

ANNUAL ANNOUNCEMENT
of the
Biological Laboratory
of the
LONG ISLAND BIOLOGICAL ASSOCIATION



COLD SPRING HARBOR
LONG ISLAND, NEW YORK

Forty-Sixth Year

1935

THE LONG ISLAND BIOLOGICAL ASSOCIATION

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LONG ISLAND
BIOLOGICAL ASSOCIATION
Incorporated 1924

ANNUAL ANNOUNCEMENT
of the
BIOLOGICAL LABORATORY
Founded by JOHN D. JONES, 1890

COLD SPRING HARBOR
LONG ISLAND, NEW YORK

Forty-Sixth Year

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THE LABORATORY STAFF

(See also Cold Spring Harbor Symposia on Quantitative Biology, Page 8)

- *Reginald G. Harris Director, The Biological Laboratory
- *Hugo Fricke The Biological Laboratory
Biophysics
- *Eric Ponder The Biological Laboratory
Physiology
- *A. J. Grout The Biological Laboratory
Bryology
- George W. Corner Professor of Anatomy, University of Rochester,
School of Medicine
Surgical Methods in Experimental Biology
- H. S. Conard Professor of Botany, Grinnell College
Research in Plant Sociology
- I. R. Taylor Assistant Professor of Biology, Brown University
General Physiology
- Asa A. Schaeffer Professor of Biology, Temple University
Research in Protozoology
- Charles B. Davenport Director, Department of Genetics
Carnegie Institution of Washington
Lecturer
- W. J. V. Osterhout Rockefeller Institute for Medical Research
Chairman Advisory Committee on Physiology and Biophysics
- J. H. Bodine Professor of Zoology, University of Iowa
Chairman Scientific Advisory Committee
- *Howard J. Curtis The Biological Laboratory
Physicist
- *Edwin J. Hart The Biological Laboratory
Chemist
- Herman T. Spieth .. Dept. of Biology, College of the City of New York
Marine and Fresh Water Biology
- Stanley A. Cain Research Associate, Indiana University
Plant Sociology
- Kenneth S. Cole Assistant Professor of Physiology
College of Physicians and Surgeons
Associate in General Physiology
- Harold A. Abramson .. Dept. of Bacteriology, Cornell Medical College
Associate in General Physiology
- E. Witschi Professor of Zoology and Experimental Embryology
University of Iowa
Associate in Marine and Fresh Water Biology
- Bert Cunningham Professor of Biology, Duke University
Lecturer
- Ernest W. Blanchard Associate, Bryn Mawr College
Assistant in Surgical Methods in Experimental Biology

* Member of All-Year Staff.

- W. A. Castle Assistant Professor of Biology, Brown University
 Associate in Marine and Fresh Water Biology
- *John MacLeod The Biological Laboratory
 Research Assistant in Physiology
- Edward McC. Walzl The Johns Hopkins University
 Assistant in Physiology
- *D. M. Gallagher Radio Engineer
- *Ruth E. Van Olinda Librarian
- *Dorothy A. Curtis Secretary (Part-time)
- *Lillian K. Smith Stenographer (Part-time)
-
- Chemical Supplies
- *Edward Deery Glassblower (Part-time)
- * Member of All-Year Staff.

HISTORICAL SKETCH

The Biological Laboratory was established at Cold Spring Harbor in 1890 as a department of the Brooklyn Institute of Arts and Sciences. Prominent among the founders and early patrons of the Laboratory were Professor Franklin W. Hooper, Director of the Institute, who, through his acquaintance with Professor Agassiz's station at Penikese Island, immediately recognized the advantages of Cold Spring Harbor for the location of a permanent biological laboratory. Mr. Eugene G. Blackford, fish commissioner of New York and the first president of the Board of Managers of the Laboratory, gave much thought and effort, while Dr. Bashford Dean, the first director of the Laboratory, and his lifelong friend, William E. Jones, interested the latter's uncle, Mr. John D. Jones, in the newly founded station.

In 1894 Mr. Jones (in collaboration with his brother, Walter R. T. Jones) erected, on land provided by him for the use of the station, a building (now called John D. Jones Laboratory) to which the Laboratory was immediately transferred from the previous cramped quarters of the State Fish Hatchery. From this modest beginning the Biological Laboratory has steadily grown until its present equipment includes two laboratory buildings for use throughout the year, three laboratory buildings for summer use, Blackford Memorial Hall, seven other dormitory buildings and cottages, four of which are heated for use throughout the year, and four of which are provided with small apartments.

