



BIOLOGY TODAY AT HUNTER

The success of contemporary biology has posed new problems for departments of biology throughout the country. At Hunter, one of the most pressing problems being dealt with is the achievement of a realistic balance between classical and contemporary biology in an up-to-date undergraduate and graduate curriculum. A second and equally important problem is a re-definition of the role of research as a function of the Department. One thing is certain: chemistry and physics are regarded as allies, not foreign disciplines to be looked upon as a nemesis to the biologist.

During the past two decades tremendous strides have been made in the ever-broadening field of biology. Fundamental problems that seemed unapproachable in the early part of the twentieth century are now being solved at a rapid rate. The application of newly-developed techniques of physics and chemistry to the study of living things is, in large part, responsible for this success. For instance, the characterization of cellular ultrastructure was virtually impossible until the advent of the electron microscope.

The story of the role of deoxyribonucleic acid (DNA) in biological systems is well-known and has been told on several levels of sophistication. Nevertheless, a brief review might be of value here in illustrating the great strides made through the application of these physical and chemical techniques.

DNA carries in its chemical structure a code which contains the information necessary to specify the in-

heritable characteristics of the organism. The structural configuration of this molecule was unknown until studies were made utilizing X-ray crystallography, a physico-chemical technique. Studies have indicated that another nucleic acid, ribonucleic acid (RNA), is produced in the nucleus in close association with DNA and acts as a messenger carrying the DNA code from the nucleus into the cytoplasm of the cell. Messenger RNA first becomes located on the ribosomes of the cytoplasm, then associated with an unordered array of amino acids and then, depending upon its coded information, the amino acids are arranged into a *specific* sequence. Chemical bonds are formed between the ordered adjacent amino acids with the resultant formation of long-chained compounds called proteins. The amazing thing is that there are approximately twenty naturally-occurring amino acids; thus the possible ways of constructing a long-chain protein molecule of, say, one hundred amino acids are enormous. Yet, the cell, through the mechanism described above, almost invariably produces specific proteins, always consisting of the same number of amino acids, always in the same sequence!

Many areas of the scheme proposed above remain to be worked out, but it appears that the beginning of a solution to one of the great mysteries of life—how specific proteins are made—is not far away. Recently developed biophysical and biochemical techniques have made possible this and other discoveries and have



Dr. Balboni and Tamara Salumaa, graduate student, preparing stock solutions for plant physiology laboratory

therefore become basic to the study of biological sciences today.

The impact of these concepts and techniques has made necessary significant changes in the undergraduate curriculum. Efforts have been made to reduce the descriptive courses and to introduce such courses as cell physiology, plant and animal metabolism, and radiation biology. The Departmental Honors Program in biology will serve as an important adjunct to the formal curriculum, and for qualified undergraduates the Honors Program will be the first opportunity to do carefully directed original work.

Under the Graduate Program, the Department of Biological Sciences and the Department of Physiology, Health and Hygiene combine in offering the M. A. and the Ph. D. in biological sciences. Work leading to the Ph. D. is now offered in the fields of genetics, biophysics (including radiation and photobiology), and cellular, animal, and plant physiology.

Since September, 1961, the Department has added ten new full time faculty members to fill vacancies caused by retirement and to take care of the expanding undergraduate and graduate programs. In the past eight years the number of majors in biological sciences has doubled.

In line with this expansion, the Department has undertaken the conversion of various rooms to up-to-date laboratories. Coupled with this, a large amount of

equipment has been made available through grants to individual Department members, assuring excellent facilities for conducting research and teaching.

Not only must this Department be concerned with changes of curriculum, equipment, etc., but, even more important, it must re-examine the basic definition of biology: the study of life.

Since nucleic acid is a chemical substance, can life be reduced to the chemistry of nucleic acids and their molecular progeny? Will there be a progressive isolation of ecology, morphology, taxonomy and other classical disciplines in biology for the more exciting and timely fields of biophysics, molecular biology or cybernetics? What will be the fate of future biology students—will they all be mating DNA strands instead of mating fruit flies? Will the utilization of purely physical, chemical, or mathematical studies of living organisms run out of momentum and need to be rejuvenated by a return to the study of living organisms as a whole?

