62-63

ANNUAL REPORT OF THE BIOLOGICAL LABORATORY / 1963-64

THE LONG ISLAND BIOLOGICAL ASSOCIATION / COLD SPRING HARBOR, N.Y.

OFFICERS AND DIRECTORS

LONG ISLAND BIOLOGICAL ASSOCIATION

Walter H. Page, *President*
Nevil Ford, *Chairman*
E. C. MacDowell, *Secretary*
Robert V. Lindsay, *Treasurer*
Mrs. David Ingraham, *Assistant Secretary*

BOARD OF DIRECTORS

To serve until 1966:

Mr. Amyas Ames
Cold Spring Harbor, N.Y.
Dr. Rollin D. Hotchkiss
Rockefeller Institute
Mrs. David Ingraham
Cold Spring Harbor, N.Y.
Mr. Walter H. Page
Cold Spring Harbor, N.Y.
Mr. Gerard Piel *New York, N.Y.*
Mr. Richard Storrs
Oyster Bay, N.Y.
Dr. Edward L. Tatum
Rockefeller Institute

To serve until 1965:

Mr. Duncan B. Cox
Oyster Bay, N.Y.
Dr. M. Demerec
Brookhaven National Laboratory
Mr. Nevil Ford
Cold Spring Harbor, N.Y.
Dr. Bernard L. Horecker
New York University School of Medicine
Mr. Angus McIntyre
Huntington, N.Y.
Dr. Stuart Mudd *University of Pennsylvania Medical School*
Dr. Robert Cushman Murphy
Setauket, N.Y.

To serve until 1964:

Dr. Vernon Bryson
Rutgers University
Mrs. George S. Franklin
Cold Spring Harbor, N.Y.
Mr. Edward Kozlik *Huntington Federal Savings and Loan Ass'n*
Dr. S. E. Luria *Massachusetts Institute of Technology*
Dr. E. C. MacDowell
Cold Spring Harbor, N.Y.
Mr. William B. Nichols
Syosset, N.Y.
Mrs. William S. Smoot
Syosset, N.Y.

To serve until 1963:

Dr. Ernst W. Caspari
University of Rochester
Dr. Howard J. Curtis
Brookhaven National Laboratory
Mr. Joseph R. Eggert, Jr.
Cold Spring Harbor, N.Y.
Dr. B. P. Kaufmann *Carnegie Institution of Washington*
Mr. Robert V. Lindsay
Syosset, N.Y.
Mrs. Franz Schneider
Oyster Bay, N.Y.
Mr. Dudley W. Stoddard
Wawepex Society

SCIENTIFIC ADVISORY COMMITTEE

Dr. E. L. Tatum, Chairman
Rockefeller Institute
Dr. E. W. Caspari
University of Rochester
Dr. M. Demerec
Brookhaven National Laboratory
Dr. H. B. Glass
Johns Hopkins University
Dr. B. L. Horecker *New York University School of Medicine*
Dr. S. E. Luria *Massachusetts Institute of Technology*
Dr. F. J. Ryan *Columbia University*
Dr. J. D. Watson
Harvard University

REVIEW OF THE YEAR

During a period of major administrative change, it is always difficult to continue normal operation. Members will be glad to learn, therefore, that the normal year-round research, the XXVIIIth Annual Symposium, and the adult and childrens' summer courses were carried through successfully and in full during the past year by our Laboratory Directory pro tem, Dr. H. Edwin Umbarger, and since June first by the new director, Dr. John Cairns. Reports on these activities follow.

Dr. Cairns is no stranger to the Laboratory, as he was here in 1960-61 and was a participant in last year's Symposium. He comes to us after eight years at the Australian National University. His original training was at Oxford, where he received his MD in 1946.

Of great portent for the Association and the entire scientific community is the accomplishment of our long time planning for more solidly secured and expertly guided future operation, by our joining with others of distinction in our field of interest in the founding of The Cold Spring Harbor Laboratory of Quantitative Biology. Dr. Cairns has been appointed its Director and our President and Treasurer have been elected to its Board. Our associates in this venture are The Rockefeller Institute, Duke University, Albert Einstein College of Medicine, Princeton University, Brooklyn College, New York University Medical Center, The Public Health Research Institute of the City of New York, Sloan-Kettering Institute for Cancer Research. Their combined abilities and experience assures the Laboratory of guidance and opportunity for association far greater than under past arrangements.

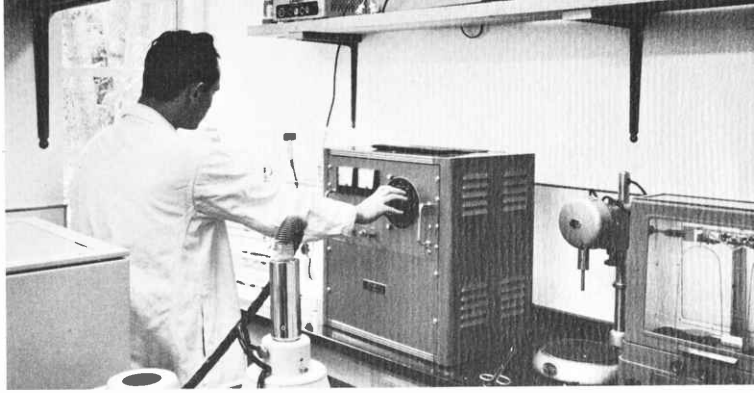
All the physical facilities and the scientific programs formerly under the control of the Long Island Biological Association, the Wawepex Society, and the Carnegie Institution of Washington, as well as selected personnel, have been transferred to the new entity. The intent of our founders and supporters is fully protected by reversion of the property of the Long Island Biological Association in the event that the Laboratory for Quantitative Biology should not carry out the purposes for which it was formed.

The Long Island Biological Association continues its separate existence with members, officers, and directors. Our future role will differ from the past in that we now share responsibility and direction with others. Our responsibility differs from that of our associates in that our contribution of facilities relieves us from sharing in certain future capital financial commitments undertaken by the others, and we have greater representation on the Board of Directors. The most vital and constructive aspect of our future role is the fostering of closer relations between the Laboratory and the Community for the end that greater understanding of the importance to mankind of genetic research as conducted at our Laboratory will lead to greater financial support. We have told you before of the great influence of community financial support in securing grant funds from Foundations and Government agencies and this cannot be overemphasized.

