LONG ISLAND BIOLOGICAL ASSOCIATION

ANNUAL REPORT
OF
THE BIOLOGICAL LABORATORY

COLD SPRING HARBOR
LONG ISLAND, NEW YORK
1941

LONG ISLAND BIOLOGICAL ASSOCIATION

INCORPORATED 1924

ANNUAL REPORT

OF

THE BIOLOGICAL LABORATORY

FOUNDED 1890

FIFTY-SECOND YEAR

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Seaside stations for biological research existed in Europe as early as 1835. The publication of the "Origin of Species" in 1859 was, however, the particular stimulus that sent forth a host of investigators into a newly recognized arena of organic evolution at the edge of the ocean. The famous Naples Zoological Station opened, after several years of preparation, in 1874. That at Kristineberg, Sweden, which had the oldest background of any, completed its first modern building in 1884. The laboratory at Plymouth, England, was dedicated in 1887. Huxley, exponent to laymen no less than to savants of the budding gospel of evolution, was one of the organizers, and it is significant that the largest single gift, amounting to £2,000, was made by "The Worshipful Company of Fishmongers" of London. Thereafter, similar institutions sprang up rapidly in other countries, and at the beginning of the present war fully a hundred were in operation in Europe alone.

Woods Hole, first in age and influence among kindred organizations on this side of the Atlantic, was founded in 1888. Coming hard on its heels, and long antedating most of the other stations along the two-ocean coast, was New York's contribution to the field, the Biological Laboratory at Cold Spring Harbor, which has now entered the second half century of a notably useful career.

The choice of a site in 1890 was a happy one. The long, fiordlike, drowned valley, opening on rocky beaches of the Sound and leading to a shallow inner basin and in turn to a chain of hidden lakes, ponds, cool springs and peat bogs, offers an abounding habitat for plant and animal organisms of salt and fresh water and of the tension zone between the two. A generation ago, intensive studies of the life of the sandspit that nearly bisects the harbor carried the fame of this tiny intertidal strand into classrooms the world over.

Physical advantages, however, give no assurance of accomplishment. From the beginning, Cold Spring Harbor has been fortunate in the devotion and enthusiastic labors of its friends, who include near-by residents of Long Island as well as men and women in educational institutions everywhere. The original parent body was the Brooklyn Institute of Arts and Sciences, but in 1923, simultaneously with the appointment of the late Dr. Reginald G. Harris as Director, control was shifted to the newly created Long Island Biological Association, Inc. At the same time the program was more closely geared with new and promising trends in research.

A roster of the instructors, investigators and the participants in soundly planned conferences at Cold Spring Harbor would include a large proportion of the outstanding biologists of the last half century. Aside from summer activity, many a leader has spent his sabbatical year in the undistracted atmosphere of the station, which has seen the inception or the fruition of countless discoveries. Nor would the list be limited solely to American scholars; a recent summer's staff, for example, includes representatives of universities scattered from Stanford, in California, to Oxford and Cambridge, in England. The international prestige of the Laboratory has always, indeed, exceeded its fame at home, a fact indicated as long ago as 1907, when the members of the International Zoological Congress thronged to the spot with which they were already familiar in spirit.

In one or another of the laboratory buildings now numbered in our equipment at Cold Spring Harbor, approximately twenty-five hundred biologists have received part of their training. The year 1933 saw the beginning of the annual summer "Symposia on Quantitative Biology," designed to establish closer relations with the basic sciences of physics and chemistry. These gatherings have been attended by strong groups of collaborators, and the resultant annual volumes, of which that recently published is the ninth, have become necessary tools of all related inquiry.

The status and immediate plans of the Laboratory are described in the annual report of the Director, which is commended to layman and scientist alike as lively and significant reading. Economy and efficiency of operation have been enhanced through the generosity of the Carnegie Institution of Washington in lending us the services of Dr. Demerec, who has already guided the Laboratory through one of its most successful summer periods. But, under a war-time national program marked by many economic and educational restrictions—such as continuous university sessions—none of us can afford to disregard the shadow of possible danger to a fine tradition.

For more than fifty years the Laboratory has operated without an appreciable endowment. It has carried on largely with local support, which in days of increasing taxes becomes more difficult to obtain. Research, which is its highest function in both a scientific and an economic sense, does not always lend itself well to popular advertisement. The educational foundations, which have extended generous aid for special purposes, cannot be expected to assume the burden of maintenance; their traditional policy is, rather, to foster new undertakings until they have grown strong enough to walk alone, or to enrich the opportunities of projects already firmly established.

The total membership of the Long Island Biological Association has never exceeded about three hundred individuals. Here, in all likelihood, lies the clue to ultimate success. The basis for a more inclusive pride and proprietary interest, particularly among residents of all Long Island, has been established. The long career of the Laboratory on a modest budget has well earned its reputation for "plain living and high thinking." If, here at home, a realization of its value as a permanent educational asset for metropolitan New York can only be made to equal or approach the regard in which our institution is held in the far corners of the earth, support will be forthcoming to assure an ever-growing future.

ROBERT CUSHMAN MURPHY, President
The Long Island Biological Association, Inc.

THE LONG ISLAND BIOLOGICAL ASSOCIATION

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Robert Cushman Murphy

Vice-President	Secretary
Arthur W. Page	Charles B. Davenport
Vice-President and Treasurer	Ass't. Treasurer and Auditor
Marshall Field	William F. Dean

Director of The Biological Laboratory, M. Demerec

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To serve until 1943

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Mrs. Sewall Wright
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† Deceased

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Albert D. Silver
J. G. Dettmer
William G. Loew
John Hill Morgan
Acosta Nichols, Jr.
George Lane Nichols
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Herman Stutzer

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Vice-President—Mrs. F. Huntington Babcock
Secretary—Mrs. Fairman R. Dick
Chairman, House Committee—Mrs. Percy H. Jennings
Chairman, Membership Committee—Mrs. Russell C. Leffingwell

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(By contribution of $100 or more)

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(By contribution of $10 or more)

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†Mrs. E. H. Harriman
†Mrs. Anton G. Hodenpyl

† Deceased

REPORT OF THE SECRETARY

The 41st meeting of the Board of Directors was held in New York January 20, 1941, with 13 members present and Mr. Page presiding. Dr. W. J. V. Osterhout presented his resignation on account of ill health and it was accepted with regret. Elected were: President, Robert Cushman Murphy; Vice President, Mr. Arthur W. Page; Vice President and Treasurer, Mr. Marshall Field; Secretary, Charles B. Davenport; Laboratory Director, M. Demerec. The Executive Committee was elected and the Bankers Trust Company designated custodian depository. Dr. Ponder presented his report on the operation of the Laboratory for 1940. Dr. Demerec presented his program for the year 1941, including an outline of the Symposium. The budget for 1941 amounting to $8,886 was adopted.

The 18th annual meeting of the Long Island Biological Association was held at Blackford Hall, Cold Spring Harbor, on July 29th, 1941. President Murphy gave an address on the work of the Association. The members of the Board of the Class of 1945 were elected as follows: Henry Hicks, Stuart Mudd, R. C. Murphy, J. K. Roosevelt, Acosta Nichols, C. B. Davenport, M. Demerec. A resolution was passed of appreciation of the services of Mrs. Merle-Smith whose resignation, in consequence of her removal to Australia, was accepted; also one of expression of regret at the illness of Mr. Acosta Nichols, long a leading member of the Board.

