ation of the nonconformist or the "uppity Negro," and perceptions of black deviancy, including mental illness and more general "disease"? Haller has not so much answered questions as furthered inquiry, and he shows that historians have been no more successful in making sense of the role of science in social tragedy than have contemporary scientists in a variety of disciplines.

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Historical Interpretations

The Origins of Theoretical Population Genetics. WILLIAM B. PROVINE. University of Chicago Press, Chicago, 1971. xii, 202 pp. $7.75. The Chicago History of Science and Medicine.

This is a little book about a big subject. It covers a field which has received little attention from historians, and one sufficiently difficult that even understanding it is a serious problem for an outsider. Add to this the fact that the history of science itself is as yet a rather immature discipline, and the task of writing a history of population genetics becomes most formidable. We should be most grateful for so useful an introduction, even if further work soon necessitates different interpretations.

Provine has circumscribed his study to concentrate upon the more influential figures and schools. He stresses the conflict between the Mendelians and biometricians, and the work leading up to the syntheses of Fisher, Wright, and Haldane. This approach has obvious difficulties, in that the works examined may not adequately reflect what is going on. Indeed, one of the points that emerges from this study and others like it is how little the arguments presented in research papers reflect the actual reasons why scientists advocate theories. Peripheral influences may not be sufficiently recognized, and one has to be very careful in accepting what one scientist says about another. Provine has taken advantage of personal interviews to learn how Wright thinks he has been misinterpreted. One isn't always in a position to obtain insight in this way, however, and Provine rather uncritically goes along with Fisher's interpretations of Darwin.

Provine documents some general conclusions which give his work unusually great interest for working scientists. The unfortunate lack of communication between those who make history and those who write it may result in our not appreciating how right he is or how much it matters. First, he notes that "personality conflicts are sometimes very important in the development of scientific ideas." I dare say that this should be given as a rule rather than an exception, and the rule casts a great deal of light on the history of biology. Provine finds it curious that Huxley, one of Darwin's "staunchest supporters and admirers," advocated saltationism. There are two basic reasons, neither of which is generally recognized, for Huxley's attitude: he didn't understand natural selection, and he was jealous. The failure to understand natural selection helps to explain as well why Huxley opposed Darwin on genealogical classification. Also, Darwin was a Cavalier of biology, Huxley a Roundhead. Darwin had independent means, but Huxley had to struggle to make a living. Darwin made it as a theoretician, Huxley succeeded through professionalism and public service. I wonder how much of Huxley's advocacy of Darwinism was ultimately motivated by a desire to get even with Richard Owen. Second, "the acceptance by scientists of a new idea is sometimes more dependent upon its a priori acceptability than upon its scientific proof." We might add that the very idea of "proof" is suspect. Was Bateson more reasonable in criticizing the chromosome theory of inheritance than he was in championing Mendel's genetics? Finally, a "field of science can begin with a theoretical structure which is far from consistent," and in the field under study here the inconsistencies are still with us. The problem goes far beyond resolving contradictions. When we follow the misadventures of blending inheritance, genetic load, the "bean bag" approach, and the like, it may seem dubious whether gratuitous assumptions can ever be totally excluded from our thinking. The trouble with theoretical population genetics, now as always, is that so many of its basic premises are false. It needs continued support from empirical population genetics. Our universe is not populated by mathematical models, and if the organisms contradict the theories it is not the organisms that have to be corrected.

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A Tussle with Orthodoxy

Homeopathy in America. The Rise and Fall of a Medical Heresy. MARTIN KAUFMAN. Johns Hopkins Press, Baltimore, 1971. xii, 206 pp. $10.

This instructive account traces the strange American odyssey of homeopathy from its tardy arrival in the second quarter of the last century to its present moribund state. In so doing, the book sheds light on the history of the orthodoxy with which homeopathy constantly wrestled in a tussle sometimes bitter, sometimes gentlemanly.

With its mild medication, homeopathy won countless converts among patients tired of heroic bleeding and purging and so forced regular medicine to relax its heroism. In their turn, many homeopaths forsook the purity of Hahnemann's systematic theories and borrowed what seemed useful from the burgeoning medical revolution. This posed a continuing identity crisis for homeopathy: adapt the new and become lost within the regular medical profession; hold to the old and become quaint, outmoded, and perhaps barred from practice by tightened licensing laws. The major wing adopted the new sufficiently that in 1903 the American Medical Association accepted homeopaths to membership, but the homeopaths still held on stubbornly to a unique materia medica, a retention that probably prevented the AMA from granting homeopathy status as a therapeutic specialty.

Kaufman might have done better than he has at explaining homeopathy's 20th-century reluctance to abandon its special materia medica and at characterizing homeopathy as a therapeutic mode. He does not mention the homeopathic pharmacopoeia, a volume that was lofted to an official status in federal drug regulation with the enactment of the 1938 Food, Drug, and Cosmetic Act because the law's chief sponsor, Senator Royal S. Copeland, was a homeopathic physician. Nonetheless, even though denied access to crucial records, Kaufman relates a much fuller story than has heretofore been told about homeopathy's recent history. By 1923, as a result of the radical upgrading of medical education, only two of the 22 homeopathic medical colleges that had existed in 1900 remained, and these two lost their homeopathic distinctiveness a decade later when an AMA council refused to continue the approval of schools teaching "sectarian medi-

cine." Despite the efforts of a few dynamic young recruits, the average age of homeopathic practitioners has steadily increased. Kaufman predicts the sect's demise within two or three decades.