REVIEW OF THE YEAR *(cont'd)*

It is generally accepted that the Laboratory has made outstanding contributions to the extension of knowledge in the field of quantitative biology. We also feel very proud that it is a part of Cold Spring Harbor and derived its original support as well as it continuing yearly contributions from our neighborhood. With the reconstruction of the Laboratory under the control and with the support of our Association, in alliance with eight leading universities and research centers, we feel it can now earn further distinction. We look forward to the continuance of the Long Island Biological Association, in its altered role, with enthusiasm and with the conviction that its fundamental objective has never had greater potential for accomplishment.

Nevil Ford, Chairman *Walter H. Page, President*



TO THE MEMBERS OF THE LONG ISLAND BIOLOGICAL ASSOCIATION

In days gone by, before governments were rich, support for the arts and sciences came from merchants and princes; a family such as the Medici might dominate much of Southern Europe for two hundred years, but they are remembered for their patronage of the arts, and their power speaks to us now in the works of the Renaissance. Following the industrial revolution, governments came to see the power of scientific discovery and, with their new-found wealth, began to support the sciences. The resulting advances in science and technology led to still greater productivity and wealth. Thus far, science has certainly paid its way, and there is every reason to think that it will do so in the future. (To take one example, the recent increase in life expectancy of the wage-earner represents more money than has ever been spent on medical research.)

At first sight, there hardly seems to be any place nowadays for the philanthropist's million in the midst of the billions that his government may spend. However, as government expenditure has risen, so the rules that govern this expenditure have had to become stricter. As far as possible, these rules are designed to allay the nervousness of the taxpayer and yet, at the same time, cater to the needs of the average scientific institution. If, as in certain instances, the very strength of an institute lies in its departure from the common mold, that institute must either seek support from non-governmental sources or conform and lose its virtues.

The Laboratory at Cold Spring Harbor is just such a case. In its year-round activities it operates much like other institutes. In combining these activities with its summer programs it is unique. The annual symposia have made Cold Spring Harbor a household name throughout the scientific world; many contemporary biologists began their careers with some course given at Cold Spring Harbor; yet no federal agency has rules that could wholly encompass such a summer program. Rules, after all, are seldom framed to accommodate the exception.

For the scientist from abroad, Cold Spring Harbor stands at the gateway to the United States, one hour from Idlewild, and about as far from New York. Here, as he quickly discovers, the visitor may discuss with scientists drawn from many fields his and their problems in such detail as only comes with leisured ease. He learns about subjects he had not seen as related to his own. At most scientific meetings, such discussion is carried out almost clandestinely, usually in the crowded foyer of some hotel. Here, he can dissect his problems in an arcadian world where time, for once, is not the master.

It is paradoxical that the Laboratory should find itself in financial difficulties just at this time. The 20th century has witnessed the flowering of the sciences; this, if any, is the Age of Science. At the start of the century, the foundations of nuclear physics were being laid by a group of scientists under Rutherford at Cambridge. Today, a similar process is occurring in biology, though this time by a much larger group scattered throughout the world. Their main meeting place has been at Cold Spring Harbor; indeed, many of them began their careers here. For this reason, if for no other, our influence on the progress of biology has been immense. Efforts are being made by various of our European "alumni" to start a similar program at Naples. But, until that program gets fully under way, we can consider ourselves certainly unique and probably indispensable.

The Trustees of the Laboratory are therefore looking for some source of endowment that could secure the Laboratory from one year to the next. Only by getting this kind of support can our operation cease to be a most perilous venture.

JOHN CAIRNS, *Director*
Cold Spring Harbor Laboratory for Quantitative Biology

YEAR-ROUND RESEARCH PROGRAMS

One of the major activities of the Biological Laboratory is the program of year-round research carried on by several groups of investigators in the areas of genetics and biochemistry. Following are brief summaries of research completed or in progress.

BACTERIAL GENETICS

Paul Margolin

During the past year the bacterial genetics group has focused its attention upon two facets of genetics: 1) The genetic basis of mutation and 2) Interactions among genetic regulating elements.

Dr. Frank Mukai has continued studies utilizing purine and pyrimidine analogues in studying the mutation mechanism. A total of 171 leucine auxotrophs have now been carefully studied for the pattern of induction of back mutations by 2-aminopurine. Each mutant was found to demonstrate one of three types of response: non-revertibility (46), division dependent revertibility (100), and division independent revertibility (25). Our interpretation of these results is that the two types of revertibility identify the responses of the two different types of base pairs of DNA, adenine-thymine and guanine-cytosine. Experiments designed to confirm this interpretation are under way now, using 5-bromouracil as the mutagenic agent.

The identification of the genetic elements which regulate leucine biosynthesis has produced evidence for an unlinked regulator gene and an operator gene linked to the cluster of genes which determine the structures of the leucine pathway enzymes. Three different types of operator gene mutations have been recognized. Analysis of one of these indicates that the operator gene is relatively small and that the specificity of response to repressor can be separated from the capacity to initiate transcription of genetic information into messenger RNA.

Studies of the interactions of mutants of the leucine operator with the regulating elements for other metabolic pathways is providing information about the locations, numbers, and functions of these elements. For example, we now have evidence that a single cluster of genes, all concerned with a single metabolic pathway (tryptophan), may contain more than one operator.

MICROBIAL BIOCHEMISTRY

H. Edwin Umbarger

The activities of the microbial biochemistry group have centered mainly upon a study of the factors controlling the synthesis of the amino acids valine, isoleucine, leucine, and serine in the bacteria *Salmonella typhimurium* and *Escherichia coli.*

Dr. Martin Freundlich has continued his study of the control of the biosynthesis of valine and isoleucine. He has demonstrated that the activity of the first specific enzyme in isoleucine synthesis, threonine deaminase, besides being inhibited by the endproduct of the pathway, isoleucine, is also variously affected by compounds structurally related to isoleucine. The compounds tested could be classified into three groups with respect to their effects on threonine deaminase. One class represented by isoleucine inhibited and stabilized the enzyme. The second group characterized by threonine destabilized the enzyme and protected it against inactivation by isoleucine. Another class of compounds represented by allothreonine inhibited the enzyme, protected it against inhibition by isoleucine, and acted variably with respect to stabilization.