The 42nd meeting of the Board was held at the George Lane Nichols Memorial Building at Cold Spring Harbor on July 29, 1941. Dr. Murphy presided and 11 additional members were in attendance. A committee was appointed to confer with President Bush about lending Director Demerec to the Association for another year. The future policy of the Association, especially the work of the Laboratory, was fully discussed.

C. B. DAVENPORT, Secretary.

REPORT OF THE TREASURER

The Treasurer reports total income for the year of $35,141.48 and disbursements of $32,899.27.

The Women's Committee, under the leadership of Mrs. Van Santvoord Merle-Smith, President; Mrs. Russell C. Leffingwell, Vice President; Mrs. Fairman R. Dick, Secretary; Mrs. Walter Jennings, Treasurer; and Mrs. Percy Jennings, Chairman of the House Committee, contributed $1,025.00 to the work of the Laboratory and also made many valuable gifts of furnishings for the houses on the grounds.

The Wawepex Society continued its annual grant, this year of $1,250 plus $250 for the John D. Jones Scholarship. Officers of the Wawepex Society are: Charles M. Bleecker, Governor; Jesse Knight, Scribe, and T. Bache Bleecker, Custodian. In addition to its annual financial support the Wawepex Society leases certain lands and buildings to the Association, free of rent, and carries the insurance on these buildings.

The balance sheet and income and expense accounts of the Association follow herewith in Exhibits A, B and C.

EXHIBIT A

ASSETS

Current Assets:		
Cash in Banks		5,693.41
Assets Receivable:		
Accounts Receivable		63.72
Securities Purchased	10,856.00	
Endowments	5,000.00	
		15,856.00
Land Assets:		
Land Purchased	69,880.52	
Land (on 50 years' lease)	13,500.00	
Land (improvements)	2,898.01	
		86,278.53
Building Assets:		
Blackford Hall	19,000.00	
Jones Laboratory*	10,000.00	
Davenport Laboratory	8,500.00	
George L. Nichols Memorial Laboratory	13,700.00	
Williams House	11,300.00	
Stewart Cottage	3,000.00	
Hooper House*	13,200.00	
Wawepex Laboratory*	7,500.00	
Osterhout Cottage*	5,500.00	
Dr. Walter B. James Laboratory	13,500.00	
Fire House	8,500.00	
Urey and Cole Cottages and Garage	4,867.53	
		$118,567.53
Fixed Assets:		
Equipment	38,527.01	
Equipment, Biophysics	16,849.90	
Equipment, Physiology	2,513.15	
		57,890.06
		$284,349.25

* Situated on property on 50 years' lease from Wawepex Society.

LIABILITIES

Current Liabilities:		
Accounts Payable		3,514.92
Capital:		
Long Island Biological Association	160,450.32	
Value of Leasehold—Wawepex Society	39,153.74	
		199,604.06
Surplus:		
December 31, 1940	78,042.52	
Gain in Capital—December 31, 1941	3,187.75	
		81,230.27
		$284,349.25

EXHIBIT B

STATEMENT OF RECEIPTS AND DISBURSEMENTS

January 1, 1941 — December 31, 1941

Disbursements:			
Administration			
Salaries	1,343.06		
General Expenses	388.99		
Telephone & Stamps	215.07		
Print. & Stationery	298.77		
		2,245.89	
Buildings and Grounds			
Salaries	3,076.68		
Repairs & Supplies	4,386.73		
		7,463.41	
Heat, Light & Water		857.29	
Library		6.25	
Insurance		306.80	
Rooms & Apartments		1,220.94	
			12,100.58
Summer Research			
Salaries	719.50		
Expenses	1,008.79		
		1,728.29	
Summer Course Expenses		309.86	
			2,038.15
Dining Hall Expenses			5,644.09
Symposia			162.81
Symposia Book Expense			5,854.43
Scholarships			
John D. Jones		250.00	
Temple Prime		75.00	
			325.00
Accounts Payable—1941			6,774.21
			$32,899.27
Cash in Banks—Dec. 31, 1941		5,693.41	
			$38,592.68
Less: Accounts Payable allocated above		3,514.92	
			$35,077.76

STATEMENT OF RECEIPTS AND DISBURSEMENTS

Receipts:		
Dues & Contributions	4,665.34	
Women's Committee	1,025.00	
The Rockefeller Foundation	6,500.00	
Wawepex Society	1,250.00	
		13,440.34
Summer Course Tuition	498.00	
Rentals	3,586.38	
Symposia Receipts	3,614.07	
Dining Hall Receipts	6,282.91	
		13,981.36
Miscellaneous Receipts		63.72
Physiology Salaries		.35
John D. Jones Scholarship		250.00
W. B. James Bequest	198.68	
W. J. Matheson Bequest	375.00	
Interest on Securities	55.00	
Securities Sold	36.52	
		665.20
Balance		40.00
Accounts Receivable—1940		4,635.00
		$33,075.97
Cash on Hand—1940	2,065.51	
		$35,141.48
Less: Accounts Receivable allocated above..	63.72	
		$35,077.76

EXHIBIT C

(1) TEMPLE PRIME SCHOLARSHIP FUND

Donor: Cornelia Prime. Principal, $2,500 (1913).

"In memory of my brother, Temple Prime, the entire annual income to be expended each year for the payment of the tuition and other expenses of a male, or female, student in biology, who is working at the Laboratory at Cold Spring Harbor, New York, during that year."

Interest, 1941	
Scholarship, Norman Giles	$75.00

(2) DOROTHY FRANCES RICE FUND

Donor: Oran W. Rice. Original Principal, $2,000 (1926).

To apply income as follows: (1) one-sixth to be added annually to principal of fund, (2) remaining five-sixths to be paid over each year to a woman student, preference of selection being given to students working in the botanical sciences and particularly worthy of such recognition.

Interest, 1941	

Scholarship not awarded.

(3) DR. WALTER B. JAMES FUND

Bequest, in trust, of Dr. Walter B. James (1927). Principal, $5,000.

"I give and bequeath Five Thousand Dollars ($5,000) to the Equitable Trust Company, in trust, . . . I desire the net income thereof to be devoted to the support of Long Island Biological Association of Cold Spring Harbor, Long Island."

Invested by Trustee, Equitable Trust Co., New York.

Received, 1941	$198.68
Transferred to Income Account	$198.68

(4) DR. WILLIAM J. MATHESON FUND

Bequest of Dr. William J. Matheson. Bequest $20,000. Cost of securities $20,116.18. (1931).

"I give and bequeath to Biological Laboratory, of Cold Spring Harbor, Long Island, for its endowment fund, the sum of Twenty Thousand Dollars."

Interest, 1941	$375.00
Transferred to Income Account	$375.00

Marshall Field, Treasurer
William F. Dean, Assistant Treasurer and Auditor.

REPORT OF THE DIRECTOR

To the Officers and Members of the Long Island Biological Association:
Ladies and Gentlemen:

I have the honor to submit my report for the year 1941.

