several of the chapters wondering whether the drugs discussed really did anything to the subjects other than perhaps cause nausea or comparable malaise. Subjective descriptions and accounts of self-administration are not going to fool a scientist into believing he knows anything about the effects of a drug. No serious analysis of the behavioral effects in animals of any of the drugs referred to in the book has been attempted, and no contributor or editor seems to lament the fact. Presumably the attitude is that studying a psychoactive drug in a monkey is rather more difficult than studying it in an illiterate deaf-mute, so why work with monkeys when literate and verbal subjects are available? But all literate and verbal subjects have had a long, uncontrolled, largely unknown, and very powerful cultural training before they became subjects for drug experiments. The manifest effect of a drug is, as it were, the reflection of its direct action by an irregular mirror whose contours are determined by past or present circumstances. The distortions