Dr. Freundlich, in collaboration with Dr. R. O. Burns, has discovered a novel means by which some microorganisms control the rate at which pre-branchpoint enzymes are synthesized. α-ketoisovaleric acid is a precursor of valine and leucine, as well as pantothenic acid. Four of the enzymes involved in the synthesis of α-ketoisovalerate are common also to the synthesis of α-keto-β-methylvalerate, the immediate precursor of isoleucine. Drs. Freundlich and Burns showed that cells limited in growth by either leucine, valine, or isoleucine contained derepressed levels of the common enzymes. This phenomenon, which has been termed "multivalent repression," illustrates a way by which the products arising from a common intermediate control the formation of the enzymes responsible for the synthesis of this intermediate. Dr. Freundlich showed further that cells limited in growth with respect to pantothenic acid contained the derepressed levels of the enzymes mentioned. He also was able to demonstrate the operation of multivalent repression in another branched pathway. The amino acids lysine, methionine, and threonine are all derived from aspartic acid. Dr. Freundlich showed that the synthesis of at least four of the enzymes involved in these syntheses are controlled by the above mentioned amino acids, as well as by isoleucine, which is ultimately formed from the deaminated product of threonine.

Dr. R. O. Burns has demonstrated the unitary response of the rate of synthesis of the three specific leucine synthesizing enzymes and has verified by his results the earlier observation by Dr. Paul Margolin that the leucine synthesizing enzymes comprise a single functional unit or operon. Dr. Burns has also collaborated with Dr. Frank Mukai in a study of organisms which have overcome by mutation a previous and separate mutation in the segment (operator) of the leucine operon governing the rate of production of the three specific leucine-forming enzymes.

Dr. Patrick Siu, who joined our group in the Fall of 1962, has studied the initial enzyme in serine biosynthesis. His studies have led to a description of the standard parameters of the reaction. Dr. Siu found that the enzyme, as tested *in vitro*, possessed atypical properties regarding endproduct inhibition; the enzyme, which in the direction of serine biosynthesis catalyses the conversion of 3-phosphoglycerate to phosphohydroxypyruvate, is almost completely refractory to inhibition by serine, whereas the reverse catalysis is strikingly sensitive to serine inhibition.

Dr. Joseph Calvo, who also joined our group in the Fall of 1962, has studied the effect of various leucine analogues on the activity of the first enzyme in leucine biosynthesis. Dr. Calvo has found that this enzyme possesses a high degree of specificity of inhibition by its natural antagonist, leucine, in that among a large number of analogues tested, only methallylglycine and fluoroleucine were leucine-mimetic.

Dr. Calvo has demonstrated that inhibition of growth by fluoroleucine can be overcome by mutation, and has devised a method whereby resistant organisms can be readily selected. Dr. Calvo has shown that the organisms which are resistant to fluoroleucine all possess a derepressed level of the leucine synthesizing enzymes.

A genetic analysis of this resistance has led Dr. Calvo to conclude that alterations in either of two regions of the *Salmonella* chromosome lead to high levels of the leucine enzymes. One of these regions is located in the leucine operator whereas the other is not linked to the leucine region.

Dr. Fredrik Størmer, who joined our group in the Spring of 1963, has partially purified a factor which stimulates the activity of the first enzyme in valine biosynthesis. He has resolved the factor from the enzyme, and has demonstrated that whereas the resolved enzyme is almost totally inactive, activity can be restored by addition of the factor to the enzyme.

Dr. Ronald Bauerle, who is the most recent addition to our research staff, is presently engaged in a study of the formation of acetolactic acid and α-acetohydroxybutyric acid, intermediates in the biosynthesis of valine and isoleucine, respectively.

RESEARCH GRANTS

The Association is pleased to recognize the generous support of various agencies which makes our research possible. During the past year, year-round research at the Biological Laboratory was supported by the following research grants: National Institutes of Health, U.S. Public Health Service: Grants GM 07675-03, A1 3501-04S1, GM 07178-03, C 4440 (C4), RG 7464 (C1), RG 5336 (C4); National Science Foundation: G-19848, G-17285.

28th COLD SPRING HARBOR SYMPOSIUM

"Synthesis and Structure of Macromolecules" June 7th to 13th, 1963

The symposium this year was the 28th in the series sponsored by the Long Island Biological Association and, at the same time, the first meeting of the Commission on Molecular Biophysics of the International Organization for Pure and Applied Biophysics. This newly-formed group was encouraged by the National Academy of Sciences to hold its first meeting in the United States. Since the implementation of international scientific communication is a major function of the Cold Spring Harbor Symposia, the joint sponsorship of the meetings this year was welcomed by the Long Island Biological Association. The symposium was planned and organized by Dr. H. Edwin Umbarger.

It was undoubtedly the largest meeting yet held at Cold Spring Harbor, being attended by about 65 scientists from overseas and about 250 scientists from within the United States. The printed proceedings of these meetings will include 74 papers and numerous informal contributions. Despite the ever-increasing number of scientific meetings held throughout the world, it is clear that those held at Cold Spring Harbor continue to be the main forum for reports and discussion on current work in the field of genetics and molecular biology. Indeed, these meetings themselves have certainly contributed significantly to the spectacular advances in biology made in recent years. (It is significant that the program this year included contributions by seven Nobel laureates.)

The meetings were opened with an address by Dr. Francis Crick of the Laboratory for Molecular Biology of Cambridge University. Professor Crick spoke on the role which has been played by numerous physical and chemical methods in the development of molecular biology to its present state. The material presented at this symposium suggests that the major advances to be expected in the near future in the field of molecular biology will depend, as pointed out by Dr. Crick at the start of the meeting, upon the most detailed chemical analysis of the mechanisms of cellular processes. For it is only by the accumulation of such concrete evidence that the models of the theorist are finally substantiated.

Support for this Symposium was obtained by the Long Island Biological Association and by the National Academy of Sciences on behalf of the Commission on Molecular Biophysics from the following agencies: National Institutes of Health, National Science Foundation, National Air and Space Administration, Office of Naval Research, United States Atomic Energy Commission, and United States Air Force under Grant AF-AFOSR 62-276, monitored by the Air Force Office of Scientific Research of the Air Research and Development Command.

SUMMER COURSES

These courses are designed to provide, in a very short period of time, the latest methods and tools for research employing bacterial mutants, bacterial viruses, and animal viruses in tissue cell cultures. Selection of a limited number of students has favored biochemists, physical chemists, physicists and mathematicians who are interested in moving into biological research.

Courses given at the Laboratory in the past have been instrumental in the fusion of genetics and biochemistry that has recently resulted in so many great advances in molecular biology. They have furnished the models for experiments presently employed in graduate level courses at many colleges and universities.

In conjunction with these courses, the Laboratory brings about 50 prominent investigators as seminar speakers. These speakers provide an extensive review of the latest research developments in the various areas of the courses.