The year just past marked the beginning of the third epoch in the history of the Biological Laboratory. The Laboratory was founded in 1891 by a small group of enthusiastic scientists and laymen, for the purpose of utilizing the advantages of Cold Spring Harbor flora and fauna for summer instruction in biology and for summer biological research. During the first period of its life, which extended over more than thirty years, the Laboratory held a leading place among summer laboratories of America. It was particularly successful in its teaching program, and trained over 2,000 persons, mostly destined to become teachers. The presence of the Laboratory in Cold Spring Harbor induced the Carnegie Institution of Washington to establish the Department of Genetics there, and thus the Laboratory is directly responsible for the fact that this small whaling village has become an important center for scientific research. During most of this first period, Dr. C. B. Davenport was director of both the Laboratory and the Department of Genetics, and the two institutions cooperated closely in their work.

A second epoch began in 1923, when the Long Island Biological Association was incorporated and took charge of the Laboratory. During the first part of this period, under the directorship of Dr. Reginald G. Harris, the physical facilities and the work of the Laboratory were greatly expanded. Through the interest and the generous support of the members of the Association, thirty-two acres of land were purchased, seven buildings were acquired, and funds were made available for a year-round research program. The Laboratory pioneered in one of the most important developments of this decade in the field of science, by initiating the Cold Spring Harbor Symposia on Quantitative Biology. The work at the Laboratory was reorganized, the emphasis was shifted from teaching to research, and an all-year program with full-time personnel was developed. The relationship between the Laboratory and the Department of Genetics was cordial, but no attempt was made to develop close cooperation between these two neighboring institutions.

Members of the Long Island Biological Association showed keen interest in the research work at the Laboratory; and during the early years of this second epoch, while the country was riding the crest of the prosperity wave, the Laboratory derived an appreciable income from contributions. With the onset of economic depression, however, this income decreased sharply, and as the depression continued it became evident that with an uncertain income an ambitious program of year-round research could no longer be carried on. The program of the Laboratory was, therefore, reorganized from one of all-year research to one of summer research; and, through an arrangement worked out between Mr. Arthur W. Page as representative of the Long Island Biological Association and Dr. Vannevar Bush as President of the Carnegie

Institution of Washington, the Laboratory has now entered upon the third epoch of its history. This is characterized by close cooperation between the Laboratory and the Department of Genetics of the Carnegie Institution for their mutual benefit. Closer cooperation will strengthen research programs of both institutions, and thus will serve the primary aim of each. The Department is providing, without cost to the Laboratory, scientific leadership and administration; and Dr. Bush and the Trustees of the Carnegie Institution have approved the appointment of M. Demerec as director of the Laboratory. Due to the change of program and the establishment of a new relationship with the Carnegie Institution, the expenses of the Laboratory have been greatly reduced, and the income is for the present sufficient to cover them. Indeed, the Laboratory reached the end of 1941 with a small surplus.

THE SYMPOSIUM

The Symposia on Quantitative Biology are the most important scientific achievement of the Laboratory in recent years. Accordingly, it seemed justifiable to make the Symposium the central theme of scientific work during the past summer. Since it had been decided by your Board of Directors to bring the work of the Laboratory into closer contact with that of the Department of Genetics, it was appropriate to select as a theme of this year's symposium a topic dealing with genetics. The title chosen was "Genes and Chromosomes—structure and organization".

The Symposium was held from June 18 to July 2. Thirty-four papers were presented, and served as a basis for discussion as in previous years. As usual, the participants included workers in several branches of science—biology, chemistry, physics, and mathematics. However, instead of extending over five weeks, as in the past, the program was condensed into two weeks' time. This modification helped to keep the group together, a majority of participants remaining at Cold Spring Harbor during the whole session, which had not been the case in former years.

One of the fundamental discoveries of Biology during this century deals with the physical basis of the carriers of heredity. It has been established that the units of heredity—called genes—are arranged in thread-like structures called chromosomes. Genes and chromosomes are present in every living cell of an organism and, as a rule, the full complement of genes must be available for normal functioning of each cell. Thus, genes not only are responsible for the transmission of hereditary characteristics, but in addition they play an exceedingly important role in the vital functions of individual cells and of the whole organism.

In discussions between geneticists and physicists, these are some of the questions invariably asked: What is the approximate thickness of the chromosome threads; when do they divide; how close together do they lie; how tightly are they coiled; and what is their number? The experimental evidence pertaining to these and related questions was

presented by C. A. Berger, C. L. Huskins, B. R. Nebel, and H. E. Warmke in the first section of the Symposium, dealing with the "Structure of chromosomes as revealed by optical methods".

It is generally assumed that in the giant salivary-gland chromosomes found in the larvae of flies the primary chromosome thread is multiplied a great many times. The structures which are visible in salivary-gland chromosomes are also present in the chromosomes of other cells; but they cannot be detected, as they are too fine for microscopical observation. Thus salivary chromosomes constitute material unusually well suited for the problem of finer structures of the changes induced in chromosomes. Known facts dealing with the problem in which salivary chromosomes were utilized were discussed by P. A. Cole, E. Sutton, D. Mazia, C. W. Metz, T. S. Painter, and J. Schultz, in the second section.

The third section dealt with the "Spontaneous and induced changes in chromosome structure", and consisted of papers by J. G. Carlson, M. Delbruck, U. Fano, B. P. Kaufmann, B. McClintock, and K. Sax. It is known that chromosomes break spontaneously, and also that such breaks may readily be induced by X-rays and similar radiations. Since the occurrence of a break is undoubtedly connected with some chemical reaction, the studies of the breaks may give a clue to an analysis of the chemical properties of chromosomes.

Spontaneous and induced changes in genes were discussed by M. Demerec, J. W. Gowen, A. Hollaender, H. J. Muller, H. H. Plough, M. M. Rhoades, and L. J. Stadler, in the fourth section of the Symposium, which was designated as "Mutations". Emphasis was placed on the problem of spontaneous mutations, which lately has been too much neglected. It is felt that data on spontaneous mutations may help to clarify certain problems dealing with induced changes, and thus contribute toward a better understanding of chemical processes involved in mutational changes. However, a full opportunity was afforded for a discussion of changes in genes induced by various physical agents, since at present data on this subject constitute the best material for interpreting the physico-chemical properties of genes and chromosomes.

"Physical aspects and tools" were discussed in the fifth section of the Symposium, by I. Fankuchen and V. K. Zworykin. New tools like the electron microscope may well prove an important factor in the study of properties of very fine structures such as chromosomes. Therefore, the information about the electron microscope may accelerate work in that field. For interpretation of changes induced in genes and chromosomes by radiation, a familiarity with certain physical aspects is essential.

It seems very probable that genes are large organic molecules in which protein and nucleic acid are present. Thus a discussion of the properties of giant molecules, and particularly of proteins, nucleic acid, and viruses, properly belonged in this Symposium. These topics were taken up by A. Claude, J. S. Fruton, J. P. Greenstein, H. Mark, A. E. Mirsky, D. Rittenberg, A. Rothen, B. F. Chow, R. O. Greep, H. P. Van Dyke, W. M. Stanley, and C. A. Knight. The attention of the

group was called to the evidence which indicates that frequent atomic interchanges occur in living organic molecules, since this may have an important bearing on the visualization of the activity of a gene. A general resume was presented as a concluding lecture by H. J. Muller.