Prof. Herbert W. Conn was Director of the Laboratory from 1891-1897. From 1898 to 1923, Dr. Charles B. Davenport was the Director, being aided in the later years of this period by Prof. H. E. Walter of Brown University who was appointed assistant director. In addition to his splendid work in behalf of the Laboratory, Dr. Davenport played a leading part in influencing Carnegie Institution of Washington to establish a station for Experimental Evolution at Cold Spring Harbor in 1904, and was the chief factor in the foundation and location of the Eugenics Record Office nearby in 1910.

During the thirty-four years of its existence previous to 1924 the Biological Laboratory had been instrumental in training over eighteen hundred biologists, while many scientific investigations of note had been carried on by investigators in residence during the summer.

In 1924 the Laboratory was transferred from the Brooklyn Institute of Arts and Sciences to the Long Island Biological Association. With this transfer the activities of the Laboratory were placed in the hands of biologists and neighbors of the station. This action has resulted in an increase in financial support which has permitted important improvements in facilities and equipment for scientific work, and a marked emphasis upon research not only during the summer but throughout the year. The growth of the Laboratory in this respect was indicated by the formation of an all-year laboratory for biophysics in 1928, and one for physiology in 1934.

The Laboratory's interest in a closer liason between biology and the so-called basic sciences was given further expression in 1933 with the inauguration of a new method in biological research, namely conference-symposia, now known as Cold Spring Harbor Symposia on Quantitative Biology.

Meanwhile notable additions have been made to the Laboratory's assets since its transfer to the Association. These include the purchase of over thirty-two acres of land with a large dwelling house and with frontage on Cold Spring Harbor; the erection of a small new laboratory building used as a general laboratory; the purchase of the Stewart cottage; the gift of the George Lane Nichols Memorial Laboratory; the gift of the Doctor Walter B. James Memorial Laboratory; the purchase and remodelling for dormitory use of the old Cold Spring Harbor fire house; the erection of two small cottages, and the purchase of equipment now valued at over fifty thousand dollars.

THE BIOLOGICAL LABORATORY IN 1935

The Biological Laboratory exists for the advancement of biology in the most fundamental sense. To this end it promotes biological research at all times (a) through a permanent staff and through guest investigators resident throughout the year, (b) through welcoming investigators who wish to make use of the facilities of the Laboratory during any period, especially during the summer, (c) through holding each summer conference-symposia on quantitative biology, and (d) through giving advanced instruction during the summer to students of biology.

The active promotion of research throughout the year gives an atmosphere to the whole Laboratory which the investigator and the student find agreeable and stimulating. The permanent work has been arranged with a view to its value to the summer work as well as its intrinsic value.

The staff of the Laboratory is so composed that various members are eminently fitted to give advice in a wide range of research including ecology, physiology, embryology, endocrinology, biophysics, biochemistry, anatomy, protozoology, entomology, histology, and genetics, in plants and in various groups of animals from protozoa to mammals. Advanced students of approved standing are allowed to choose the investigator with whom they will work. They may continue to work upon problems which they have already started or, after appropriate conferences, begin work upon new problems. While such work will be carried on under the guidance of individual members of the staff, the student will find the tradition of the Laboratory such that it is always possible and agreeable to approach all members of the staff in seeking advice concerning his problem.

A number of evening lectures will be given, open to the members of the Laboratory, of the L. I. Biological Association, and of the Carnegie Institution. These lectures are given by the members of the staff and by visitors from various other institutions. The lectures are intended to be of general biological interest and will be fully illustrated.

Special attention is called to the fact that the Laboratory is eager to cooperate with persons having sabbatical leave, to the end that such leave may be of the greatest possible advantage to themselves and to biology. The Laboratory is ready not only to place its facilities at the disposal of such biologists who wish to carry on research, but to give supplementary financial support during the period of residence, whenever it is desirable and necessary.

COLD SPRING HARBOR SYMPOSIA ON QUANTITATIVE BIOLOGY

Cold Spring Harbor Symposia on Quantitative Biology are an experiment in scientific procedure, a natural outgrowth of the Laboratory's policy of fostering a closer relationship between biology and the basic sciences, and of serving as a clearing house for methods and ideas in modern biology.

