nificant by far to the billions of people who least understand her. Around the globe, her image was splashed across television screens interspersed with footage from films of *Boys from Brazil*, *Frankenstein*, *Brave New World*, and *Multiplicity*. Instantly, Dolly's public fame emerged not from what she really is, but from what she represents. She is a metaphor for the Promethean power that scientists now have to create and control life, and her innocent image drives fear into the hearts of those who think man has wrongly crossed into God's domain.

Although the title of *The Second Creation* is an echo of the metaphorical Dolly, in their text the authors try hard to bring readers back down to the real-life version. They end their story with an overview of the many benefits that humankind may derive from the biotechnology facilitated by genetic cloning. This section, at the very least, should be required reading for societal leaders who still mistake metaphor for reality in the promulgation of anti-cloning laws.

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BOOKS: NEUROSCIENCE

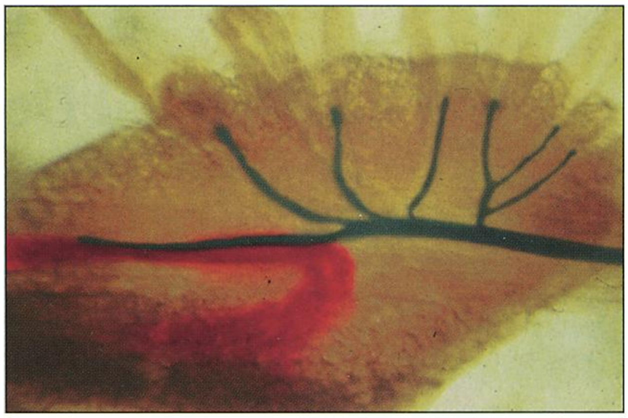
Big Synapse Stories

George J. Augustine

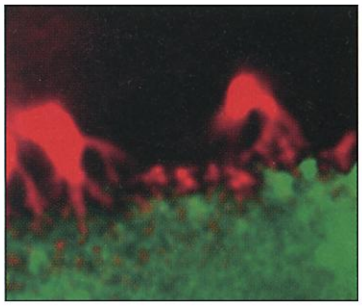
Given that the brain consists of some 100 billion nerve cells, understanding how synapses allow these cells to communicate with each other has been a core question in neuroscience. The past 50 years have seen remarkable advances in this area, largely due to a small number of experimental systems—such as neuromuscular synapses and the squid giant synapse—whose great advantages for physiological analyses have illuminated the beauty of synaptic function. Thus a book, such as *The Squid Giant Synapse*, that concisely highlights the contributions of one such model system is a very good idea. An even better idea is to have the book written by Rodolfo Llinás, a distinguished synaptic physiologist who now has been working on this preparation for five decades.

The Squid Giant Synapse
A Model for Chemical Transmission
by Rodolfo R. Llinás
Oxford University Press, New York, 1999. 332 pp. + CD-ROM. $85, £49.95. ISBN 0-19-511652-6.

The Squid Giant Synapse is billed as an introductory text for graduate and advanced undergraduate courses and has much to offer students in such classes. Llinás covers the main breakthroughs in unraveling the long-standing mystery of how neurotransmitters are released. He starts with the 1957 demonstration by Ted Bullock and Susumu Hagiwara of a presynaptic action potential, discusses the 1967 "calcium hypothesis" of Bernard Katz and Ricardo Miledi, and continues through contemporary studies of the molecular biology of exocytosis. As I had hoped, the author gives prominent attention to his own seminal contributions, such as the first voltage-clamp analysis of presynaptic calcium channels, his elegant biophysical analyses of calcium-secretion coupling mechanisms, and his pioneering efforts in using microinjection experiments to implicate synapsin and other proteins in the molecular apparatus of neurotransmitter release. There is no substitute for hearing such first-person accounts, and Llinás's perspectives are certainly the main attraction of the book.



Giant synapse study site. Within the pallial nerve, the presynaptic giant axon (green dye) branches into fingerlike extensions, each of which contacts a postsynaptic giant axon. The largest postsynaptic axon (red dye) passes rearward through the squid's muscular mantle.



Giant synapse junction. This confocal microscopy image shows postsynaptic "claws" (red) terminating as rounded fingerprint-like contacts (1 μm in diameter) on the smooth presynaptic terminal (green).

The author's colorful prose is also a big plus. For example, who else would see the giant postsynaptic neuron as "a bouquet of smaller axons"? And who else would dare admit that "in the end, our complete understanding of this process (synaptic transmission) will manifest itself not as a simple insight, but rather as an ungainly reconstruction of parallel events more numerous than elegant"? Another strength of the book is the accompanying simulation software, which allows both students and advanced researchers to model the electrical signaling events that occur during synaptic transmission. This user-friendly software should provide a painless tool for students to understand the complex interplay between membrane potential, calcium influx, and transmitter release.

On the other hand, Llinás's personal perspective necessarily limits the utility of the volume as a textbook. His personal approach lacks sufficient scientific balance to give students a clear sense of perspective. To give but one example, over five pages are devoted to the somewhat exotic question of how temperature affects synaptic transmission, but the more clear-cut and important presynaptic current-clamp results of Katz and Miledi (1967), as well as those of Kiyoshi Kusano and colleagues, receive much less coverage. Also, though the squid giant synapse has been unparalleled for understanding presynaptic mechanisms, it has played a relatively minor role in elucidating postsynaptic mechanisms. As a result, Llinás has too little to say about the postsynaptic half of brain function. Finally, although the author devotes many pages to the molecular biology of transmitter release, this field is moving so rapidly that the material already is dated. Given these characteristics, *The Squid Giant Synapse* really is best viewed as a monograph rather than as a full-service textbook.

In summary, the value of this book lies in its personal narration of one scientist's journey through the synapse. Llinás has done a good job of capturing the excitement that has kept the field of synaptic physiology energized. By its example, *The Squid Giant Synapse* offers a strong argument for the continued value of physiological analyses of brain function, even in these genomic times.

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