It has generally been assumed that if a symposium is to be a success the attendance should be limited to a relatively small group, since it is believed that a large group hampers the free discussion that is so essential. It has been the policy of the Biological Laboratory to have the Symposia open to all who desire to attend, and this policy was followed this year. It was rather disconcerting to find that, instead of the expected 35 to 50 persons, we had an attendance of about 120. However, as soon as the first session was over, it was evident that large attendance, instead of preventing free discussion, actually stimulated it. Our Symposium this summer demonstrated that the interest and not the size of the group determines the success of a conference.

The Symposium was again supported by a grant made by the Rockefeller Foundation for that purpose. The proceedings were published early in December in a volume of 325 quarto pages, containing 34 papers, edited discussions in which 85 persons had participated, many line drawings, 15 halftone plates, and an index. They were edited by Dr. Katherine Brehme. The volume is selling well, in spite of a decrease in foreign orders due to the war. A number of colleges have adopted it as a textbook in advanced courses.

The subject of the Symposium to be held during the summer of 1942 is "The Relation of Hormones to Development". I think this topic is one to which scientists from many fields can contribute on more or less equal grounds; one which is ripe for discussion in terms of concrete evidence, and which needs the critical consideration of specialists in related fields. The program is being worked out in cooperation with Professor L. C. Dunn, Chairman of the Department of Zoology, Columbia University; Dr. W. J. Robbins, Director of the New York Botanical Garden; and Dr. Oscar Riddle, staff member of the Carnegie Institution.

RESEARCH

In this country, summer is the migration period for scientists. When the teaching sessions terminate at the universities, many members of their teaching staffs move to various summer laboratories. As a result of this practice, the isolation which may exist in many small colleges is broken down, new contacts are established, an exchange of ideas is facilitated, and the cooperative use of expensive equipment is made possible. At present, summer laboratories are a very important feature of the scientific life of this country; and we may feel proud that among them this Biological Laboratory holds a prominent place.

You will undoubtedly be interested to know what the Laboratory accomplished and what services it performed last summer. I wish to make it clear that no one can expect a great deal of new research to be completed within the short period of three months which our guests spend at the Laboratory. A great majority of them bring their work

with them and take it back again. The most important service of a summer laboratory such as ours is to provide suitable conditions for personal contact between scientists which will encourage critical consideration of experimental results and of working hypotheses. A summer laboratory should be a melting pot for scientific thinking.

It can be said without hesitancy that our Laboratory is fulfilling such a function. This year the Symposium stimulated the work on a number of cooperative projects; and I am certain that it has sown seeds which within a few years may produce an abundant harvest. The importance of our Laboratory as a melting pot for scientific research can best be illustrated by a few examples taken from this year's experience:

Dr. B. R. Nebel, of the New York State Agricultural Experiment Station, Geneva, New York, and Dr. N. H. Giles, formerly of Harvard University and now of Yale University, were studying breaks induced by X-rays in chromosomes of the plant Tradescantia. Their results did not agree on a very important point. In order to find the cause of the discrepancy, they repeated the experiment together at the Laboratory, and thus avoided a controversy which might have developed had their independent results been published separately.

A group of eleven research workers coming from eight laboratories (Amherst College, Goucher College, Chicago University, Cold Spring Harbor, Columbia University, Dartmouth College, California Institute of Technology, and Queens College) worked here on the genetics of the vinegar fly, Drosophila. All of them feel that they had an unusual opportunity to clarify a number of questions connected with their problems by discussing them with the other members of the group. Similarly, a group of five research workers from four institutions (Columbia University, University of Missouri, Washington University, and Wellesley College) conducted genetic investigations on maize in close cooperation.

Dr. Delbruck, of Vanderbilt University, and Dr. Luria, of Columbia University, who had never before met but who had for a number of years been interested in similar problems, spent the summer here doing more productive work on a joint problem.

Several summers ago, Doctors Abramson, Moyer and Gorin began to write a book on the electrophoresis of proteins after a discussion of that subject following the symposium of that year. Last summer the book was completed, and Dr. Abramson writes in his report that "without the facilities of the Laboratory a cooperative work of this sort would be very difficult."

A very illuminating statement, illustrating the value of the Laboratory and the Symposium in the initiation of new projects in borderline fields, may be found in the report by Dr. Mirsky printed on page 42. This is written by a chemist who became interested in biological problems and who, under the stimulating influence of the Laboratory, began a new line of investigations.

So far as I know, last summer was the first time that experimental work with growing field plants had been carried on by the guests of the Laboratory. This was made possible through the cooperation of the Department of Genetics, which placed at the disposal of the members

of the Laboratory about five acres of garden and field land and took care of its cultivation. This arrangement greatly expanded the scope of our work, and made this Laboratory unique among summer laboratories of the United States.

This year our laboratory buildings were filled almost to capacity by research workers who stayed throughout the summer. We had with us 39 independent investigators, 8 assistants, and 6 volunteers,—or a total of 51 workers doing scientific research. They were located as follows: 12 in the Davenport Laboratory, where the work with bacteriophage, protozoa, snails, and mice was conducted; 7 in the Walter B. James Biophysical Laboratory, where X-ray and ultra-violet equipment was available and in use; 12 in the George Lane Nichols Memorial Laboratory, where microscopical, physiological and mathematical studies were made; 18 in the John D. Jones Laboratory, where workers with Drosophila, fishes, and plants were located; and two in Wawepex Laboratory, which was used also by the Nature Study Class for Young People.

INSTRUCTION

For a number of reasons this year's program concentrated on research and omitted formal teaching on the university level. It is clear now that this was a good arrangement. Our living facilities and laboratory space would have been badly strained if we had to accommodate several courses. It seems to me that it is better to do one job well than to do several unsatisfactorily.

However, we had a very active program of instruction, which was carried on not only for the benefit of students but also for the benefit of research workers connected with the Laboratory and the Department of Genetics. The main part of the program was the seminar course at which scientists present at Cold Spring Harbor discussed their research problems. This course was continued throughout the summer, from July 16 to August 26, and thirty-minute sessions were held before lunch from Monday through Friday. Altogether, 37 investigators talked about their work. The course offered to students an unusual opportunity for getting first-hand information about current research problems from those actually doing the work.

Another course, consisting of twelve sessions and dealing with "Radiation Physics for Biologists," was given by Dr. Ugo Fano, research fellow of the Carnegie Institution. Dr. Fano, who is by training a theoretical physicist, became interested in biological problems and is now actively engaged in genetic work on radiation which is being carried on at the Department of Genetics. Thus he is a person exceptionally well fitted to give such a course.

As in the past, this year also Professor A. J. Grout accepted a limited number of students and investigators at his private laboratory at Newfane, Vermont. Professor Grout is a member of the all-year staff of the Laboratory who for the past few years has been writing and publishing a series of monographs on the Moss Flora of North America North of Mexico.

A new departure in public service was organized in the form of a nature-study class for young people under the leadership of Mr. J. Southgate Y. Hoyt, of Cornell University. This class proved extraordinarily popular, drawing 49 pupils between the ages of six and sixteen, or about twice the

number expected. The success of the course was so obvious that we plan to continue it next year. At the conclusion of the course, students held an open-house demonstration of the material collected and cultured. This was followed by a picnic luncheon attended by 105 students, parents, and friends.