Each summer the Laboratory invites a group of 'mathematicians, physicists, chemists and biologists, actively interested in a specific aspect of quantitative biology, or in methods and theories applicable to it, to carry on their work, to give lectures and to take part in conference-symposia at the Laboratory.

A given group in residence is necessarily relatively small, since large attendance would interfere with certain unique advantages such as the present informality and freedom of discussion, but the members of the group are chosen with the aim that every important aspect of a particular subject be adequately represented from the physical and chemical, as well as the biological point of view; and that the whole span of a subject, from theories of physics to application to medicine, be covered.

The conference-symposia of 1935 will deal with **Photochemistry and Its Biological and Medical Applications**. It will occupy five weeks, from June 26 to August 7, during which time the following aspects will receive particular attention. Basic photochemistry, June 26—July 2. Photosynthesis, July 3—July 16. Photoreceptors and bioluminescence, July 17—July 23. Photochemistry in Medicine, July 24—August 7.

While plans are still incomplete, as this announcement goes to press, they are already relatively advanced. The following men will present papers, and, with five exceptions, will be in residence from one week to five weeks at least.

Dr. Vernon H. Albers, Physicist, Kettering Foundation, Antioch College.

Dr. William Arnold, Biological Laboratories, Harvard University.

Dr. Charles E. Bills, Biochemist, Director, Research Laboratories, Mead Johnson and Company.

Dr. Harold F. Blum, Assistant Professor of Physiology, University of California Medical School.

Dr. F. S. Brackett, Physicist, Bureau of Cotton Economics, Dept. of Agriculture.

Dr. Dean Burk, Associate Physical Chemist, Bureau of Chemistry and Soils, Department of Agriculture.

Dr. E. S. Castle, Assistant Professor of Physiology, Harvard University.

Dr. M. Demerec, Investigator, Department of Genetics, Carnegie Institution of Washington.

Dr. N. R. Dhar, Head of Chemistry Department, University of Allahabad (India).

Dr. Robert Emerson, Biological Laboratory, California Institute of Technology.

- Dr. Henry Eyring, Physical Chemist, Research Associate, Princeton University.
- Dr. Hugo Fricke, in charge of biophysics laboratory, Biological Laboratory.
- Dr. H. Keffer Hartline, Fellow Medical Physics, Johnson Foundation, University of Pennsylvania School of Medicine.
- Dr. E. Newton Harvey, Professor of Physiology, Princeton University.
- Dr. Selig Hecht, Professor of Biophysics, Columbia University.
- Dr. O. L. Inman, Director, Kettering Foundation, Antioch College.
- Dr. H. V. Knorr, Physicist, Kettering Foundation, Antioch College.
- Dr. Henry Laurens, Professor of Physiology, Tulane University School of Medicine.
- Dr. H. F. Mayerson, Assistant Professor of Physiology, Tulane University School of Medicine.
- Dr. Harold Mestre, Department of Bacteriology, Yale University School of Medicine.
- Dr. Carl Meyer, Department of Ophthalmology, College of Physicians and Surgeons.
- Dr. W. A. Noyes, Jr., Associate Professor of Chemistry, Brown University.
- Dr. Gerhard K. Rollefson, Associate Professor of Chemistry, University of California.
- Dr. Paul Rothemund, Biochemist, Kettering Foundation for Study of Chlorophyll and Photosynthesis, Antioch College.
- Dr. S. E. Sheppard, Chemist, Assistant Director Kodak Research Laboratories.
- Dr. Hugh S. Taylor, David B. Jones Professor of Chemistry, Princeton University.
- Dr. George Wald, Biological Laboratories, Harvard University.
- Dr. Ernst Wolf, Biological Laboratories, Harvard University.
- Dr. F. Paul Zscheile, Jr., Department of Chemistry, University of Chicago.

In order to make available to all workers the methods and ideas which are set forth in the group meetings from year to year, the lectures, symposia and essential parts of the discussions are being published as books, under the title: Cold Spring Harbor Symposia on Quantitative Biology. Volume I, resulting from the conference-symposia of 1933, is concerned with surface phenomena; Volume II (1934) with certain aspects of growth and development. Copies of either volume may be purchased from the Laboratory at \$3.35 each. Continuation orders for each volume as it appears are received at \$2.90 per volume bound in cloth and delivered. The papers and discussions of 1935 will be published as Volume III.

