possibilities offered by jumping spiders, a group that has been strangely neglected in the last 30 years.

This book will function in two important ways. It gives general summaries of our knowledge of some aspects of spider biology, and it provides an entry into the unfortunately widely scattered literature on spider behavior. In this respect it forms a fine companion volume to Sebeok's *How Animals Communicate*. In addition some of the summaries also serve as links to studies on other animal groups and will thus help keep arachnologists in touch with other disciplines.

The production of the book is excellent, the figures are generally clear, and there are few typos. The delay in its publication (it is 3½ years since the papers were originally given) is regrettable.

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A Model in Neurobiology

Neurobiology of the Leech. KENNETH J. MULLER, JOHN G. NICHOLLS, and GUNTHER S. STENT, Eds. Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y., 1981. x, 320 pp., illus. $36.

It is not often the case with science books that you can tell something about them from their covers. But with this one you know that it is out of the ordinary, for it is covered in a handsome simulated leechskin. Though the leech is the subject of understandable but undeserved loathing, in the hands of neurobiologists it has become a powerful tool in the attempt to forge an understanding of the brain. The editors of this book are leaders in leech neurobiology, and, not coincidentally, the organizers and teachers of a successful annual summer workshop on the subject. In slightly more than 200 pages of text, the case is made that the leech, like a few other invertebrate animals, is a superb experimental model in which to investigate complex neural activities. In fact, the leech is an especially good choice for the cellular analysis of a wide variety of important problems in the neurosciences. These include the physiology of synapses, developmental plasticity of the nervous system, and mechanisms of locomotion. The key to the leech's success in neurobiology is that its nervous system is simply organized and particularly accessible to experimentation.

The book leads off with a delightful chapter on leech biology and behavior by R. T. Sawyer, who after dutifully outlining the taxonomy and ecological habits of leeches reports a little-known fact, that the foraging strategies (a.k.a. finding a blood meal) of immature leeches differ from those of adults. B. Payton's chapter "History of medicinal leeching and early medical references" is a fascinating account of the medicinal application of leeches, formerly practiced widely in both Eastern and Western cultures. The book gets down to business with chapters on the structure of the nervous system and on the sensory and motor neurons, by Payton and S. E. Blackshaw, respectively. The nervous system is a chain of ganglia that are more or less identical, running the length of the animal like a string of pearls laid straight. Each body ganglion contains a scant 400 neurons; of these, a few dozen identified neurons have been singled out for detailed studies of reflex organization, behavior, and development. These two chapters serve as an introduction to the attractive features of the leech nervous system for neurobiologists, and although severely summary they contain complete references to the original literature. In a concise, well-written chapter, K. J. Muller points out how similar are the properties of synapses in the leech and higher animals. This holds true for their physiological properties as well as their anatomic features. Stent and W. B. Kristan describe the neural circuits that generate rhythmic movements, such as underlie locomotion and heartbeat. Since most of the work they describe originated from their own laboratories, the review is certainly authoritative (and very good). The chapter "Regeneration and plasticity" by Muller and Nicholls is one of the highlights of the book. In no other animal has the cellular analysis of neural regeneration been carried out as thoroughly and thoughtfully as it has in the leech. These studies range from in vivo studies of axonal regeneration following lesions of various kinds to in vitro studies of synapse formation between identified neurons in cell cultures. It is certain that this sort of analysis will continue to be an important line of research in the future, and this review is a good place to start to learn about it. Work on neurotransmitter chemistry has not advanced as far as work on other aspects of leech neurobiology, but in a chapter on the subject B. G. Wallace makes it clear that the advantages that attract physiologists to the leech surely will attract biochemists as well. One of the early (about 1880) scientific studies on the leech was done by the great American zoologist C. O. Whitman on the development of the nervous system, and renewed interest in this subject is reported by D. A. Weisblat. Again, owing to the rich accumulation of information about specific connectivity among identified neurons and the availability of new techniques in cell staining, the leech nervous system is a promising one for the study of how nervous systems are constructed.

The book could stand on the quality of the review chapters discussed above. But there is more. Four chapters are included as appendixes and, to my mind, are themselves worth the price of the book. These appendixes ("Killing single cells" by I. Parnas, "Immunological identification of specific neurons" by B. Zipser, S. Hockfield, and R. McKay, "The nervous system of the leech: a laboratory manual," and "An atlas of neurons in the leech, *Hirudo medicinalis*") make the book a switch-hitter—suitable for the lab as well as the desk. In particular, the laboratory manual is a treasure. Besides being a splendid preparation for original research, the leech is an excellent subject for instruction in neurophysiological techniques, particularly intracellular recording, dye injection, and reflexology. My only complaint about the book is that the quality of reproduction of some of the photographs is poor. But this is to quibble.

In summary, here is a book written by a small band of dedicated and talented neuroscientists who truly love the leech and want to communicate the reasons for their attraction to a broader audience that includes not only other scientists but students. They succeed admirably.