OTHER ACTIVITIES

Scientific research cannot be carried on effectively with a rigid schedule and set working hours. Quite frequently an experiment requires attention late at night, and sometimes a twenty-four-hour schedule is necessary to keep the experiment going. At our Laboratory, conditions are ideal for such irregular working hours, since investigators live in the proximity of their laboratories and their work is always easily accessible to them. Many of our guests utilized this opportunity, and lights could be seen burning in most of our laboratory buildings late into the night.

Regularly, throughout the summer, an "evening lecture" of general interest was held every Thursday. This year these evening lectures were arranged as joint meetings with the Journal Club of the Department of Genetics, with Dr. E. C. MacDowell as chairman. The lectures were well attended by members of the two institutions and of the nearby hospitals.

EVENING LECTURES

July 10—Gordon, Myron, The Aquarium, New York Zoological Society, New York, N. Y.:
The genetics of melanoma.

July 17—McClintock, Barbara, University of Missouri, Columbia, Mo.:
The relation of homozygous deficiencies to mutation in maize.

July 24—Anderson, Edgar, Missouri Botanical Garden, St. Louis, Mo.:
The genetic analysis of species crosses.

July 31—Wright, Sewall, University of Chicago, Chicago, Ill.:
Genetics and evolution.

August 7—Mirsky, A., Rockefeller Institute, New York, N. Y.:
A nucleo-protein of the liver.

August 14—Delbruck, M., Vanderbilt University, Nashville, Tenn.:
Bacterial viruses.

August 21—Kimball, R. F., Johns Hopkins University, Baltimore, Md.:
Recent advances in the genetics of the ciliate protozoa.

August 27—Sturtevant, A. H., California Institute of Technology, Pasadena, Calif.:
Comparative genetics of the species of Drosophila.

As a service to the neighborhood, the Laboratory arranged, in addition to the Nature Study Course, for two general lectures, and set aside every Friday morning for visiting. Each Friday a different group of investigators demonstrated their experiments to visitors. General lectures were so well attended that they were given in the dining hall, as our lecture hall was too small to hold the audience.

GENERAL LECTURES

July 22—J. Southgate Y. Hoyt, Cornell University, Ithaca, N. Y.: Life History of a Piliated Woodpecker. The lecture was based upon colored films showing the nesting activities of a woodpecker family and the day-by-day development of a young bird. The living bird was also demonstrated.

August 19—How We Inherit. Two sound films, with an introduction by Dr. C. B. Davenport. The first film showed the intricate phenomena of cell division and growth which follow fertilization of an animal egg, and the second film demonstrated the Mendelian Laws of heredity.

On August 27-29 the Laboratory and the Department of Genetics were hosts to the Genetics Society of America, which held its annual summer meeting at Cold Spring Harbor. The session was attended by about 140 scientists from universities and other institutions of the United States and Canada. Thus the Laboratory played a leading part in two of the most important events which occurred in genetics during the year: namely, the Symposium on Gene and Chromosomes, and the meeting of the Genetics Society.

Social events play an important part in the life of a summer laboratory, such as ours, since they do more than almost any other activity to bring the members of the group together. Last summer, social affairs in our community were abundant. Teas, dinners, picnics, and after-dinner gatherings involving small groups were held frequently. During the Symposium the whole group had an outing and picnic at Jones Beach, attended by about 150 persons. During the meetings of the Genetics Society, a picnic supper was served on the Laboratory grounds to approximately 200 people, and was followed by square dancing on the lawn until late into the night. The dancing was very successfully directed by Dr. MacDowell. Highlights among the social events were two recitals given by local musicians under the able direction of Mrs. Albert Mirsky, and two evenings of square dancing conducted by Dr. E. C. MacDowell. Neighbors joined the families of the scientists in these events.

INSTITUTIONS REPRESENTED

The following institutions were represented last summer by students, investigators, or people taking part in the Symposium, who were actually in residence at the Laboratory for at least ten days:

Amherst College, Amherst, Mass.
Brooklyn Polytechnic Institute, Brooklyn, N. Y.
Brown University, Providence, R. I.
California Institute of Technology, Pasadena, Calif.
Carnegie Institution of Washington, Baltimore, Md.
Carnegie Institution of Washington, Cold Spring Harbor, N. Y.
Columbia University, New York, N. Y.
Columbia University, College of Physicians and Surgeons, New York, N. Y.

Connecticut Agricultural Experiment Station, New Haven, Conn.
Cornell University, Ithaca, N. Y.
Cornell University Medical College, New York, N. Y.
Dartmouth College, Hanover, N. H.
Fordham University, New York, N. Y.
Goucher College, Baltimore, Md.
Harvard University, Arnold Arboretum, Jamaica Plain, Mass.
Instituto Agronomies de Campinas, Estado de S. Paulo, Brazil.
Iowa State College, Ames, Iowa
Johns Hopkins University, Baltimore, Md.
Johns Hopkins University, School of Medicine, Baltimore, Md.
Kansas State College of Agriculture and Applied Science, Manhattan, Kans.
Louisiana State University, University, La.
Massachusetts Institute of Technology, Cambridge, Mass.
McGill University, Montreal, Canada
Missouri Botanical Garden, St. Louis, Mo.
National Institute of Health, Bethesda, Md.
New York State Agricultural Experiment Station, Geneva, N. Y.
New York University, New York, N. Y.
New York University, Washington Square College, New York, N. Y.
New York Zoological Society, New York, N. Y.
Queens College, Flushing, N. Y.
R. C. A. Manufacturing Corporation, Camden, N. J.
Rockefeller Institute for Medical Research, New York, N. Y.
Rockefeller Institute for Medical Research, Princeton, N. J.
Sarah Lawrence College, Bronxville, N. Y.
Squibb Institute for Medical Research, New Brunswick, N. J.
University of Alabama, University, Ala.
University of Bristol, England
University of Chicago, Chicago, Ill.
University of Illinois, Urbana, Ill.
University of Kansas City, Kansas City, Kans.
University of London, London, England
University of Missouri, Columbia, Mo.
University of Oklahoma, Norman, Okla.
University of Pennsylvania, Philadelphia, Pa.
University of Rochester, Rochester, N. Y.
University of Southern California, Los Angeles, Calif.
University of Texas, Austin, Texas.
Vanderbilt University, Nashville, Tenn.
Wellesley College, Wellesley, Mass.
Yale University, New Haven, Conn.

The above list gives some idea of the influence exerted by the Laboratory in the scientific world. It would be still more imposing if it included all places where the Symposium volume is sold. This list would then cover the civilized world, and would reveal that the spirit of enmity has no place in scientific thought. As late as last summer we received an order from

Japan for 62 copies of the Symposium volumes. Since at that time considerable tension already existed between this country and Japan, shipment of the books was delayed and, fortunately for us, has not yet been made.

SCHOLARSHIPS

The John D. Jones scholarship was held by Dr. Herman J. Muller of Amherst College; and the Temple Prime scholarship was held by Dr. N. H. Giles, of Yale University; while the Dorothy Frances Rice scholarship was not awarded this year.

DINING ROOM

The dining hall was in charge of Mrs. Isabelle Gilferm Dubar, graduate in home economics of the University of Texas, who employed as cooks the Misses Helen Ensign and Dorothy Montgomery, students of home economics at Kansas State College. It was run as a joint undertaking with the Department of Genetics. This arrangement increased the number of persons taking meals in the dining hall and made the service more economical. The dining hall was able to replace old equipment and to purchase some new equipment.