The biologists' answer to these questions might well be that *life* is certainly unique, and at the present time it still remains difficult to reduce this uniqueness to a single substance or a system of lesser integration and complexity than a single living cell. In any event, the task of the biological sciences is clear—to increase our knowledge and understanding of what is embodied in the concept "living."

Edward R. Balboni



Professor Brody, Chairman



Dr. Grob and undergraduate Annette Schimenti, conferring on a microscopic preparation for work on calcification of tissue

BIOLOGICAL SCIENCES FACULTY

Marcia Brody (B.A., Hunter College, 1951; Ph.D., University of Illinois) Assistant Professor and Chairman of the Department. Professor Brody's research interest is in the primary photophysical step in photosynthesis. Her current work deals with *in vivo* states of chlorophyll and photochemical activity. This work is supported by a grant from the National Science Foundation. She is a member of the Graduate Advisory Committee on the Biological Sciences of the City University, and is also chairman of the University Subcommittee on Biophysics.

Edward R. Balboni (Ph.D., University of Massachusetts) Instructor. An entomologist, Dr. Balboni's research has been concerned with the mechanical and energetic aspects of honeybee flight. This work is supported by a grant-in-aid from the City University. For this work he maintains a colony of honeybees at Boyce Thompson Institute for Plant Research in Yonkers. He is preparing articles on Annelida and *Amphioxus* to be published in the revision of the American Peoples Encyclopedia.

Gily E. Bard (B.A., Hunter College, 1945; Ph.D., Rutgers University) Instructor. Dr. Bard has collected and identified over one hundred species of mosses and liverworts toward the preparation of a check-list of the bryophytes of northern New Jersey and southern New York. This collection is in two identical parts, one of which is used at Hunter in General Botany and the Lower Plants, and will be donated to the Department when its herbarium is activated.

Olive Cross (M.A., Columbia University) Assistant Professor. Professor Cross's special interests are botany and microbiology. Her research is on respiration in *Laminaria*. She is active in student guidance and in Departmental and inter-departmental committee work.

Alice G. Elftman (Ph.D., Cornell University) Professor and Department Chairman, 1956-1962. Professor Elftman's research interests are in histology, with particular reference to the microscopic anatomy of innervation. Her teaching specialties are embryology, microtechnique and anatomy and she is very

active in vocational guidance and student-faculty relations. She is Chairman of the Faculty Science Club.

Morris Green (Ph.D., University of Rochester) Assistant Professor. Professor Green received a grant from the Atomic Energy Commission for the purchase of equipment which is currently being used for teaching and research in radiation biology at Hunter. He has conducted research on the role of formate in the biosynthesis of chlorophyll a; protein metabolism in tumor tissues and the metabolism of I^{131} -insulin in normal and diabetic rat livers.

Howard Grob (Ph.D., New York University) Instructor. Grants-in-aid from both the City University and the Lalor Foundation have enabled Dr. Grob to continue his research in three closely-related areas of endocrinology—the maturation of ovarian follicle, soft tissue calcification, and hormonal effects on cell differentiation and specialization.

Hyman Guthwin (Ph.D., New York University) Instructor. Cellular physiology is Dr. Guthwin's principal research interest and his past research has been concerned with the isolation of subcellular organelles, the fractionation of human gynecological tumors and other closely-related areas. At present, he is conducting preliminary experiments concerning the proteolytic enzymes of starfish hepatopancreas.

Dorothy Hammond (Ph.D., Columbia University) Associate Professor. With a special interest in genetics, Professor Hammond has done research on the genetics of leaf shape and worked on the use of colchicine in plants for doubling chromosome number. She makes extensive use of the greenhouse at Hunter for plant propagation and genetics research.