COURSES FOR THE SUMMER OF 1963

1) **Bacterial Genetics: June 24th to July 13th.**
Staff—J. Gots, E. Goodgal; University of Pennsylvania
2) **Bacterial Viruses: July 15th to August 3rd.**
Staff — C. Bresch, W. Michalke; University of Cologne
3) **Microbiology of Vertebrate Cells and Quantitative Animal Virology: Aug. 5th to Aug. 24th.**
Staff—P. I. Marcus, Albert Einstein College of Medicine
G. Sato, Brandeis University

SEMINAR PROGRAM — SUMMER 1963

M. Demerec — Brookhaven National Laboratory: "Selfer mutation in Salmonella".

N. Zinder — Rockefeller Institute: "RNA Bacterial Phages."

B. Ames — National Institute of Arthritis & Metabolic Diseases, N.I.H.: "The histidine operon."

K. Fisher — Princeton University: "Lysogeny and Induction in *E. coli* K12 (λ) ".

L. Baron — Walter Reed Medical Center: "Intergenic recombination and episome transfer".

E. Freese — Laboratory of Molecular Biology, N.I.H.: "Mutagenesis".

H. Halvorson — University of Wisconsin: "The Genetic control of β-glucosidase in *Saccharomyces lactis*".

E. Englesberg — University of Pittsburgh: "Coordinate variation in induced synthesis of enzymes controlled by a structural gene".

P. Margolin — Long Island Biological Association: "Interaction among genetic regulator elements".

M. Fox — Massachusetts Institute of Technology: "The fate of deoxynucleate in pneumoccal transformation".

A. Garen — University of Pennsylvania: "Mechanism of action of a suppressor gene".

C. A. Thomas — Johns Hopkins University: "Physical studies on bacteriophage DNA."

A. Campbell — University of Rochester: "Crosses between lambda dg and lambda prophage."

F. C. Womack — Vanderbilt University: "Heterozygosis in T4 bacteriophage."

H. V. Aposhian — Tufts University: "The enzymology of bacteriophage infection."

A. W. Kozinski — Wistar Institute: "Recombinaton between the DNA molecules of bacteriophage."

John M. Buchanan — Massachusetts Institute of Technology: "Biochemical studies with amber and temperature-sensitive mutants of bacteriophage T4."

I. Tessman — Purdue University: "Control of gene expression."

H. Eagle — Albert Einstein College of Medicine: "Biochemistry of Cultured Mammalian Cells."

R. P. Cox — New York University School of Medicine: "Alkaline Phosphatase in Cultured Cells."

R. Rifkind — College of Physicians and Surgeons, Columbia University: "Electron Microscopy of Animal Viruses: Techniques and Applications."

W. K. Joklik — Albert Einstein College of Medicine: "Vaccinia Virus: Replication and Genetics."

J. E. Darnell — Massachusetts Institute of Technology: "The Molecular Biology of Poliovirus Replication."

D. Baltimore — The Rockefeller Institute: "Altered Patterns of Macromolecule Biosynthesis in RNA Virus-Infected Cells."

N. Ledinko — Carnegie Institute of Washington, Cold Spring Harbor: "Genetics of Animal Viruses."

I. R. Konigsberg — Carnegie Institute of Washington, Baltimore: "Cellular Differentiation *In Vitro*."

N. Salzman — National Institutes of Health: "Biochemistry of Vaccinia Multiplication."

The summer courses and seminars are supported by the following grants: The National Foundation, CPERT 133; and The National Institutes of Health, 2G-890 (C5).

SUMMER GUEST INVESTIGATORS

Originally conceived as an informal, summer haven for scientist to meet their colleagues, the Biological Laboratory continues to pla host to a group of active workers who spend the summer here. The come to teach the courses, pursue independent projects, write, an collaborate with others in related fields.

In the informal summer atmosphere at Cold Spring Harbor, th scientific activities are enhanced intellectually by the presence of thi group.

SUMMER INVESTIGATORS — 1963

Dr. J. T. August — *New York University School of Medicine*
Mrs. Jill Bailin — *University of Pennsylvania*
Dr. Alan Bernheimer — *New York University School of Medicine*
Dr. Carsten Bresch — *Institut für Genetik der Universität zu Köln*
Dr. Edward Glassman — *University of North Carolina Medical School*
Dr. Sol S. Goodgal — *University of Pennsylvania*
Dr. Joseph S. Gots — *University of Pennsylvania*
Dr. S. Granick — *Rockefeller Institute*
Dr. Samson R. Gross — *Duke University*
Dr. I. C. Gunsalus — *University of Illinois*
Dr. Jens Hedegaard — *University of Illinois & College de France*
Dr. Rollin D. Hotchkiss — *Rockefeller Institute*
Dr. Philip I. Marcus — *Albert Einstein College of Medicine*
Dr. Norman Melechen — *St. Louis University School of Medicine*
Mr. Wolfgang Michalke — *Institut für Genetik der Universität zu Köln*
Dr. Gordon Sato — *Brandeis University*

UNDERGRADUATE RESEARCH PARTICIPATION PROGRAM

For the past five summers, the Biological Laboratory has been privileged to conduct an undergraduate research participation program sponsored by the National Science Foundation. With the aim of encouraging careers in science for outstanding young students, the year-round and summer staff at Cold Spring Harbor provide unique opportunities for these young people to learn at first-hand what a career in research is like.

In most cases, the student is given a set of orientation exercises performed under the direction of his supervisor. Later the student is channeled into a project which ordinarily is closely associated with the supervisor's area of interest. For most students, every phase of these projects introduces new concepts and new techniques. It is the aim of every supervisor to choose projects which will give the student the satisfaction of interpreting his own data and revealing previously unknown information.

It was the opinion of the program supervisors this year that the students gained tremendously in listening to first-hand reports of recent research in several aspects of molecular biology, and in learning to communicate with established workers in the field. Their first-hand laboratory experience gave them an awareness of the intellectual and physical tools needed for research in molecular biology.

The following students participated in this program during the Summer of 1963:

Wayne Paul Diamond, Senior, University of Pennsylvania: "I have investigated the physical properties of *H. influenzae* bacteriophage and isolated lysogenic colonies to be used in transduction experiments."

Supervisor:Dr. Sol H. Goodgal, University of Pennsylvania.

Claire Diane Dryfuss, Junior, Douglass College: "I am trying to increase the frequency of deletion mutations that occur in *Salmonella typhimurium* by the use of various mutagens and, in this way, find out something about the nature of deletions."

Supervisor: Dr. Paul Margolin, L.I.B.A.