LABORATORIES AND EQUIPMENT

In a laboratory such as ours, where a great many investigators come to work for relatively short periods of time, and where a variety of problems is being studied, it is evident that an appreciable supply of chemicals, glassware, and instruments has to be available. It is evident also that some of these would be used frequently, while the demand for others would be small. However, equipment which is used but rarely is just as essential for a working laboratory as that which is used a great deal; and all of it should be kept in good condition and readily available.

During the past few years the Laboratory underwent many important changes in the type of work accommodated, and a great deal of equipment was released from permanent use. This equipment had been moved from one laboratory building into another, and in some cases was so located that it was not readily available. Therefore, one of the first big jobs of the year was to go over the supplies of chemicals and equipment and put them into a more usable condition. This job has not yet been completed, although a good start has been made.

From March until late in August, Dr. James A. de Tomasi was in charge of the stock room, which was partly reorganized under his direction. Chemicals were classified into main families and arranged alphabetically on shelves, and a complete list was prepared. The stock room contains a collection of 221 inorganic and 283 organic chemicals. Glassware and laboratory equipment was also collected in the stock room and arranged on shelves.

X-ray equipment located in the Walter B. James Laboratory for Biophysics was reorganized and made available for use by biologists, by Pro-

fessor Frank E. Hoecker, Chairman of the Physics Department of the University of Kansas City. His report follows:

"At the beginning of the summer of 1941 the X-ray equipment of the Biophysics Laboratory consisted of a specialized type designed for high tube current (100 milliamperes) at voltages up to 100 K.V.P. The X-ray tubes had been built in the laboratory, and necessitated continuous pumping. Since this equipment had not been used for several years, the evacuating units were in bad condition due to deterioration of rubber tubing and accidental breakage of glass tubing and stop-cocks. Even when in good working order, this type of equipment was not well adapted to biological work involving short treatment periods, due to necessity of evacuation of the X-ray tube, which may require several hours before each treatment. It was decided, therefore, to rebuild the entire apparatus with a view to its use in biological experiments. The apparatus now consists of a commercial-type, water-cooled target, line focus tube of small diameter (gift of the General Electric X-ray Corp.). The cold target and small diameter permits the treatment of Drosophilia and corn pollen at 5 cm. from the target, under which conditions X-ray dosages may be delivered at the rate of 4,000 roentgens per minute continuously. The cross-sectional area of the beam at this 5-cm. distance from the target is approximately one inch square. Beams of larger cross-section can be obtained by placing the specimens at greater distances from the target with, of course, a corresponding decrease in the intensity of the beam. The tube is housed in a lead chamber which affords adequate protection to the operator. The electrical circuit has been greatly simplified, and all controls are located on a single vertical panel adjacent to the lead tube chamber. The entire change-over from the original apparatus was accomplished without the purchase of any new equipment."

The direct-current generator located in the Walter B. James Laboratory was overhauled and put into good working condition. It was used as a source of direct current for ultra-violet equipment belonging to Dr. A. Hollaender. A cooling unit serving the constant-temperature room in the same building was also overhauled, and the room was used for experiments requiring low temperatures.

Our experience last summer showed that many biological experiments require controlled temperature, and that the Laboratory was badly in need of another air-cooled room. To relieve that need, material and equipment was purchased for building and equipping such a room in the John D. Jones Laboratory. The room will be ready for use during the 1942 season. It will be well adapted for experiments with Drosophila.

BUILDINGS AND GROUNDS

The Laboratory controls thirteen buildings, four of which are more than one hundred years old. Although the buildings are kept in good condition, it is to be expected that some repairs will be necessary every year. This year was no exception; and $1,000 was set aside in the budget for repairs to buildings. However, during the summer it became evident that operating expenses were kept so low that at the end of the year a comfort-

able surplus would be available; and the Board of Directors approved the expenditure of that surplus for repairs and improvements to buildings. While this expenditure was not provided for in the last budget, the rising scale of prices for materials made it appear to be a wise investment.

The major portion of the expenditure for buildings was for the replacement of roofs that were either leaking or otherwise in poor condition. New roofs were put on the Walter B. James Laboratory for Biophysics, the John D. Jones Laboratory, the Fire House, the kitchen wing of Blackford Hall, and the kitchen wing of the Osterhout Cottage. A much-needed bathroom was built on the second floor of Hooper House. Before that addition was made, the eight rooms located on the second floor were served by the bathroom located in the basement. In order to make painting work more efficient, a paint-spraying machine was purchased. Outside painting was done on the John D. Jones Laboratory, the Davenport Laboratory, and the Fire House. In the Fire House, the whole upper floor, the hall, and one room on the first floor were repainted; and several rooms were painted in Williams House, Wawepex Laboratory, and Blackford Hall. New storm windows were installed in the rooms of the George Lane Nichols Memorial Laboratory, which are used throughout the winter.

The majority of our guests who come with families prefer to do their own housekeeping and cooking; and we experienced difficulty in accommodating them because most of our apartments were not provided with facilities for light housekeeping. Temporary makeshift arrangements were installed last summer in a few apartments; and as soon as the summer was over we began the installation of permanent housekeeping facilities. A wing with a kitchenette was added to the Urey Cottage; a section, with a kitchenette on the first floor and a bedroom on the second, was built onto the Cole Cottage; and kitchen facilities were installed in one apartment in the Williams House and in one apartment in the Fire House.

The Laboratory has about three acres of lawn, and it took almost the full time of one man to keep it cut with a hand lawnmower. Since we had difficulty in getting labor, a gasoline lawnmower was purchased early in the summer, and the work was reduced to approximately one day per week. We also purchased a used one-ton 1938 Chevrolet truck, to replace our 1930 Ford suburban car, which had the top removed and was used for carting garbage and materials. This purchase proved to be a good investment, as we now could sell the truck for more than we paid for it.

ACKNOWLEDGMENTS

It gives me great pleasure to acknowledge the support that the members of the Long Island Biological Association have given to the Laboratory. It is due primarily to their interest and generosity that the Laboratory has become an outstanding scientific center and is continuing in this status.

The grant made by the Rockefeller Foundation for the support of the Symposium and of the research program connected with the Symposium, is gratefully acknowledged. The Laboratory is indebted to the Carnegie Institution of Washington for the assistance noted earlier in the report.

Acknowledgement is also made here of the contribution of the Wawepex Society for the upkeep of buildings and grounds, and of the John D. Jones Scholarship.

The Women's Auxiliary Board, under the presidency of Mrs. Van Santvoord Merle-Smith, made an important contribution towards the support of the scientific work of the Laboratory; and the House Committee of the Board, under the chairmanship of Mrs. Percy H. Jennings, collected furniture for residences and contributions for the purchase of additional furnishings. Mrs. Acosta Nichols made a special donation for the purchase of kitchen equipment.

The Laboratory is indebted to a number of friends and to the Carnegie Corporation for special contributions which covered the deficit incurred in 1940 and made it possible for the present administration to begin work in 1941 without any financial burden.

The Laboratory is grateful to the National Youth Administration, and particularly to Miss Beatrice Ziegler, district supervisor in Huntington, for clerical and laboratory help which made it possible for us to do additional work in the stock room and in the office and library.