Investigators interested in any given symposium, or group of symposia, may attend and take part in the discussion of papers without further invitation. Programs of the symposia for 1935 will be sent to such persons upon request. Those planning to stay over night or longer at the Laboratory should make arrangements for rooms in advance.

GENERAL

Situation. The Biological Laboratory stands on the shore of a harbor five miles long and hardly a mile wide—a deep fiord, stretching back into the land and limited on each side by a plateau. The harbor is not exposed to the surf of the ocean, with the result that marine animals and plants grow here in great numbers, in a way which is impossible upon an unsheltered beach. The inhabitants of rocks, of gravelly and sandy and muddy bottoms, all live here in profusion. Combined with these marine conditions there is an abundance of fresh water—a chain of small lakes, numerous small ponds and springs. Woods and uplands complete the unusual series of habitats.

The Laboratory is situated in a center of biological activity that is maintained throughout the year. The State of New York maintains here its largest fish hatchery, where many millions of brook trout and tom cod are hatched annually. The Department of Genetics, Carnegie Institution of Washington, with its library of 14,000 volumes, and a permanent staff of research associates and assistants, is located on the grounds adjoining those of The Biological Laboratory. The Eugenics Record Office, also of the Carnegie Institution of Washington, devoted to the collection and study of data on human heredity, is located nearby.

The Biological Laboratory maintains certain of its work throughout the year; notably in biophysics (see page 13) and in physiology (see page 14). The Laboratory's library contains over one thousand volumes, and over ten thousand catalogued authors' reprints.

Buildings. There are five laboratory buildings, two of which, the Doctor Walter B. James Memorial Laboratory for biophysics and the George Lane Nichols Memorial Laboratory, are heated and in use throughout the year. Three of the five laboratories are equipped with running sea water, the source and piping of which insure freedom from toxic substances. The collecting of experimental material from the floor of the Sound has been considerably improved through arrangements with local oyster boats, whereby their dredging and collecting facilities supplement those of the Laboratory. Of the eight dormitories and dwelling houses, four are provided with facilities for central heating.

Instruction. The Laboratory offers courses of instruction during the summer, designed for the training of investigators and others who intend to make primary use of pure or applied biology in the professions which they plan to enter. The taking of examinations and the assignment of grades is optional with the student. The Laboratory will certify to the satisfactory completion of the work of any course upon the recommendation of the instructor of the course.

Admission. Application for admission to the Laboratory should be made on a form which may be obtained from the Laboratory upon request. New applicants must present supporting statements from their former or present instructors in biology. Applications should be made before May 15th, on which day notices of the action taken on all applications will be sent to the applicants. Applications for admission received subsequently will be acted upon immediately.

Rooms. Single and double rooms in the dormitories cost \$3.00 to \$4.50 per person per week, payable in advance either by the season or by the week. Rooms are reserved in the order of application, accompanied by a fee of \$5.00 applicable to the student's account. In all cases in which applications are not accepted by the Laboratory the deposit will be refunded. In other cases the deposit will not be refunded after May 10.

A number of small apartments have been arranged which are available summer or winter. At all times it is wholly optional whether workers eat at the general dining room or keep house. In addition to the living accommodations available at the Laboratory, a number of building lots are procurable, while frequent bus service to Huntington makes it practicable for investigators and their families, who so desire, to live in this pleasant town while working at the Laboratory. Huntington is the business center of this region and provides very adequate shops of many kinds. Arrangements for apartments and cottages may be made by correspondence.

Board is furnished to investigators and their immediate families and to students only, for \$7.75 per week (at any time throughout the year) payable in advance either for the season or by the week. Board may be furnished to relatives or friends visiting students, if due notice is given, at \$1.50 per day. A limited number of students may defray the cost of board by waiting on tables.

Tuition and Fees. Tuition including one course of instruction, the general lectures, and the use of the privileges, is \$75. Students who make use of the Laboratory microscopes will be charged \$6.00 extra. Research table \$50. Private laboratories \$75 to \$200 per season. Institutions may secure research facilities to be available at any time of the year by the subscription of \$100 per person per year. Tuition and fees are payable in advance at registration.

Scholarships. Besides the various scholarships offered by colleges and universities to students in their biological departments and applicable to this Laboratory, the following scholarships have been established:

The John D. Jones scholarship, donated by the Wawepex Society in memory of the founder of the Society and of the Laboratory. Given

annually to one or more advanced students in biology. Stipend \$250 or a part thereof.