Alan George Finesilver, Junior, University of Rochester: "The objective of our initial work here is the attemped isolation of a naturally occurring polyadenylate from *E. coli* RNA by the use of a cellulose-bound polythymidylate column, which complexes with the poly A under suitable conditions. In addition, an investigation of a possible Kinase for oligonucleotides is planned."

Supervisor: Dr. J. T. August, New York University School of Medicine.

Edward June Hackney, Jr., Sophomore, Duke University: "To study the properties of fluoroleucine resistant mutants of *Neurospora crassa* and to try to isolate leucine excreting mutants by use of ultra-violet light as a mutagen."

Supervisor: Dr. Samson R. Gross, Duke University.

Lewis Arthur Jacobson, Senior, Amherst College: "I am studying induction of a soluble FMN-requiring DPNH oxidase using camphor and steroids (testosterone, progesterone, androsknedione, and testololactone) as gratuitous inducers."

Supervisor: Dr. I. C. Gunsalus, University of Illinois.

Michael Lawrence Murray, Junior, Bellarmine College: "To investigate the nature of the isomerase enzyme in the biosynthetic pathway of L-leucine in *Salmonella typhimurium*."

Supervisor: Dr. Richard O. Burns, L.I.B.A.

Mary Ellen Robbins, Junior, University of California: "The object of the project was to cause zygotic induction of λ phage between two strains of *E. coli*, between *E. coli* HFR and *Salmonella* F^-, and to cause zygotic induction of LT_2 phage between two strains of *Salmonella*."

Supervisor: Dr. Joseph Gots, University of Pennsylvania.

Rita Ann Rothenberg, Senior, Mount Holyoke College: "We have been working to improve a system where spheroplasts of B *E. coli* are infected with both disrupted rII bacteriophage mutants and DNA from wild type or different rII mutants. We have also been testing the relative effect of native, denatured, and sonicated DNA in this system."

Supervisor: Dr. Edward Goldberg, Carnegie Institute Dept. of Genetics.

Susan Etta Singer, Sophomore, Vassar College: "The work that I am engaged in involves the biosynthetical pathway leading to the formation of lysine, threonine, and methionine in *Salmonella*. Three aspartokinases are believed to exist; so far only two have been observed. My project is to investigate the existence and function of the third aspartokinase."

Supervisor: Dr. Martin Freundlich, L.I.B.A.

Kathryn Eileen Treible, Junior, Lycoming College: "We have found, by using a CsCl density gradient, that T4 bacteriophages can be separated into three classes: light, medium, and heavy. I have been studying the properties of the heavy phage using sucrose gradients and Hershey columns."

Supervisor: Dr. Gisela Mosig, Carnegie Institute Dept. of Genetics.

The Undergraduate Research Participation Program was supported by a grant, G15869, from The National Science Foundation.

NATURE STUDY COURSES FOR CHILDREN OF AGES 6 TO 14

During the summer of 1963, fourteen sections of nine courses in Nature Study were conducted in two sessions. The enrollment this year was 286 students. Each class met twice a week on alternate days for a 2½ hour period; the Advanced Ecology class met on Fridays for an average of 5 hours per session. The course offerings included:

General Nature Study (6, 7)
General Ecology (8, 9)
Earth Science (8, 9)
Botany Entomology (9, 10)
Animal Behavior (10, 11)
Entomology (10, 11)
Vertebrate Zoology (10, 11)
Seashore Life (10, 11)
Advanced Ecology (12, 14)

INSTRUCTORS:

Mr. Marvin J. Rosenberg, Ass't. Prof. Biology and Education, State University of New York at Stony Brook, L.I.
Mr. Otto Heck, Biology Teacher, Island Trees High School, Levittown, N.Y.
Miss Barbara Sheehan, Science Teacher, Bellmore Schools, Bellmore, N.Y.
Mr. Edward Farnworth, Research Ass't., State University of New York at Stony Brook, L.I.

In addition to the above instructors, each class had an assistant to help on the field trips and in laboratory work.

Two film showings highlighted Walt Disney's True Life Adventures series, with showings of "White Wilderness" and "Secrets of Life". Both films were enthusiastically received.

The Association gratefully acknowledges the fourth year contribution of the Huntington Federal Savings and Loan Association. This provided nature study scholarships for 15 students of the Huntington elementary schools.

NATURE STUDY WORKSHOP FOR TEACHERS

The eighth annual Workshop in Nature Study was offered during the summer of 1963. Upon satisfactory completion of the requirements of the course, teachers were entitled to two in-service credits awarded by the New York State Department of Education.

A primary objective of the workshop was to acquaint teachers with the remaining natural environment of Long Island. This was accomplished by collecting field trips to each of the following representative types of habitats: a fresh water pond, a salt marsh, a tidal mud flat, a beach for inter-tidal zone exploration, a field meadow, and a deciduous woodland. The Laboratory is uniquely situated so as to afford most of the habitats within walking distance. However, car trips were taken to several preserves on Long Island.

The course was given by Mr. Marvin J. Rosenberg, Assistant Professor of Biology and Education, State University of New York at Stony Brook, L. I.

LECTURERS:

Dr. Robert Smolker, Associate Professor, Dept. of Biology, State University of New York, Stony Brook, L.I.
Miss Barbara Sheehan, Science Teacher, North Bellmore Schools, L.I.
Miss Aline Dove, past president, Lyman Langdon Chapter of Audubon Society.
Mr. Edward Farnworth, Research Associate, Dept. of Biology, State University of New York, Stony Brook, L.I.

SPECIAL EVENTS

Public Meeting in Conjunction with Symposium

With the aim of bringing together Symposium participants and lay members of the community, the Long Island Biological Association held a public meeting on Thursday, June 13th, 1963, at the Carnegie Auditorium, following the last session of the 28th Cold Spring Harbor Symposium.

One feature of this program was the showing of a film "Mr. Tomkins Inside Himself," which is based upon a book "Mr. Tomkins Learns the Facts of Life" by Dr. George Gamow. Attending as a symposium chairman, Dr. Gamow is a physicist who has achieved considerable renown not only for his contribution to physics and biophysics, but also for his role in the popularization of science. His film was made in cooperation with the Biology Department and Medical School of the University of Colorado.

The other highlight of the evening was a short talk by Dr. John Cairns, who gave a brief summary of the Symposium held during the preceding week. He pointed out that this meeting was concerned with an area of molecular biology that the laboratories at Cold Spring Harbor have played a very key role in developing.

Phage Conference

Following the completion of the summer programs for 1963, the auditorium and housing facilities here were utilized for the annual phage conference, a four day meeting attended by most of the active phage workers in the country.