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Afferent Processes

Animal Psychophysics. The Design and Conduct of Sensory Experiments. WILLIAM C. STEBBINS, Ed. Appleton-Century-Crofts, New York, 1970. xiv, 434 pp., illus. $18.75.

The editor of this unique compendium cites Claude Bernard (1865) on the impossibility of studying psychophysics in the dumb brutes: "Experimental studies of sense organs must be made on man because animals cannot directly account to us for the sensations they experience." The limits of Bernard's imagination have been exposed by a century of fruitful investigations capitalizing on the behavior—both unlearned and learned—of animals.

Recent advances in the experimental control of behavior, stemming in large part from Skinner's operant conditioning methods, have notably enhanced the power and accuracy of studies of afferent processes and mechanisms in animals. The present volume assembles 18 reports from 27 authors who share a devotion to operant conditioning in some form as a basic element in their diverse inquiries, all gathered under the heading of psychophysics. This heading, as usual, comprises processes as different as stimulus transduction by sensory end-organs and the categorization, interpretation, or ranking of stimuli by the intact organism.

The book is intended to be methodological—meaning it deals with training procedures, with rules for the presentation of stimuli, and with instrumentation—but happily it is more besides. Compositely the papers afford a view not elsewhere available of the state of the art, together with some of the best products of the art, and offer an intimation of how far the art might be extended. The detailed information supplied concerning the measurement of thresholds and similar parameters is what one would ordinarily have to obtain from the investigators in person—the particulars left out of journal articles, pieces of useful lablore, mention of alternatives and of false possibilities tried and discarded.

The merit of the whole book is of a different genus from the virtues of its parts. Some contributions are long on methods, others on findings, and a couple on neither. James Smith's chapter summarizes a long program of work at Florida State University on many species and on the ordinary sense modalities plus some exotic ones. The conditioned-suppression method used by Smith is described in its application to mutant mice by Barbara Ray. Reviews of programs of research on audition are presented by Stebbins and by Gourevitch, and Dalland writes about ultrasound and bats. Weiss and Laties bring an overview of their extensive studies of pain and analgesia, of course with a pharmacologic side. This work has a motivational aspect, but even more so does the other contribution on somatic sensitivity, Harry Carlisle's chapter about rats pressing bars to douse themselves with radiant heat. These experiments deal not with cues so much as with reinforcements on their sensory side and with regulation; more precisely said, the behavior studied is jointly controlled by brain interoceptors and by exteroceptors sensitive to the same conditions, and thus we have the larger phenomenon of homeostasis, in which sensation is just an element.

Vision comes in for four chapters: Berkley's on training visual discriminations in the cat; a brief one by Glickstein and colleagues on striate cortex lesions; Yager and Thorpe's on color vision in the goldfish, which lends support to the Hering-Hurvich-Jameson theory of opponent processes; and one in which Scott and Milligan take up the difficult and delicate problem of measuring visual motion aftereffects in the monkey and report impressive results.

Three chapters, by Moody, Miller *et al.*, and Reynolds, are given over to reaction-time methods. The most positive results are shown by Moody, who has used equal reaction time as a null method for measuring light and sound intensities. Titration and tracking methods, like those of von Békésy which were first applied to animals by Ratliff and Blough, are here discussed by Rosenberger. The general principles of psychophysics and a bit of the classical methods are sketched at the outset by Stebbins, but that whole new way of thinking about sensory experiments in general called the theory of signal detection is brought in by John Nevin in the last chapter. Nevin's studies are guided by the theory, but his data are not compatible with the simple notion that the signal distribution remains fixed on the decision-axis under varied reinforcement conditions, or with the idea of a single criterion maintained by the animal for all signals.

One original theoretical effort is made—an attempt by the Mallotts to bring sensation and perception rather generally into the framework of stimulus control and cognate concepts from the language of conditioning. The effort is not successful; the claim that sensation and perception experiments can be distinguished by whether or not the experimenter knows exactly when to reinforce seems to this reviewer plainly false. The attempt to put under the heading of multidimensional generalization the diverse topics of illusions, sensory scaling, and stimulus matching emerges as a confusion. These difficult questions will have to be settled at a future date, as both psychophysics and the study of behavior advance, helped along by this book.

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Pharmacology

Molecular Properties of Drug Receptors. A Ciba Foundation Symposium, London, Jan. 1970. RUTH PORTER and MAEVE O'CONNOR, Eds. Churchill, London, 1970 (U.S. distributor, Williams and Wilkins, Baltimore). x, 298 pp. + plates. $14.

The purpose of this symposium was to bring pharmacologists and protein chemists together and let them discuss the "state of the art" as far as pharmacologic receptors are concerned. Thus the proceedings begin with a historic review of pharmacologic receptors; several well-known receptor systems are described; recent information about active sites of several enzymes and methods that can be used to study conformational changes are discussed; and finally, the participants share their thoughts about how to characterize and isolate the "elusive" pharmacologic receptor.