Irwin H. Herskowitz (Ph.D., Columbia University) Professor. Professor Herskowitz joined the Department in September, 1963. He received a substantial four-year grant from the United States Public Health Service, which provides funds for research in genetics. During his career Professor Herskowitz has published more than one hundred papers in the field of genetics. In 1962, his textbook "Genetics" was published. A third volume of a *Drosophila* bibliography by Professor Herskowitz is cur-



Professor Salmon, performing a dissection of a honey bee for class study



*Professor Herskowitz and his graduate assistant, Marian Bakula, conferring on their work in the genetics of *Drosophila**

rently in press. Space has been provided in the Department for the housing of a library dealing with the biology and genetics of the fruit fly, *Drosophila*. This library is the most extensive of its kind in the world.

Ruth W. Little (M.A., Columbia University) Assistant Professor. Specializing in comparative vertebrate anatomy, Professor Little is also a competent teacher of college physics. She has made statistical studies of grade distribution for use by the Department as well as for reports to the Middle Atlantic States Association.

Mildred M. Marengo (B.A., Hunter College, 1927; M.A., Columbia University) Assistant Professor. Professor Marengo has teaching interests in botany and zoology. She has made major contributions to the Department in writing and revising laboratory outlines. She has recently received a stipend for participation in the 1963 NSF Conference.

Sarah H. May (B.A., Hunter College, 1928; M.A., Columbia University) Instructor. With her special interest in teaching undergraduates, she is well-known to alumni for her ability to develop enthusiasm in the introductory courses in biology.

Richard Mawe (Ph.D., Princeton University) Instructor. Dr. Mawe's research is concerned with the structure of cell membranes and the relationship of these structures to the transport of substances into all living cells. In 1962, he was awarded a National Science Foundation grant for a research project entitled "The Mechanism of Glucose Penetration in Human Red Blood Cells." Last Spring, through the efforts of Dr. Mawe and others, funds from the National Science Foundation and from Hunter College were awarded for the purchase of equipment to be used in teaching and research in cellular physiology.

Dorothy Meier (Ph.D., Columbia University) Associate Professor. A botanist, whose special area of interest is mycology, Professor Meier also has an interest in the distribution of marine algae and shells (gastropods and pelecypods) along

the Gulf of Mexico to Florida. The New York Horticultural Society awarded her the 1961 trophy for plant photography.

Charlotte J. Newman (Ph.D., Radcliffe) Associate Professor. Professor Newman has been active in developing microbiology, her specialty, at an advanced level for undergraduates at Hunter. She has maintained an extensive collection of microorganisms for a number of years.

Nan L. Robert (M.S., Emory University) Assistant Professor. Professor Robert has been active in developing an interest in the invertebrates. She developed a popular course in parasitology for undergraduates and has been active in the College on numerous committees, particularly the one on long-range planning of laboratory and research space.

Theodora N. Salmon (Ph.D., Columbia University) Associate Professor. Dr. Salmon, whose interests lie in the areas of endocrinology, embryology, microtechnique and evolution, has guided master's students in thesis research and has been active in developing the doctoral program at Hunter. She has published and done research in the area of microscopic anatomy and development.

Arthur Samuels (Ph.D., University of Chicago) Associate Professor. Coming to Hunter in September, 1963, Professor Samuels is conducting research on the metabolism of nerve and muscle as well as the trophic effect of nerve on muscle. This work is supported by grants from the American Heart Association (of which he is an Established Investigator) and the Muscular Dystrophy Association of America. He is currently utilizing immunoenzymology as a tool to study conformational alterations in enzymes during disease and substrate combination.

Gerald R. Seaman (Ph.D., Fordham University) Professor. Professor Seaman joined the Department in September, 1963. Author of a book on microbial physiology and biochemistry, he has also published some 65 research papers in these fields and has contributed review articles on protozoan metabolism to such publications as the "Annual Review of Microbiology." His current research, protein synthesis in microorganisms, is supported by a United States Public Health Service grant.