Annual Meeting

The 39th Annual Meeting of the Long Island Biological Association was held in the auditorium on Sunday, November 4th, 1962. Approximately 90 members and guests were present. After the formal meeting, Dr. Edward L. Tatum discussed the evolving status of the "Cold Spring Harbor Laboratory of Quantitative Biology", the new organization to operate our facilities and those of the Carnegie Institution in the future.

Following the program and meeting of the officers, tea was served by the Women's Committee, under the chairmanship of Mrs. David Ingraham.

FINANCIAL REPORT

FOR THE PERIOD MAY 1, 1962 - APRIL 30, 1963

As of April 30, 1963 our unrestricted assets were as follows:

Cash	$ 46,153.78	
Accounts receivable	11,027.18	
Inventory of books	14,338.62	
Prepaid expenses	4,104.58	
Investments (market value $101.66) Stocks	99.75	
Land, buildings and equipment	568,592.37	
Total		$644,316.28

Our liabilities were as follows:

Accounts payable and taxes	$ 27,628.20	
Grants and contracts, unexpended	47,401.49	75,029.69
Leaving unrestricted funds amounting to		569,286.59
Represented by: Endowment Fund (Dr. Wm. J. Matheson Bequest)	20,000.00	
Net worth	549,286.59	
Total		$644,316.28

In addition we hold cash and investments in the amount of $20,426.51, representing restricted funds as follows:

Mark H. Adams Memorial Fund	$ 1,638.39
Blackford Memorial Fund	5,000.00
Charles Benedict Davenport Memorial Fund	6,954.74
Charles Benedict Davenport, Junior, Fund	1,558.06
Temple Prime Scholarship Fund	2,661.70
Dorothy Frances Rice Fund	2,613.62
Total	$ 20,426.51

For the year 1962-63, our receipts were as follows:

Grants, contracts, research fees	$241,133.45	
Members contributions	25,955.17	
Special contributions	3,372.00	
Interest and dividends	212.49	
Operating receipts (rentals, dining hall, booksales, etc.)	130,093.92	
Total		$400,767.03

Our expenditures were as follows:

Research and educational program	$262,031.53	
Administration	40,753.05	
Plant maintenance	50,870.06	
Dining hall, rooms, and apartments	29,816.36	
Total		$383,471.00
Excess Income over Expenditures 1962-1963	$ 17,296.03	

MEMBERS OF THE LONG ISLAND BIOLOGICAL ASSOCIATION

Mr. W. H. Alston
Mr. Amyas Ames
Mr. Charles E. Ames
Mrs. Charles O. Ames
Mr. C. Stewart L. Anderson
Mr. & Mrs. Donald Arthur
Mr. & Mrs. Roy B. Attride
Mrs. Carl S. Auerbach
Mr. & Mrs. Robert W. Ayer

Mr. Richard F. Babcock
Dr. James C. Barnett
Mr. Rufus Barringer
Mr. & Mrs. Edmund Bartlett
Mr. & Mrs. E. Farrar Bateson
Mr. A. Benziger
Dr. Frederick Bernheim
Dr. Alan Bernheimer
Mr. Sidney Bevin
Dr. Saul M. Bien
Mr. Russell W. Billman
Mr. Henry Blackstone
Mr. Edward S. Blagden
Mr. F. Roberts Blair
Mr. & Mrs. B. DeWitt Bleecker
Mr. Bache Bleecker
Rev. Lyman C. Bleecker
Mr. & Mrs. T. B. Bleecker
Mr. & Mrs. Kenneth Boardman
Miss R. C. Boardman
Dr. Dietrick Bodenstein
Dr. George T. Bowdoin
Mr. Leonard Braun
Mrs. George E. Brower
Mr. Walter E. Brunauer
Dr. Vernon Bryson
Mr. & Mrs. Louis H. Buck
Mr. Bevin Budd, Jr.
Dr. Dean Burk
Mr. Frank Bursi
Mr. & Mrs. Sidney G. Butler
Mrs. J. Anthony Buzzelli

Mr. & Mrs. S. R. Callaway
Mrs. Trowbridge Callaway
Mrs. H. Schuyler Cammann
Mr. & Mrs. Oliver A. Campbell
Mr. & Mrs. Ward C. Campbell
Mr. John L. Carey
Mr. & Mrs. John M. Carroll
Dr. Ernst W. Caspari
Mrs. J. R. Castellana
Mr. & Mrs. Thomas C. Cattrall, Jr.
Mrs. William C. Caveny

Dr. Harry A. Charipper
Mrs. Thomas H. Choate
Dr. Frank C. Ciafone
Mr. & Mrs. Frank L. Clough
Mrs. Henry E. Coe
Mr. John T. Cole
Mr. Thomas L. Collins
Mr. Kingsley Colton
Mrs. Melvin Conant
Dr. Crispin Cooke
Dr. George W. Corner
Mr. & Mrs. Howard Corning, Jr.
Mr. & Mrs. Duncan B. Cox
Mr. & Mrs. John L. Cox II
Mr. & Mrs. Charles L. Craig
Mr. & Mrs. Miner D. Crary, Jr.
Mr. Arthur M. Crocker
Mr. George A. Crocker
Mr. S. Burford Crossman
Mr. & Mrs. Edward G. Cumming
Mr. Robert L. Cummings
Mr. Richard T. Cunniff
Dr. Howard J. Curtis
Mr. & Mrs. Curtis Cushman
Mr. Paul Cushman

Mr. H. T. Deane
Mr. Raymond de Clairville
Mr. Robert F. deGraff
Dr. Max Delbruck
Dr. & Mrs. M. Demerec
Mrs. William Denby
Mr. William de Neergaard
Dr. & Mrs. Richard Derby
Mr. A. C. Derrick
Mrs. I. R. Dickson
Mr. & Mrs. J. C. Dinkelacker
Mr. William R. Dotson
Mr. John N. Dyer
Mr. & Mrs. Jackson A. Dykman

Mr. Walter K. Earle
Mr. & Mrs. Ferdinand Eberstadt
Mrs. Maitland A. Edey
Mr. Joseph R. Eggert, Jr.
Mr. & Mrs. James Eisenmann
Mr. & Mrs. Richard S. Emmet
Dr. David J. Evancie
Mr. & Mrs. William Everdell III

Dr. Ugo Fano
Mr. M. H. Farnham

(cont'd next page)