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Honoring von Euler

Chemical Neurotransmission. 75 Years. Papers from a conference, Stockholm, Dec. 1980. LENNART STJÄRNE, PER HEDQVIST, HUGO LAGERCRANTZ, and ÅKE WENNMALM, Eds. Academic Press, New York, 1981. xxiv, 562 pp., illus. $89.

Ulf Svante von Euler reached the age of 75 in 1980 and so, give or take a few months, did the concept of chemical neurotransmission, to the development of which von Euler has devoted most of his remarkable career. This volume is the proceedings of a Nobel Conference to celebrate the double anniversary, and it is worthy of the occasion. The list of 50 invited participants from nine countries includes some of the best-known names in neurotransmission research; among them are Julius Axelrod and Bernard Katz, with whom von Euler shared the 1970 Nobel Prize in Physiology or Medicine. Also listed are many of his former students, who seem to have inherited not only the topics that are linked with his name—substance P, prostaglandins, noradrenaline (alias norepinephrine), and transmitter storage vesicles—but also some of his style as a researcher. Characteristic of that style has been the ability to identify a significant finding and then to define the conditions that allow it to be replicated or modified until the underlying mechanism emerges, and with it significant new findings. It is the infantry's way of advancing rather than the cavalry's, but the ground stays won.

The volume's title might mislead some prospective readers, for not much history or biography is offered; what the contributors were asked to do, and have done well, was to sum up their own recent work and to place it in the context of current knowledge. The papers are arranged in nine sections, each accompanied by a short "chairman's overview." The topics include developmental plasticity of synapses, vesicular storage of transmitters, transmitter discharge and its presynaptic and trans-synaptic modulation, receptors and the links between receptor occupancy and cellular response, interactions between "classical" and neuropeptide transmitters, and some implications of the newer findings for pharmacology and medicine.

The book's coverage is thus wide-ranging; it is also, and intentionally, uneven. Not surprisingly, the biochemical aspects of synaptic transmission receive more attention than the biophysical or morphological aspects, and among the 20 or more known or presumed transmitters it is most often one of the classical pair, noradrenaline and acetylcholine, that is brought to the center of the stage. The neuropeptides, it need hardly be said, have won at least the status of featured players. They interact in subtle ways with the other transmitters and may reside in the same neurons, perhaps even in the same vesicles. Among the minor actors, the presynaptic action current, after years of disrepute, has recovered respectability as a transmitter even at mammalian synapses; adenosine triphosphate and adenosine are at least synaptic modulators, and perhaps primary transmitters; and the potassium ions that emerge from excited nerve terminals may also help to effect transmission, as von Euler himself suggests in the book's opening paper. I found it rather odd that hardly anyone mentions the amino acid transmitters, which probably operate at more synapses in our brains than all the other transmitters combined.

The chapters that provide most stimulation will vary from reader to reader. I was pleased to have both Lennart Stjärne and Asa Blakeley *et al.* confirm that a nerve impulse, when it invades an adrenergic fiber, will release transmitter from only a few of the beaded storage sites that are strung along the fiber's length. Why this should be so has not yet been elucidated, and one would like to know if the phenomenon is a common one: do most axons in the brain work in that way too? Year by year, as we learn more about neurotransmission, synaptic mechanisms look less and less like digital switching devices.

The historical dimension appropriate to the occasion is supplied in the paper by von Euler and in the closing paper by Katz. Their retrospective accounts are engaging and their advice on current priorities is provocative; they are a welcome bonus for all the book's readers.

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A Harnessing of Electrons

Fifty Years of Electron Diffraction. P. GOODMAN, Ed. Published for the International Union of Crystallography by Reidel, Boston, 1981 (distributor, Kluwer Boston, Hingham, Mass.). xiv, 440 pp., illus. Cloth, $75; paper, $39.50.

When de Broglie "lifted a corner of the great veil" his wave hypothesis implicitly encompassed the idea of electron diffraction, but full appreciation and experimental confirmation of the effect were delayed for several years. A far longer period elapsed before improvements in electron optics and in vacuum technology enabled the unique properties of electrons adequately to be harnessed as a sensitive probe of the local microstructure and composition of matter. Here we have a fascinating account of these events. De Broglie's own brief contribution might indicate some lack of endorsement of subsequent work, particularly the dependence on Schrödinger's theory, but he could scarcely fail to be impressed by the experimental results that can be achieved today.

Electrons interact much more strongly

"Pioneers of experimental electron diffraction." Clinton J. Davisson, Lester H. Germer, and Chester J. Calbick (left to right) in the laboratory at 463 West Street, New York City, in 1927. "Note the apparatus in the background; Germer is seated at the observer's desk, ready to read and record the electron current from the galvanometer (the large 'box' beside his head); the banks of dry cells behind Davisson supplied the DC voltage for the experiments." [From *Fifty Years of Electron Diffraction*; photo courtesy of Bell Labs]