The Temple Prime scholarship established by Miss Cornelia Prime, of Huntington, in memory of Temple Prime, a distinguished student of the mollusca. Amount \$100.

The Dorothy Frances Rice scholarship, established by Mr. Oran W. Rice, in memory of Dorothy Frances Rice, a former student at the Biological Laboratory. Applicable to a woman student at the Laboratory, "preference being given to students working in the botanical sciences." Amount \$100.

Application for any of these scholarships, supported by letters and other data, is to be made to the Director of the Laboratory before April 15th, on or about which day award is made.

How to Reach the Laboratory. The Laboratory lies on the north shore of Long Island about thirty miles from Manhattan, (Route 25A), and about fifteen miles beyond the nearest part of the boundary of Greater New York. It is two miles from the village of Huntington and about three miles from Oyster Bay. Persons coming from the West and South will find the P. R. R. the most convenient, since direct connection is made at the 33rd St. terminal in Manhattan with trains to Cold Spring Harbor on the Long Island Railroad, in some cases changing cars at Jamaica. Those arriving at the Grand Central Terminal may go by subway to the Pennsylvania-Long Island station at West 33rd Street and Seventh Avenue. From the station at Cold Spring Harbor a short bus ride (25c) brings one to the Laboratory. During the summer months there are ten or more trains a day from the city. Ferries across the Sound from Bridgeport to Port Jefferson, and from Stamford, Conn., to Oyster Bay, Long Island, are usually operated daily during the summer time. Two trains a day from New England enter the Pennsylvania Station, Manhattan.

BIOPHYSICS

All Year Staff

Hugo Fricke, Biophysicist in charge.
Howard J. Curtis, Physicist.
Edwin J. Hart, Chemist.
D. M. Gallagher, Technical Assistant.
Edward Deery, Glassblower (part time).

Cooperating Investigators

M. Demerec, Investigator, Department of Genetics, Carnegie Institution
of Washington.

Franklin Hollander, School of Dentistry, Columbia University.

The work in Biophysics has particularly dealt with problems in the fields of X-rays and alternating currents of high frequencies. Within the first category are studies of the chemical actions of X-rays, the genetic effects of X-rays (carried out in cooperation with Dr. Demerec of Carnegie Institution of Washington), the use of X-rays for chemical analysis of biological materials (teeth in particular, carried out in cooperation with Dr. Hollander of the School of Dentistry, Columbia University) and certain problems in radiography.

Within the second category are studies of the dielectric constant and power loss of cell membranes, artificial membranes, and colloids (proteins), and the use of these constants in recording cellular changes (growth, injury, death). The method has especially been used in studies of the red cell, particularly with reference to lysis.

The laboratory is also interested in the field of light, and work has been carried out on ultraviolet light dosimetry.

The laboratory contains technical shops equipped for mechanical, electrical and glass work, and several research laboratories particularly equipped for X-ray work, for work with alternating currents of high frequencies, and for chemical and physico-chemical work. The equipment includes apparatus for high vacuum research, several high potential generators for X-ray work, apparatus for measuring X-ray dosage in the international r-unit, equipment for work with ultraviolet light, and apparatus for work with alternating currents of high frequencies. A well equipped chemical and physical library is available.

One to three fellowships for work during the summer are given annually to men who have already received the doctorate. These fellowships provide room and board, and freedom from laboratory fees.

Instruction in biophysics is given in the course in General Physiology. See page 15.

PHYSIOLOGY

All Year Staff

Eric Ponder, Investigator in Physiology.

John MacLeod, Research Assistant.

The all-year research in Physiology is concerned with the investigation of various fundamental properties of simple cells, and with a close cooperation with the Department of Biophysics, which is engaged in somewhat parallel researches. The particular problems under consideration at present are (a) an investigation into some of the properties of red and white cell membranes, particularly under varying osmotic conditions, (b) an enquiry into the way in which various destructive agents affect the same types of cells, the criterion used in the case of the white cells being the effect on their respiration, (c) a continuation of work on the kinetics of haemolysis, and (d) a study of certain osmotic phenomena in muscle and nerve.

The physiological laboratories are now well equipped with apparatus for the investigation of the particular problems on hand. There is a complete equipment for the study of haemolysis, and for making osmotic pressure determinations, volume measurements, and determinations of conductance and capacity. In one of the laboratories there is adequate apparatus for the study of cell respiration, and in another laboratory, largely through the generosity of the Bache Fund, there is apparatus for the investigation of many of the properties of muscle and nerve.

The Laboratory is thus equipped to meet the needs of biologists interested in osmotic phenomena, cell measurement, cell respiration, or the fundamental properties of cell membranes regarded from the physiological point of view. Investigators or suitable students who wish to take advantage of these facilities during the summer months will be welcome.

GENERAL PHYSIOLOGY

June 20 — July 31

Dr. Taylor, Dr. Abramson, Dr. Ponder, Dr. Fricke,

Dr. Cole, Mr. Walzl.

This course includes lectures and laboratory work bearing on the fundamental phenomena in general physiology with considerable emphasis placed on the physico-chemical and quantitative aspects. It is offered to advanced undergraduate and graduate students and is planned to meet the needs of those with or without previous training in physiology.

Lectures are given daily on week days at 9:00 A. M. by the members of the staff. Special lectures are also frequently given by visiting physiologists. The laboratory work continues from 10:00 A. M. to 12:30 P. M. and from 2.00 P. M. to 4:30 P. M., except on Saturdays and Sundays. On Saturdays the work continues until noon.

The main phases of general physiology to be dealt with by lecture and laboratory work this summer are:

1. To be directed by Dr. Harold A. Abramson—
Membrane potentials
Electrophoresis

- Electroosmosis
 - Streaming potentials
 - Colloids
 - Viscosity and plasticity
 - Surface tension
2. To be directed by Dr. Eric Ponder—
 - Osmosis and osmotic pressure
(Cells, tissues, biological fluids and solutions)
 - Respiration of cells and tissues as measured by microrespirometers
 - Excitation phenomena
 3. To be directed by Dr. Hugo Fricke—
 - Ultraviolet measurements with a cadmium cell
(Recording of intensity of sunlight during the day and measurement of erythema dose. Measurements with mercury arc, carbon arc. Absorption measurements on water, sea-water, serum, etc.)
 - Soft X-ray radiography.
(Radiographs of insects and plants)
 - X-ray dosimetry
(Measurements of X-ray dosage as functions of potential and filter. Determination of effective wavelength. Measurements designed to illustrate the principles of protection of the worker against the rays.)
 - Thermoelectric measurements
 4. To be directed by Dr. Kenneth S. Cole—
 - Electrical conductivity
(Cell suspensions, tissues and solutions.)
 5. To be directed by Dr. Ivon R. Taylor—
 - Hydrogen ion activity
(Hydrogen, quinhydrone and glass electrodes. Hydrogen ion colorimeter.)
 - Buffer solutions
 - Oxidation-reduction potentials
 - Physiological effects of ions

Ordinarily, students are advised to undertake the regular laboratory work offered during their first season in the course without commencing research problems. However, certain phases of general physiology which are open to investigation are called to the attention of the group and students are encouraged to remain after the course or return a second summer to carry on research. The facilities of The Biological Laboratory and the advice of the staff are at the disposal of those who wish to undertake investigations.

A considerable amount of fine equipment is available for the use of the group engaged in the work of the course.

It is recommended that each student bring a compound microscope. The number of students is limited to 15.

SURGICAL METHODS IN EXPERIMENTAL BIOLOGY

June 20 — July 31

Dr. Corner, Dr. Blanchard

This is primarily a course in experimental surgery designed for advanced students who wish to obtain knowledge of mammalian surgical technique.

The number of students is limited to 12. The hours are from nine A. M. to one P. M. daily except Sunday; the laboratory will also be open in the afternoons except Saturday and Sunday, and the work may require afternoon attendance from time to time. The course is planned to give experience in those technical methods most suitable for use in the laboratory and likely to be used in subsequent research. As far as possible the work will be adapted to the special research needs of the members of the course. The general scope of the course is indicated in the following outline:

1. Use of anaesthetics and preparation of animals.
2. Practical methods of asepsis and antisepsis.
3. Methods for obtaining blood and other body-fluids, use of catheter and stomach tube, etc.
4. Post-operative care.
5. General procedures for suture, hemostasis, etc.
6. Special technical methods: oophorectomy, nephrectomy, splenectomy, adrenalectomy, intestinal suture, pancreatectomy, uterine fistula, hypophysectomy, etc., etc.
7. Gland transplantation, tissue inoculation.