MEMBERS OF THE LONG ISLAND BIOLOGICAL ASSOCIATION *(Cont'd)*

Mr. H. L. Fates
Mr. & Mrs. Richard H. Fay
Mr. & Mrs. Gordon M. Ferguson
Dr. Anthony Firenze
Dr. Ernst Fischer
Mr. & Mrs. W. Allston Flagg
Dr. & Mrs. George H. Fonde
Dr. Alexander Forbes
Mr. & Mrs. Nevil Ford
Mr. & Mrs. William A. Foxen
Mrs. George S. Franklin
Muriel W. Frey
Mr. Childs Frick
Mrs. H. Clay Frick
Mr. Jack B. Friedman

Mrs. James Gallatin
Mr. & Mrs. Clarence D. Galston
Mr. & Mrs. James E. Gardner
Mr. Craig M. Garretson
Mr. Chauncey B. Garver
Mrs. Joseph G. Gavin, Jr.
Mrs. William C. Gay
Mr. Walter R. Gherardi
Mr. & Mrs. Herbert Glasier
Dr. & Mrs. H. Bentley Glass
Dr. Martin Z. Glynn
Dr. E. Raymond Goodrich
Mr. C. Fitzhugh Gordon
Dr. Joseph S. Gots
Dr. Edwin J. Grace
Mr. Charles V. Graham
Dr. Earl L. Green
Dr. Samson R. Gross

Mrs. Joanna J. Hadden
Mr. & Mrs. Morris Hadley
Mrs. Winston H. Hagen
Mrs. Paul L. Hammond
Mr. F. Ward Harman
Mr. Henry U. Harris
Dr. & Mrs. Chester Hartenstein
Mr. & Mrs. Herman Hartmann
Hartmann's Department Store
Mr. & Mrs. Sidney C. Hattox
Mrs. Stephen Haynes
Mrs. Frederick Heberer
Mr. R. Graham Heiner
Mr. James E. Hellier
Dr. F. H. Herlitz
Mr. John E. Hoffman
Mr. & Mrs. Robert L. Houguet, Jr.
Dr. Alex. Hollaender

Dr. Davenport Hooker
Clarence A. Horn, D. Sc.
Mrs. George J. Hossfeld
Mr. Robert C. Hunt
Mr. William R. Huntington

Mr. & Mrs. David Ingraham

Mr. Milton Jacobs
Mrs. Palmer H. Jadwin
Mr. Irving D. Jakobson
Mr. Norman D. Jamieson
Mr. Oliver B. Jennings
Mrs. Percy H. Jennings
Dr. Everett C. Jessup
Mr. Ferdinand Jevons
Mr. & Mrs. Ward L. Johnson, Jr.
Dr. E. Elizabeth Jones
T. Jungreis

Mr. & Mrs. Morris I. Karpen
Dr. & Mrs. B. P. Kaufmann
Dr. & Mrs. F. C. Keil
Mrs. Walter A. Kernan
Mr. John J. Klaber
Mr. Jesse Knight, Jr.
Mr. Edward W. Kozlik
Mr. & Mrs. Paul Kramer
Mr. & Mrs. Roy Kurahara
Dr. Benedict Kurshan

Mr. & Mrs. Victor Larsen
Mr. Orin T. Leach
Mrs. Randall J. LeBoeuf, Jr.
Mrs. Getrude H. T. LeBoutillier
Mrs. Burton J. Lee
Mrs. James J. Lee
Mr. James Lewicki
Mr. & Mrs. John J. Lincoln, Jr.
Mr. & Mrs. David A. Lindsay
Mr. & Mrs. George N. Lindsay, Jr.
Mr. Robert V. Lindsay
Mr. & Mrs. Alfred Lippmann
Mr. & Mrs. Vladimir S. Littauer
Mr. W. E. Little
Mr. & Mrs. John H. Livingston
Dr. S. E. Luria

Dr. E. C. MacDowell
Mr. John F. MacKay
Mr. Herbert T. Mahan
Mr. & Mrs. James A. Malcolm, Jr.

Mrs. Harold M. Manser
Dr. Karl Maramorosch
Mr. John B. Marsh
Mr. John M. Martin
Mr. William H. Mathers
Dr. Ernst Mayr
Mr. R. B. McAdoo
Mrs. J. Arrison McCurdy II
Miss D. H. McGee
Mr. & Mrs. Angus McIntyre
Mr. & Mrs. Lawrence M. Mead
Mr. & Mrs. Lester W. Meehan
Mrs. Van S. Merle-Smith
Mr. Henry H. Meyer
Dr. Leo M. Meyer
Mrs. S. Willets Meyer
Mrs. Harry Miller
Mrs. Marjorie G. Miller
Mr. & Mrs. William H. Miller
Mr. Jesse Mittleman
Mrs. Douglas M. Moffat
Mr. & Mrs. Robert Hartwell Moore
Mrs. Ray Morris
Mrs. George Morrison
Mrs. Joseph Mrazek
Mr. & Mrs. Eugene T. Mudge
Mr. & Mrs. John R. Muma
Mr. & Mrs. Alfred E. Munier
Mr. Robert Cushman Murphy
Mr. Rem V. Myers

Mr. Bert L. Neff
Dr. H. H. Neumann
Mrs. George Nichols
Mr. William B. Nichols
Mrs. John W. Nields
Miss Juliet L. Nourse
Mr. & Mrs. Charles P. Noyes
Mrs. D. Chester Noyes

Mr. & Mrs. George D. O'Neill

Mrs. Arthur W. Page
Mr. & Mrs. Walter H. Page
Dr. & Mrs. Joseph F. Palmieri
Mr. Vincent Parrinello
Mr. & Mrs. Charles F. Paul
Mrs. Paul G. Pennoyer
Miss Isabel Peters
Mrs. Ralph Peters
Mr. & Mrs. John B. Philips
Mr. William C. Pierce
Dr. Richard N. Pierson

Dr. & Mrs. Harold Pivnick
Mr. & Mrs. Collier Platt
Mr. & Mrs. Thomas C. Platt
Ambassador & Mrs.
Francis T. P. Plimpon
Mrs. Arthur W. Pope
Mr. Edward Everett Post
Mr. & Mrs. Frank C. Powell
Mr. Theodore H. Price
Mr. Ralph Pulitzer, Jr.