The General Electric X-ray Corporation donated to the Laboratory an X-ray tube, for which gift we wish to express our gratitude.

Respectfully submitted,

M. DEMEREC.

Fano, Ugo, Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: Radiation Physics for Biologists.—Twelve 30 to 40 minute sessions on radiation physics were held during July and August. The purpose of the sessions was to make biologists acquainted with the qualitative characteristics of the physical phenomena produced by radiations within matter. Attendance averaged 10 to 20 and the audience cooperated actively during the sessions by discussing single topics and asking for further explanations. A summary of the topics of every session was mimeographed and distributed to the audience well in advance.——Some aspects of the physical action of radiations were particularly emphasized and are listed here. 1) The interaction of radiations with matter can be fairly sharply resolved into a series of "elementaary processes" involving only very few particles at a time and governed by known physical laws. 2) The energy stream carried to matter by radiations impinging on it consists of separate portions such as the kinetic energy of individual particles or the quanta of electromagnetic radiation. These portions are split into smaller and smaller fractions through a series of "elementary processes" of interaction with matter until every fraction is comparable to the kinetic energy of individual molecules in a gas, that is, until the radiation energy is fully degraded into heat. 3) Since radiobiological actions are likely to have chemical nature, they should be produced directly by single portions of energy, which are only partially degraded and which contain just about a sufficient amount of energy to affect the external electrons of atoms, that is, to induce chemical changes. 4) The energy carried by all the so-called "ironizing" radiations (alpha, beta, gamma, X- and cathode-rays, protons, neutrons) is mainly split into portions of "chemical" size through a large number of discontinuous processes in which fast charged particles lose a small fraction of their kinetic energy. Some characteristics of these processes, e.g. the average energy transfer, are widely independent of the primary nature of the ionizing radiation. This accounts for the striking similarity of the action of different ionizing radiations. Only the spatial distribution of the action within matter, as for instance its penetration, is fairly characteristic for any particular type of radiation.——Summary of the program: A) Description of radiations: 1) A classification of radiations; 2) Corpuscular radiations; 3) Electromagnetic radiations; 4) Quantum properties of electromagnetic radiations. B) 5) Interaction of radiations with individual free material particles. C) 6) Information on the structure and properties of atomic systems. D) Elementary actions of radiations on atomic systems: 7) Action of electromagnetic radiation; 8) Action of charged corpuscular radiations; 9) Action of neutrons and other radiations on atomic nuclei. E) 10) Action of radiations on large amounts of matter. F) 11) Penetration of radiations and distribution of their action within matter.

Grout, A. J., Newfant, Vermont: Bryology.——In February with Dr. H. L. Blomquist and Dr. Lewis E. Anderson of Duke University, I made a trip into the great Okefenokee swamp from Fargo, Georgia, to explore for bryophytes. By motor boat we penetrated about 25 miles into the swamp during our two day trip. Our collections of bryophytes were rather disap-

pointing. The results were published in a recent number of the "Bryologist." Several scenes of the moving picture "Swamp Water" were shot in spots we visited. As usual, several hundred specimens have been identified for various institutions and individuals, including about 200 species of Fissidens collected by Dr. William C. Steere in Puerto Rico. These were used as a basis for a monograph of the Fissidentaceae for Volume 15, part three of the North American Flora, published by the New York Botanical Garden. This work is planned to cover all types of plant life in North America down to the Isthmus of Panama. This monograph was completed in 1941 and is now in the hands of the editorial committee of the Garden for early publication.——The six weeks summer school was attended by Dr. Guilford J. Ikenberry of the Oklahoma A. & M. College and Mrs. Inez M. Haring, who studied their individual collections of mosses from the comparatively unexplored southwestern United States. Mr. James Kucyniak, instructor at the University of Montreal, worked on the identification of local bryophytes, of which he collected and identified nearly 200 species. ——Further work on the "North American Flora" is planned, but has been impeded by poor health. To expedite such work I have been appointed Honorary Curator of the Moss Herbarium of the New York Botanical Garden.

Hoyt, J. Southgate Y., Cornell University, Ithaca, N. Y.: Nature Study.——The course was conducted with two aims in view, namely, that the students learn the powers of observation so that they will see the many forms of life that live about them all the time, and secondly, that the students learn that one does not have to go to South America to find and learn about interesting things. Without exception, I believe that these two objectives were reached.——Much of the work was done in the field within a short walking distance of the laboratory. The classes were conducted in an informal way so that each student was permitted to follow, as far as was possible, his own interests, and at the same time learn about the different fields of interest from other members of the class. Trips were taken to many ecological associations in the immediate neighborhood, and the animal and plant groups were studied.——The total enrollment of the class was 49, divided into three classes according to the ages. The first group was for the ages from six to eight and the class met every Tuesday and Thursday from July 1st to August 7th. The next group was for the ages from nine to twelve, which also met every Tuesday and Thursday during the six weeks' period. The largest group met every Monday during this period and was for those older than twelve.——The course climaxed with a nature study exhibit held in the laboratory. This exhibit contained examples of the material studied and seen on the field trips, which were arranged by the members of the class in an attractive and informative way, much in the fashion of a museum. Over a hundred persons visited this exhibition and were then served a picnic luncheon.——The interest in the field was so keen that many of the students returned many days for individual work between classes, thus stimulating much problem work which was encouraged to the fullest extent. By the end of the course all the students had a very good idea of how and where to find the various forms of life that had heretofore been unknown to them.——The following is a list of the students enrolled in the course:

Ames, Ned
Bartlett, Ann
Beatty, Adelaide
Blagden, George
Cole, Frederick
Cole, Jean
Coudert, Fritzie
Demerec, Rada
Demerec, Zlata
Dobzhansky, Sophie
Eberstadt, Frederick
Griffith, Sandy
Hallett, Peter
Hill, Nina
Johnson, Priscilla
Kaufmann, Anders
Kaufmann, Berwind
Kaufmann, Carl
Kortright, Ann
Kortright, Cynthia
Kortright, James
Kurt, Jimmy
MacKay, John
MacLeod, Joan
Martin, Toby
Mirsky, Jonathan
Mirsky, Reba
Muller, David
Nebel, Hardy
Nebel, Kye
Parks, Tommy
Pierson, Dick
Pierson, Frances
Pierson, Stephen
Plimpton, Oakes
Potter, Gina
Randall, Jolly
Randall, Melie
Sanderson, Bo
Sanderson, Molly
Sansome, John
Steggerda, Charles
Ulman, Katharine
van Overbeek, Bobbie
Whitaker, Ellen
White, Gloria
White, Sandy
Willard, Marion
Wright, Betty

Abramson, H. A., College of Physicians and Surgeons, Columbia University, and Mount Sinai Hospital, New York, N. Y.:——In the summer of 1941, two projects were carried forward. The first of these was the continuation of a book on the electrophoresis of proteins, in collaboration with Professor L. S. Moyer and Dr. M. H. Gorin. Recent advances in the electrophoretic technics of protein investigation have led to the extensive development of the field of surface chemistry of proteins. This has provided a much better insight into the nature of the chemical constitution of living cells. The book, which is now completed, discusses these problems. Without the facilities of the Laboratory a cooperative work of this sort would be very difficult.——The second problem investigated was the properties of membranes, by means of a study of the diffusion of ragweed pollen extracts. The disappearance of nitrogen and the change in conductance are correlated to establish standards of suitability for diffusion. This work will be continued.

