

BIOLOGY IN 1776*

CARL D. BROWN

Memphis State University

Memphis, Tennessee 38152

When Dr. Tanner asked me to present a review of the status of the Biological Sciences in the United States in 1776, I thought it would be difficult to condense that much material into a twenty-minute talk. I soon found, however, the opposite was quite evident and welcomed his suggestion that we include activities in other countries.

Even with a quick look at what *wasn't* in 1776, it is difficult for us to fully comprehend the state of immaturity of the field of biology. Comparing that period with our present vast reservoir of knowledge and technology is like taking a trip through Cades Cove in the Smokies and emerging at the atomic energy plant at Oak Ridge National Laboratory.

For the microbiologist: A laboratory without the influence of Louis Pasteur, the use of antiseptics pioneered by Lister, or the application of Koch's postulates. Spontaneous generation was still a fundamental concept in the minds of many scientists. Even after Spallanzani performed his experiments in 1768, nearly a century saw the issue remain in doubt.

For the botanist: A taxonomy class or laboratory without Asa Gray's classic work in taxonomy. The binomial system of Linnaeus was still in the nymphal stage of acceptance.

For the geneticist: Biology without Mendel's work, which was to remain lost on the dusty shelves of archives even into modern times. The terms gene, mitosis, and mutation were yet unknown.

For the cell-biologist: No cell theory. About 75 years were to slip by before Schleiden and Schwann advanced their "cell theory." The term protoplasm had not been coined.

For the embryologist: A long wait until 1827 for the discovery of the mammalian egg; until 1845 for the terms ectoderm, endoderm and mesoderm; until 1861 for a textbook in embryology.

For all biologists: The study of any organism without the Darwinian theory of evolution. Although Darwin's grandfather had alluded vaguely to the possibility of changes within species, nearly a century was to pass before "the origin of species" imposed its monumental impact on scientists and laymen alike. Tennessee had to wait yet another century—indeed, are we not still waiting?

As we all are aware, at the time of the discovery of America, the advancement of the scientific world was

impeded by the shackles of the "age of authority." Heated arguments arose which could have been settled by simple observation; that, however, was not allowed. The sixteenth and seventeenth centuries, with the exploration and colonization of the Americas, witnessed the overthrow of the authoritative philosophy and the return to observation and experimentation in the scientific world. Scientists and laymen alike redeveloped the desire to look and think for themselves. Their willingness to develop and defend new ideas and sets of principles based upon personal research—regardless of the criticism directed by their colleagues—was basic.

In the field of biological sciences, the work of Harvey and his contemporaries rejuvenated observation and introduced experimental procedures. The development and introduction of the microscope in the seventeenth century made possible the microanatomical work of Malpighi and Swammardam (whose diagram of the anatomy of a mayfly naiad appears in many textbooks) and led to the discoveries of Leuwenhoek, whose demonstrations of the presence of microorganisms astonished the scientific world.

The general consensus among historians places the eighteenth century at the climax of the revolt against authority. Despotism and ecclesiasticism were, to a large extent, replaced by the scientist's assertion of his right to be an end in himself. Historical expression of this tide of feeling carried into the American Revolution.

My field, entomology, attracted a large number of talented scientists. In 1750 Lyonet, of Holland, contributed anatomical work of minute detail through his first and most significant publication, in which he described the anatomy of the larva of the willow moth. Others, such as Roesel and Degeer, aroused widespread public interest through their voluminous works of detailed, well-illustrated observations on many insects, their life histories, habits and characteristics.

Mark Catesby (1679-1749) was possibly the first to illustrate North American insects in his book "A Natural History of Carolina, Florida, and the Bahama Islands. Containing Figures of the Birds, Beasts, Fishes, Insects and Plants." John Abbott, who settled in Georgia, collected large amounts of materials for European collectors during the late 1770's and prepared many drawings of insects. Thomas Jefferson noted with grave concern the economic losses caused by insects, paying particular attention to damage caused in stored grain, making a few remarks on the problems of control, and pointing out a need for further study.

Ten institutions of higher education were already in

* Highlights of a presentation made at the General Session of the Tennessee Academy of Science, November 1976.