Dr. E. Racker
Mr. Craig Rankin
Mrs. Langdon G. Rankin
Mr. E. J. Rannev
Mrs. Sara D. Redmond
Mr. Harold Reese
Mrs. Gordon S. Rentschler
Mr. Bernard J. Reverdin
Dr. Henry G. Rieger
Mr. Charles S. Robertson
Mr. Samuel B. Rogers
Mrs. Frances W. Roosevelt
Mr. John K. Roosevelt
Mrs. Philip J. Roosevelt
Mrs. Charles W. Root
Mrs. S. L. Rosenberry
Mr. & Mrs. Walter N. Rothschild, Jr.
Mr. & Mrs. Theodore S. Roxlau
Mr. Francis E. Ruland
Mr. John Rutherford

Mr. & Mrs. George J. Sallee
Mrs. Theodore F. Savage
Mr. William H. Savage
Mr. & Mrs. G. Schiappa
Mrs. Cooper Schieffelin
Mr. John M. Schiff
Mr. Richard Schlaugies
Mr. & Mrs. Franz Schneider
Dr. Irving M. Schneider
Mr. H. Livingston Schwartz
Dr. Donald Scott, Jr.
Mr. & Mrs. Donald Seavey
Mr. David Sencer
Mr. Dale Sharp
Dr. & Mrs. Milton Silver
Mrs. Charles Simone
Mr. & Mrs. Howard C. Smith
Mr. & Mrs. William S. Smoot
Mrs. J. Barstow Smull
Mr. Peter O. Solbert
Ivan Sorvall, Inc.

Mr. Theodore E. Stebbins
Mr. S. G. Stephens
Dr. Curt Stern
Mrs. Richard S. Storrs
Mr. & Mrs. Joseph S. Stout
Dr. Paul S. Strong
Mr. & Mrs. Donald Studholme
Mr. Charles H. Sullivan
Mr. & Mrs. Arnold Sundgaard

Mr. & Mrs. Suyehiko A. Takami
Mrs. T. C. Takami
Mr. & Mrs. Eugene S. Taliaferro
Mr. David S. Taylor
Mrs. E. P. Taylor
Mrs. Henry C. Taylor
Mr. & Mrs. John W. Taylor
Miss Susan Taylor
Mr. & Mrs. H. P. Baldwin Terry
Mr. & Mrs. Evan W. Thomas II
Dr. Irving A. Tittler
Mr. & Mrs. W. E. Tolles
Mr. Alexander C. Tomlinson
Mr. & Mrs. Charles C. Townsend, Jr
Dr. Ernest T. Turner

Dr. E. F. Vastola
Mrs. R. Victor
Mrs. E. A. von Raits

Mr. & Mrs. Colton P. Wagner
Mrs. Judith Wallace
Mr. William J. Wardall
Dr. & Mrs. David E. Warden
Mr. Ethelbert Warfield
Mr. & Mrs. Harold L. Warner, Jr.
Dr. Felix Wasserman
Mrs. Armitage Watkins
Mr. & Mrs. Ronald H. Webster
Mrs. Percy S. Weeks
Mr. & Mrs. L. Brandeis Wehle, Jr.
Mr. Eugene L. Wells
Mr. Thomas G. Wheelock
Mrs. J. Harwood White
Mr. C. W. Wickersham, Jr.
Dr. Daniel W. Wilbur
Mr. William W. Willock, Jr.
Mr. Henry S. Wingate
Mr. & Mrs. Valentine Wood
Mrs. Willis D. Wood
W. Wilton Wood, Inc.
James A. Woods

Editor: Leonora Frisch

COLD SPRING HARBOR LABORATORY OF QUANTITATIVE BIOLOGY

COLD SPRING HARBOR, NEW YORK

BOARD OF TRUSTEES

OFFICERS OF THE CORPORATION

Chairman: Dr. Edward L. Tatum

Vice-chairman: Mr. Walter H. Page
Laboratory Director: Dr. John Cairns

Secretary-Treasurer: Mr. John B. Philips

PARTICIPATING INSTITUTIONS

The Rockefeller Institute
Dr. Edward L. Tatum

Long Island Biological Association
Mr. Walter H. Page
Mr. Robert B. Lindsay

Duke University
Dr. Philip Handler

Albert Einstein College of Medicine
Dr. Harry Eagle

Princeton University
Dr. Arthur B. Pardee

Brooklyn College of the
City University of New York
Dr. Harry G. Albaum

New York University Medical Center
of New York University
Dr. Alan Bernheimer

The Public Health Research Institute
of The City of New York, Inc.
Dr. George Hirst

Sloan-Kettering Institute for Cancer Research
Dr. Leo Wade

INDIVIDUAL TRUSTEES

Dr. Barbara McClintock

Mr. Dudley Stoddard

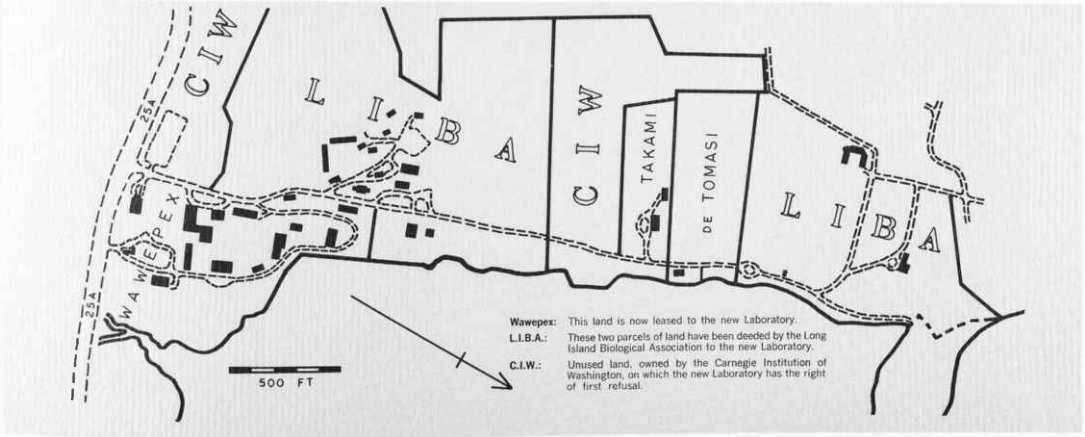
TERMS OF OFFICE

To expire 1963
Dr. Edward L. Tatum
Dr. Barbara McClintock
Dr. George Hirst
Mr. Robert B. Lindsay

To expire 1964
Mr. Walter H. Page
Dr. Harry Eagle
Dr. Leo Wade
Dr. Alan Bernheimer

To expire 1965
Dr. Philip Handler
Dr. Arthur B. Pardee
Mr. Dudley Stoddard
Dr. Harry G. Albaum

THE MAJOR DIVISIONS OF LAND ON THE WEST SIDE OF COLD SPRING HARBOR



A CENTER FOR RESEARCH AND EDUCATION IN BIOLOGY