Demonstrations will be made of certain physiological methods useful in mammalian research, such as the recording of blood-pressure and respiration, special methods used in physiology of reproduction, etc.

MARINE AND FRESH WATER ZOOLOGY

August 2 — September 12

Dr. Spieth, Dr. Witschi, Dr. Castle

The chief functions of this course are (1) to give students an opportunity to learn the habits and habitats of various marine and fresh water animals, and (2) to maintain and handle such animals experimentally in the laboratory. The class will take excursions to the numerous different ecological habitats, such as fresh water ponds, lakes, streams, falls, and swamps, and to such marine situations as marshes, brackish water areas, sea walls, wharves, mud flats, sandy and rocky shores, and deep water areas. (The latter will be accomplished by means of dredging trips.) This will give the student opportunity to collect and learn to know the different species in their normal habitats. At the same time observations will be made on relative population densities of individual species, the interrelationships of the various forms and how each fits into a definite ecological niche.

After collection, the various forms will be transported to the laboratory and kept for further observation and experimentation, under laboratory conditions. Observations will be made on the reactions of the animals to such stimuli as light, temperature, varying salinity, etc., as well as feeding habits, and in some cases breeding habits. In addition, the student will do certain supervised experiments on regeneration, color reaction, osmosis, artificial fertilization, and taxic responses.

The laboratory will furnish glassware, reagents, and such collecting equipment as pails, jars, and digging tools. All students should bring bathing suits and be prepared for digging and wading. Each person must have scalpels, heavy and fine forceps, scissors, needles, a hand lens, and pipettes. Should students desire to preserve specimens, they must furnish their own containers. It will be highly advantageous for each person to bring a first-class compound microscope equipped with substage condenser and a modern twin-objective binocular dissecting microscope. The following books will be helpful: Pratt's *Manual of Common Invertebrate Animals*, Flattely and Walton's *The Biology of the Sea Shore*, Borradaile's *The Animal and Its Environment*, Shelford's *Laboratory and Field Ecology*, Borradaile and Pott's *Invertebrata*.

PLANT SOCIOLOGY

August 2 — September 12

Dr. Cain

The study of plant sociology has received rapid development in the past decade or two, especially through the work of notable European investigators: Braun-Blanquet, Rubel, Gams, DuRietz, and others. English-speaking ecologists are more recently giving consideration to detailed and more exact methods of plant community study.

Our course of study will present the theories, concepts, and methods of leading workers in the field and will make application of them to the plant communities of Cold Spring Harbor and vicinity. Plant sociology in its broadest outlines considers: (1) The organization and composition of the plant community; (2) The relations between plant communities and the environment; (3) Succession; (4) Geographic distribution; and (5) community systematics.

The vicinity of Cold Spring Harbor is rich in material for studies in Plant Sociology. Consideration will be given all kinds of plant communities: the maritime and littoral communities (marine, beach and dune), grasslands of the Hempstead Plains, etc., freshwater communities of streams, lakes and bogs, forests of deciduous and coniferous species.

Students should know the general outline of the plant kingdom and have had experience in the identification of plants. Previous experience in taxonomy and field ecology is highly desirable. Students should bring such manuals as are available to them for all classes of plants. Equipment should include a microscope, hand lens, the usual laboratory dissecting instruments, and field clothing. A camera is useful. Students desiring to collect should bring their own equipment.

For further information concerning the course address inquiry to The Biological Laboratory or to the Instructor.

BRYOLOGY

Prof. A. J. Grout, a member of the all year staff of the Laboratory, and who for the last few years has been writing and publishing a series of monographs on The Moss Flora of North America, North of Mexico, will accept a limited number of students and investigators at his private laboratory at Newfane, Vermont.

Newfane and adjacent regions in the hills of southern Vermont offer a moss and hepatic flora which is unusually abundant. In addition Dr. Grout's complete library and his collections are at his laboratory in Newfane.

Students wishing to gain proficiency in the study of mosses will have opportunity to work along lines most appropriate to their needs. Problems in morphology, taxonomy, ecology or physiology may be taken up by those who are qualified.

Tuition and research table fees are the same as those at Cold Spring Harbor. Students and investigators interested in working with Dr. Grout should communicate directly with him.