Anderson, Edgar, Missouri Botanical Garden, St. Louis, Mo.: A study of inbreeding in southwestern maize.——Eight inbred stocks of Papago corn from the southwest were grown, as well as two first-generation hybrids with sweet corn. Controlled pollinations were made for continuing the inbreds and for producing second-generation hybrids for further analysis. Crosses were also made with Dr. Rhoades' dent inbreds and multiple marker stocks. The outstanding quantitative characteristics of the Papago inbreds were recorded, as well as plant color, tassel, and silk color. Herbarium specimens, showing leaf and tassel characters, were made of all Papago inbreds and hybrids.

Creighton, Harriet B., Wellesley College, Wellesley, Mass.:——Chromosomal studies were made on eight inbred lines of Papago Indian corn and on two hybrids between Papago stocks and two inbred sweet corns (Evergreen and Country Gentleman). Papago maize, though exhibiting heterogeneity in appearance, differs from other Indian corns in ways which make it resemble gamagrass, or Tripsacum. Since it has been suggested by Mangelsdorf and Reeves, after their extensive studies, that Tripsacum may have entered into the development of North American maize, it was thought that a cytological study of Papago corns should be made to see whether any chromosomal basis for this hypothesis might be found here. Particular attention was given to chromosomal pairing and disjunction. Irregularities in meiosis may be evidence of structural hybridity which might indicate hybridity in the ancestry of maize. It was found that there was regular meiotic behavior both in the Papago lines and in the hybrids with sweet corn. Also, the presence and positions of knobs on the chromosomes were investigated, since it has been suggested that the knobs on maize chromosomes may have come from Tripsacum. The cursory study showed that 6-8 chromosomes had large, sub-terminal knobs and that chromosome 9 was the only one to have a terminal knob. None of these knobs was in a position that was unfamiliar nor undescribed in Longley's extensive summary of chromosome morphology in Indian corns. The cytological observations, then, gave no critical evidence that Tripsacum chromosome segments

were present in the Papago maize. Two of the Papago stocks had supernumerary "B" type chromosomes, as do many Indian corns.——This cytological study was undertaken in conjunction with the genetic studies of the same material being carried on by Dr. Edgar Anderson of the Missouri Botanical Garden. Dr. Anderson is also growing and studying several species of Tripsacum. It seems very desirable for the progress of the whole problem of the origin of maize to know the chromosome morphology of these species and to study the behavior of the chromosomes in the Tripsacum-maize hybrids. It is planned to study several of the Tripsacums which have recently been collected in Central America.

Delbruck, M., and Luria, S. E., Vanderbilt University, Nashville, Tenn., and College of Physicians and Surgeons, Columbia University, New York, N. Y.:——We availed ourselves of the facilities of the Biological Laboratory to carry out a joint research project, which had been prepared for by preliminary experiments at Vanderbilt University and Columbia University respectively.——The growth of two different bacterial viruses (bacteriophages), alpha and gamma, active on the same host (Bacterium Coli) was studied, both separately and simultaneously. The plaque counting technique was used throughout all the experiments.——It was found that each virus, if grown alone in the presence of actively growing bacteria, gives a yield of about 150 particles per lysed bacterium. The increase in virus titer takes place as a sharp rise after a latent period, which is 13 minutes for alpha and 21 minutes for gamma. This latent period is extremely constant and independent of the number of virus particles adsorbed per bacterium. However, in case of multiple infection, the yield of particles per bacterium is somewhat increased, (200-300), more in the case of gamma than in that of alpha.——If a bacterium is simultaneously infected with both alpha and gamma viruses, the slow-growing gamma completely suppresses the faster-growing alpha. This suppression still takes place if the infection of the bacterium with alpha precedes the infection with gamma by several minutes. The growth of gamma itself seems not to be affected by the presence of alpha, except when the latter is adsorbed in great excess on the bacterium. In this case, the total increase of gamma is reduced; a decision has not yet been reached as to whether this reduction is due to suppression of growth in some of the bacteria or to a dimunition of the average yield per bacterium. ——One of us (M. D.) spent part of his time writing a review on bacterial viruses, to be published in the second volume of Advances in Enzymology.

Diederich, Gertrude Wylie, The University of Chicago, Chicago, Ill.: ——This summer I continued an investigation which suggests that non-random mating between wild-type and mutant Drosophila melanogaster may be one of the most important components of selection pressure against the mutant in mixed populations. When equal numbers of virgin yellow-white and wild-type females, for example, were exposed simultaneously to both types of males, 66 per cent of the yellow-white females and 94 per cent of the wild-type females fertilized were fertilized by wild-type males. To check such findings against the behavior of large mixed populations under more natural conditions, I improved my earlier "population cages." The new model consisted of a cake tin, closed by a transparent cover, with holes punched in the bottom to give access to vials of food, inserted from the

outside into corresponding holes in a sponge rubber pad, which was attached to the bottom of the tin by rubber bands. From a count of the number of adults of each type present in a cage on a given day, I could predict what the next generation should be, assuming random mating and equal fecundity and viability. From data on what type of sperm these females were using (obtained by isolating a representative sample individually in vials until their offspring emerged), I could predict what the next generation should be if there were no differences in fecundity and viability. Fresh vials of food left in the cage that day yielded a sample of what the next generation actually was. In preliminary tests on yellow-white and Bar, it proved to differ markedly from the prediction which assumed random mating, but to approximate the prediction based only upon knowing what females were fertilized by what type of males. This and other promising procedures which were devised now require thorough testing.

Eigsti, O. J., University of Oklahoma, Norman, Okla.: Mitotic phenomena of the generative cell of the pollen tube of Tradescantia and Polygonatum.——Two phases of this work were studied, viz., the effects of certain chemicals upon mitosis, and cytological evidence of speciation in the genus Polygonatum through a study of chromosomes in pollen tubes treated with colchicine. A pollen tube technique developed for such work affords an opportunity to study isolated cells as well as chromosomes of an isolated haploid complement.——One phase, the effect of chemicals upon mitosis, involved a comparative study of the effects of sulfanilamide and colchicine upon the generative cell of the pollen tube. The presence of colchicine in the culturing medium prevents the formation of a metaphasic plate stage; hence the chromosomes become distributed in the pollen tube, and daughter chromosomes rarely separate from each other completely. Sulfanilamide interferes with mitosis but also interrupts the formation of chromosomes. Duplication of sets of chromosomes is the usual result of treatment with colchicine, whereas disintegration of parts of chromosomes is a result of treatment with sulfanilamide.——Another phase of this investigation was concerned with the occurrence of polyploidy in the genus Polygonatum as shown by comparative studies of the chromosomes. Colchicine facilitates such studies through the distributing influence of the drug upon the chromosomes of the generative cell. These chromosomes represent the haploid complement; hence the appearance of pairs of chromosomes led to the discovery of polyploidy within the genus. Diploid and polyploid material was studied. The taxonomic problems of this genus are closely associated with the presence of polyploidy among certain species.——Facilities of the Long Island Biological Laboratory greatly aided in the continuance of this work with pollen tubes.

Giles, N. H., and Nebel, B. R., Yale University, New Haven, Conn., and New York Agricultural Experiment Station, Geneva, N. