

PREFACE

Biology— Today and Tomorrow

This book arises out of our conviction that, in its recent cataclysmic evolution, the science of biology has come of age. And, as in all the races and societies of man, "coming of age" brings with it new privileges and new responsibilities. By any reckoning, the responsibilities loom large.

As biology comes of age, so must its teachers and students. Biology, like its sister sciences chemistry and physics, which are themselves rapidly becoming part of the warp and woof of biology, has immense potential for both good and evil. The almost overwhelming advances in biomedicine and biomedical engineering—the development of antibiotics and vaccines and the fashioning of artificial organs; and in agriculture—the emergence of hybrid corn and other crops and livestock to feed the world—will soon be dwarfed by advances we are just beginning to perceive. But with these advances come responsibilities for larger decisions that will inevitably shape the lives of future generations.

As this book is being completed, one of the debates in the Congress and in the Courts centers on determining the vital balance between the need for increased power, to be provided by atomic plants, and the protection of the environment from radioactive and thermal pollution. The question is being asked in all seriousness, "Is a little pollution a good thing?" Which organisms are favored by raising the temperature of the ocean? Given the need for more electricity, where in the political process—and on what

grounds—do we determine which is the lesser of two possible risks, radioactive and thermal pollution or pollution by the products of burning fossil fuels, products including cancer-causing hydrocarbons?

This question is related to another of great moment: The need for a vastly expanded program of cancer research. How does the public and its elected representatives determine whether the field of biomedicine is ready for a billion dollar

reality." But we have tried to convey more than selected facts and representative examples; we have tried to bring into focus the ideas of biology—their origin, testing and social impact.

We have paid serious attention to the social implications of biology. However our readers should not expect to find a single "catch-all" chapter on "social biology." We find merit in discussing the social implications of a discovery in the context of other findings to which it is related.

"non-biologist?"), or used in conjunction with paperbacks and other readings, as the text for a year's course for biology majors, whatever their preprofessional aims.

Our principal concern has not been the "package" or framework within which our readers will be receiving their training in biology. That responsibility rests with the instructor, who knows the background and experience and the motivations of his students. Rather, we have tried to convey the ideas of our subject, its spirit, and the sense of excitement surrounding it.

We have developed each topic gradually, but with sufficient rigor to make it meaningful no matter whether the instructor elects to follow the sequence we have chosen or whether he follows any one of several other equally valid routes to the same end.

For example, we have tried to offer an incisive treatment of cell regulatory mechanisms, leading up to a consideration of development and its controls, both the cell's inner controls and the environmental forces shaping development. We have worked hard to make topics which students traditionally find difficult, for example the electrochemical changes underlying the nerve impulse, clear and easy to remember. These key concepts are presented within the framework of a modern treatment of the nervous system and the physiological basis of animal behavior, including an analysis of the limbic system, motivation, learning, and the physiological effects of drugs.

Plants have been given major emphasis, with plant structure, function, diversity and development being treated extensively. In fact the sections on diversity of both animals and plants, with which the book is concluded, are, we believe, unique, recapturing the interest of natural history in a framework of modern comparative biochemistry, physiology and behavior.

The ideas of biology constitute an increasingly large part of our social heritage. More and more we are contemplating from whence we came. It was our late President, John F. Kennedy, who said: "All of us have in our veins the exact same percentage of salt in our blood that exists in the ocean, and therefore, we have salt in our blood, in our sweat, in our tears. We are tied to the ocean. And when we go back to the sea—

whether it is to sail or to watch it—we are going back from whence we came."

And the President might have added that in our embryonic lives we spend some time in that "other ocean," the fluid of the amnion.

Thus we ponder our origins and our place in the universe. Our understanding of the living world about us is ever changing, ever expanding. If we are to face the future with confidence, we must understand how our ideas are rooted in the past—and nourished and winnowed in the present. It is toward that end that we offer this book.

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