

Preface

Like populations, textbooks evolve. Not only must the content change, but our goals must be rethought as well. We have tried, in this Seventh Edition of *Life*, to emphasize those things that will best prepare students for their future careers. The store of biological knowledge increases ever more rapidly. This requires us to seek a careful balance between thoroughness of coverage and appropriate treatment of the process, or processes, of science. We have retained and expanded the emphasis on experiment—on how things were and are learned. The emphasis remains on concepts. However, because different instructors emphasize different topics, and because a key role of the textbook is as a “place to look things up,” this book is comprehensive as well. We provide sufficient detail to meet most needs without making the book too voluminous. We have enhanced our emphasis on an evolutionary theme, and have added new material on such important cutting-edge topics as evolutionary developmental biology (“evo-devo”) and earth systems.

Experimental Focus

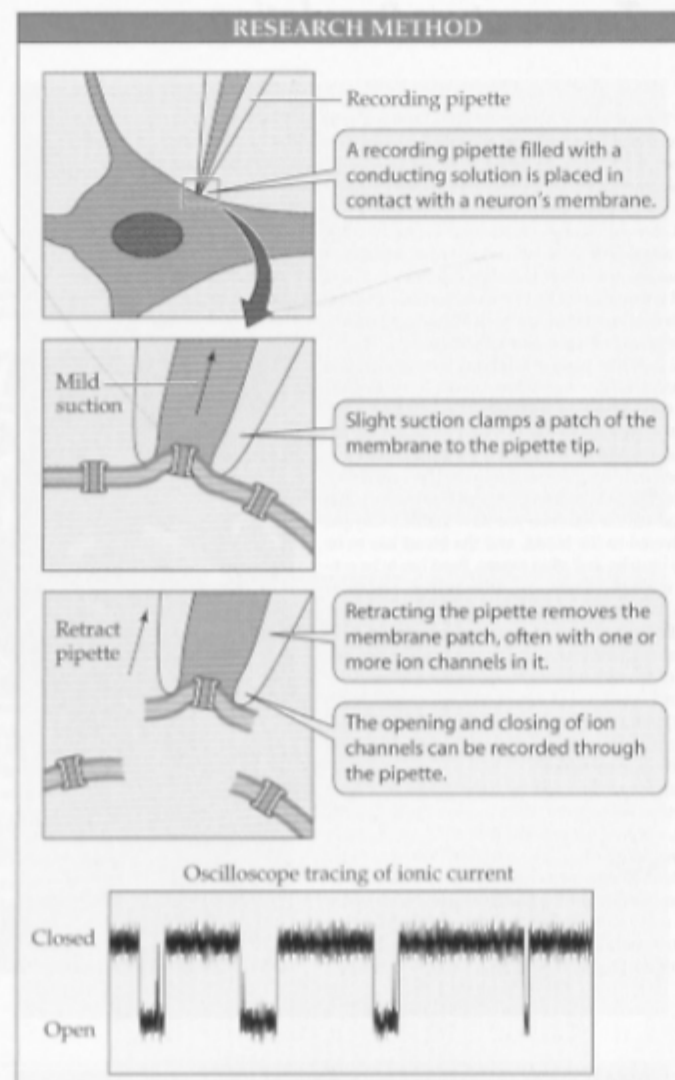
Since the First Edition of this book, we have been committed to answering the question, “How do we know?” As the book has evolved, this commitment has steadily deepened.

Obviously, we can’t provide the experimental or observational evidence for every fact or theory we discuss. However, we have selected the key experiments underlying some of the most important biological principles. Some are very recent, at the cutting edge of current research; others are classics. To supplement and highlight the text discussions, we have created unique Experiment figures that show how experiments, field observations, and comparative methods help biologists formulate and test hypotheses. Other figures highlight some of the many laboratory and field methods used to do this research. In this edition there are more than 100 Experiment and Research Method figures (examples at right). In addition, we have 20 new Experiment tutorials on www.thelifewire.com, the Website/CD that was created for *Life*.

We hope that, in tandem with the frequent discussions of experimental evidence, these figures and tutorials will help students understand and appreciate the nature of biology as a vital, ongoing experimental science.

New Chapters, A New Unit, and New Essays

This edition features two new chapters that reflect current trends in biological research. Chapter 21 (“Development and Evolutionary Change”) introduces students to evolutionary developmental biology, a rapidly growing field that deals with how the molecular genetics of the developing organism affects the evolution of complex morphology and biochemistry. In addition, the interaction of environment and embryogenesis on the ultimate form of an organism is covered at length.



44.11 Patch Clamping The patch clamping technique can record the opening and closing of a single ion channel.

EXPERIMENT

Question: Will adding Gremlin protein (an inhibitor of BMP4) to a developing chick foot transform the chick foot into a ducklike form?

METHOD	Open up chicken eggs and carefully add Gremlin-secreting beads to the interdigital (web) regions of one embryonic chick hindlimb. Add beads that do not contain Gremlin to the other hindlimbs (controls). Close the eggs and observe limb development.
RESULTS	In the hindlimbs in which Gremlin was secreted, the webbing does not undergo apoptosis, and the hindlimb resembles that of a duck. The control hindlimbs develop the normal chicken form.

Gremlin added

Control

Conclusion: Changes in *gremlin* gene expression could cause the changes in morphology, allowing duck hindlimbs to retain their webbing and chick limbs to lose it.

21.7 Changing the Form of an Appendage In this experiment, chick hindlimbs exposed to Gremlin-secreting beads developed ducklike webbed feet.