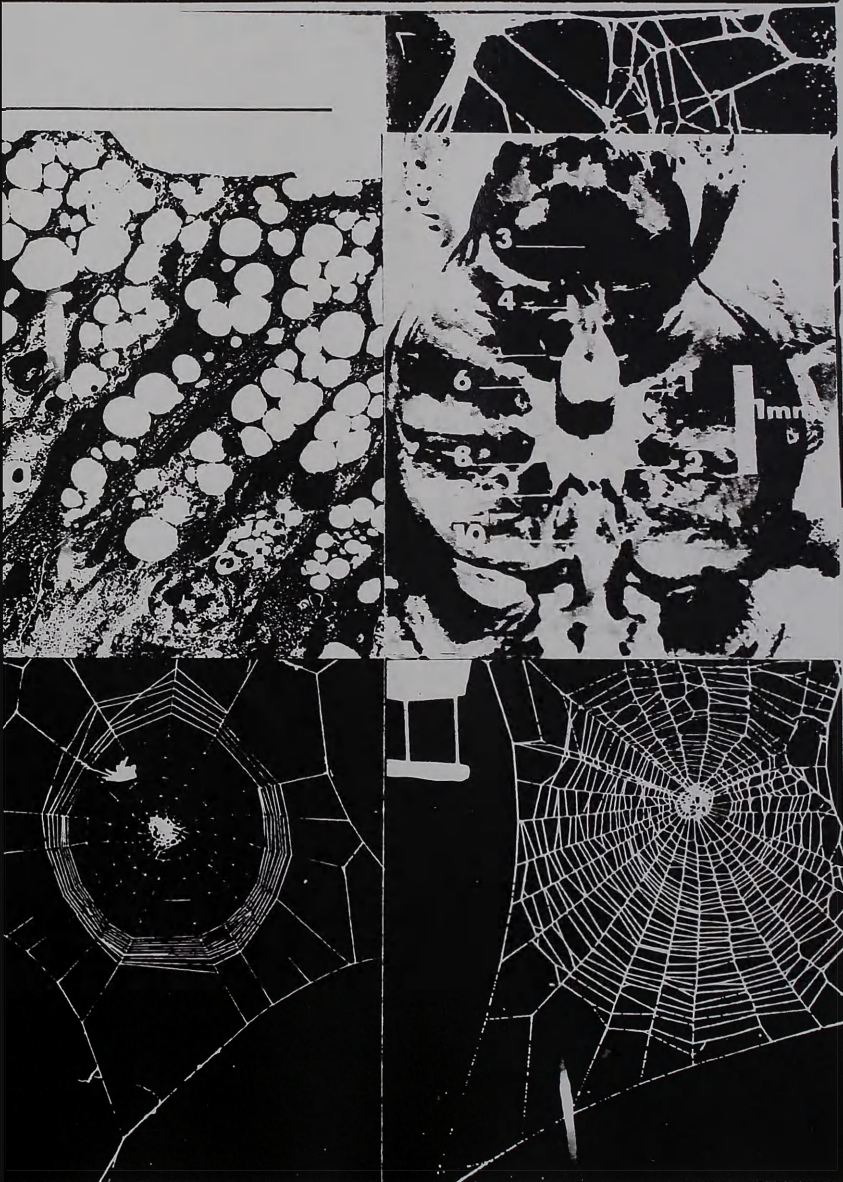


A SPIDER'S WEB

PROBLEMS IN REGULATORY BIOLOGY



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Figure 1. Electron micrograph of epithelium of ampullate gland which produces scaffolding silk. Observe bubbles of silk-polypeptide which empty into gland lumen at upper right.

Production of silk material at the cellular level is explored with biochemical and histological methods, and the regulatory cycle of polypeptide synthesis is discovered. Drugs can interfere with such regulation, and more or less silk becomes available for construction of the web; the amount of detail in the geometric pattern is intimately related to thread material through thread thickness and length. Neural feedback systems from the glands and body surface help in achieving a common end point for material supply and its even distribution in the trap. Adaptive mechanisms aid in reaching the goal—an efficient net to catch flying prey—even if disturbances appear during construction. Methods for raising and keeping spiders in the laboratory, measuring and analyzing the web, and observing the animals in activity are described. A number of strange drug webs and individual variation in patterns can be expressed in size, regularity and shape measures. Statistical comparisons with control webs are performed with the aid of the digital computer. A way is proposed in which all such behavior is coded in the animal's central nervous system.

The book is understandable and of interest to teachers, scientists and students who want to follow the ways in which biophysics and biochemistry join efforts with neurophysiology and pharmacology to help elucidate a complex behavior problem. Everybody can see the beauty and complexity of a spider's orb-web on a sunny morning; but the enjoyment of looking at it and the curiosity about it are much enhanced through reading this book and following the ways by which laboratory research has succeeded in clarifying some of its mysteries.

Figure . Web under construction: hub, radii, frame and temporary spiral have been completed, and the sticky permanent spiral has been started at the periphery. Cues for construction can be tested through burning of threads or exchanging spiders from one web to another.

