Behavior of Arachnids

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Behavior of Arachnids

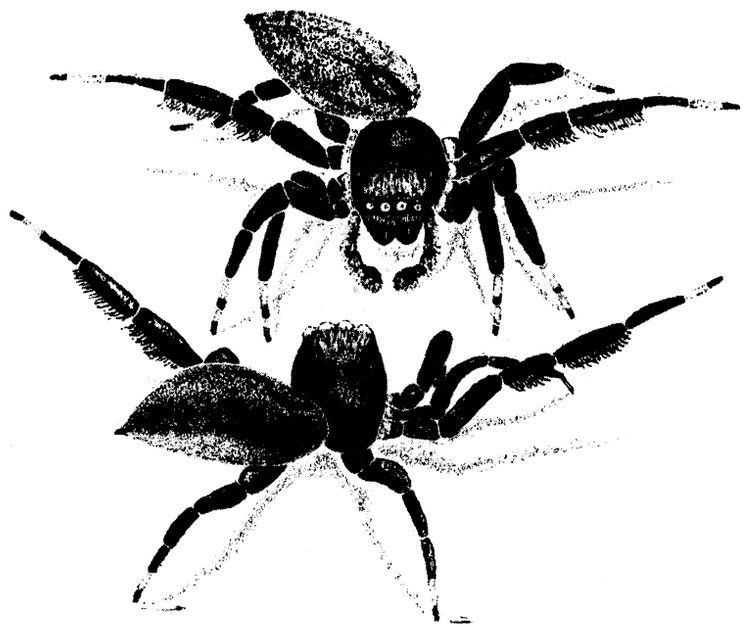
Spider Communication. Mechanisms and Ecological Significance. PETER N. WITT and JEROME S. ROVNER, Eds. Princeton University Press, Princeton, N.J., 1982. x, 442 pp., illus. $30.

Why is it that spiders are so poorly studied compared with insect groups of similar size? It can't be because they are less common or less interesting. Perhaps it is because people so often irrationally fear them, or because spiders are not usually perceived to be important to any major economic activities of humans. Or perhaps (my favorite explanation) it is because they must be preserved in alcohol and thus are not picked up by most arthropod nuts owing to the bother of carrying alcohol vials in the field. Whatever the reason, the study of spiders has only just arrived at the stage of producing useful books on particular aspects of their biology.

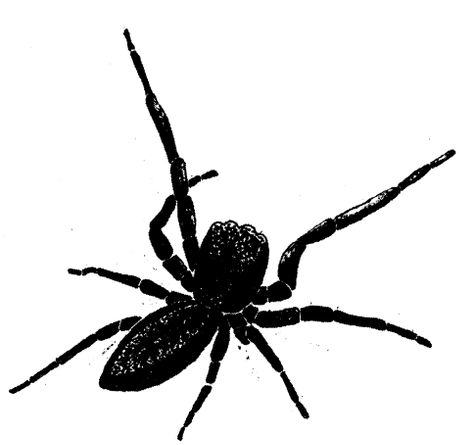
If spiders are understudied, however, biological communication is relatively overstudied. Ten to 20 years ago there were hopes that general heuristic theories of communication would emerge, but time has passed without much progress (perhaps because until recently the competitive aspects of communication have been underemphasized and the possibility that animals may systematically attempt to lie to each other has not been seriously entertained). Happily, one of the more fruitful aspects of communication studies—the influence of the animal's ecology on both the messages sent and the channels used—is stressed in this book.

The strength of the book is that it is not just a collection of research papers but, at least in most chapters, a conscientious attempt to review the spider literature on general topics related to communication and to couple it with new data. The chapters include Krafft on the significance and complexity of communication, Barth on vibratory signals, Uetz and Stratton on acoustic communication, Forster on visual communication in jumping spiders, Jackson on courtship and aggressive displays in jumping spiders, Tietjen and Rovner on chemical communication, Riechert on interaction strategies in *Agelenopsis aperta*, Burgess and Uetz on social spacing strategies, and Riechert and Luczak on spider foraging. All the authors are active in the fields they cover, and several chapters brighten considerably when the review of other work ends and new results begin. Some inclusions and exclusions are less than ideal: a chapter by Michael and Barbara Robinson on vibratory courtship in web weavers would have been a good replacement for the one on foraging strategies, which is one of the best in the book but is clearly out of place.

The general quality of the chapters is good; there are no clunkers. In some I sensed a pedestrian compilation of observations rather than the inspiration of a new synthesis, but in others the spark is there. I personally found the review of jumping spider visual systems by Forster and vibratory signals by Barth particularly enlightening. Robert Jackson's essay lays a good foundation for future behavioral work with salticids, and he and Forster convinced me of the exciting



"Two male *Europhrys parvula* jumping spiders side-step and circle toward each other with legs lifted and abdomen raised. They mirror each other's performance as they approach." [From Forster's paper in *Spider Communication*]



"A male *Trite auricoma* raises his forelegs when he is confronted by *Trite planiceps*. *T. planiceps*, on the other hand, stretches his forelegs sideways and taps vigorously on the ground." [From Forster's paper in *Spider Communication*]

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