look particularly promising. We can expect increasing help from the paleoclimatologists, who are hard at work in the central and southern Andes.

These are exciting times to be working in the neotropics. Merely keeping abreast of new developments is difficult, and integrating them is a major achievement. This book belongs on the shelf of anyone who is trying. Descimon assures us that refugiology will be overtaken by other approaches in due time. Perhaps; but, in good Latin American style, it has already spawned a revolution.

ARTHUR M. SHAPIRO
Department of Zoology,
University of California, Davis 95616

Psychopharmacology

Neuroregulators and Psychiatric Disorders. Proceedings of a conference, Asilomar, Calif., Jan. 1976. EARL USDIN, DAVID A. HAMBURG, and JACK D. BARCHAS, Eds. Oxford University Press, New York, 1977. xxx, 628 pp., illus. $29.50.

Our knowledge of the function and metabolism of neurotransmitters and of other compounds that regulate neuronal activity is much more advanced than is our understanding of the role of these compounds in psychiatric diseases. Much of the information we do have about the neurochemical correlates of psychiatric illness has come from studies of the effects of drugs on brain function. The investigation of the mechanism of action of the antischizophrenic drugs, the phenothiazines and butyrophenones, illustrates the important role of pharmacological studies in shaping our ideas in this field. In *Neuroregulators and Psychiatric Disorders*, Snyder and his colleagues review the evidence that these drugs are dopamine-receptor blocking agents. The blocking of dopamine receptors in the basal ganglia by the drugs almost certainly accounts for their production of side effects similar to the symptoms of Parkinson's disease. A plausible and widely held hypothesis is that the antischizophrenic actions of the drugs are due to their interaction with dopamine receptors elsewhere in the brain. A corollary of this hypothesis is that schizophrenia may involve an increase in the activity of dopaminergic neurons. As Matthysse emphasizes, however, there is little independent evidence for an increase in dopaminergic activity in schizophrenia. It is dangerous to extrapolate from the action of a drug to the pathophysiology of a disease.

The study of exogenous psychotogens has also yielded insights into the relationship between neuronal function and psychiatric disease. Chronic amphetamine intoxication produces an illness that is very similar to schizophrenia and that may serve as a model for the disease. Ellinwood and his colleagues describe the changes that result from amphetamine administration and make a special effort to correlate the neurochemical and behavioral effects of the drug. The actions of hallucinogens are even more spectacular, but the relevance of these compounds to normal brain function or to psychiatric disease is still obscure. Five papers, by Saavedra, Koslow, Hollister, Friedhoff, and Gillin and Wyatt, discuss these compounds. It is conceivable that exogenous hallucinogens act by mimicking the effects of some endogenous compound and that the disordered metabolism of this hypothetical endogenous hallucinogen might be related to psychiatric illness. If there are endogenous hallucinogens, *N*-methylated tryptamine derivates now appear to be the most likely candidates. Both tryptamine and a tryptamine *N*-methyltransferase activity are present in brain, and the hallucinogen *N,N*-dimethyltryptamine has been detected in blood.

The remaining chapters are devoted to other specific neuroregulatory compounds. Almost everyone's favorite compound, from prostaglandins to substance P, is discussed. Most of these chapters are similarly organized. They begin by reviewing the occurrence and distribution of some substance in brain, present some new data on the action or metabolism of the substance, and conclude with speculations about the possible role of the substance in mental illness. These chapters illustrate a fault common to much of the research in this field—a delusion of grandeur on the part of the investigator. Snyder *et al.* have pointed out the delusion clearly: "Of the literally millions of chemical systems in the human body, why should nature have chosen to inflict the 'schizophrenic abnormality' upon whatever specific chemical the experimentalist happens to be best equipped to measure?" (*Science* **184**, 1243 [1974]). Many of the chapters will serve as useful introductions to the compounds they discuss, however, and have good bibliographies.

There are several noteworthy omissions from this volume. Although Ciaranello discusses the biochemical genetics of the catecholamine biosynthetic enzymes, the genetics of schizophrenia is mentioned only in passing. This omission is particularly curious because Kety, who has done the pioneering work on this subject, was a participant in the conference from which the book stems. His research has served as a model for the design of well-controlled studies of schizophrenia and has provided some of the most compelling evidence that the disease does have a biological basis.

The book contains only a few minor errors. The editors' use of Try instead of Trp as an abbreviation for tryptophan is idiosyncratic but inconsequential; their use of TRY as an abbreviation for tryptamine, however, invites unnecessary confusion. And the editors have allowed several unfortunate neologisms to creep into the book. One can only hope that "schizotoxin," whatever it is supposed to mean, does not become a permanent addition to our vocabulary.

This is an attractive and well-edited book. On the whole, it provides a valuable survey of the current state of this exciting and important field.

ROBERT L. PERLMAN
Department of Physiology,
Harvard Medical School,
Boston, Massachusetts 02115

On Heisenberg's Discovery

The Uncertainty Principle and Foundations of Quantum Mechanics. A Fifty Years' Survey. WILLIAM C. PRICE and SEYMOUR S. CHISSICK, Eds. Wiley-Interscience, New York, 1977. xviii, 572 pp., illus. $42.

This book commemorates the 50th anniversary of Heisenberg's discovery of matrix mechanics. It consists of brief reminiscences by him on the uncertainty relations and 24 essays of great diversity in subject and value by various authors.

About half of the essays are devoted to aspects of the foundations of quantum mechanics. Gudder's "Four approaches to axiomatic quantum mechanics" is a splendid survey, with judicious comments from a unifying viewpoint. Sławianowski's analysis of versions of the correspondence principle—for example, the WKB (Wentzel-Kramers-Brillouin) approximation and the limits of high quantum numbers and of $\hbar \to 0$—is a profound contribution. Ludwig's operational formulation of quantum mechanics in terms of preparing systems and recording is careful but ponderous. Kraus's beautiful paper surveys previous results on the impossibility of photon position observables and cogently argues for relaxing conditions so as to permit their construction; his application of Ludwig's general ideas on measurement provides better evidence for their value than the latter's own exposition. There are two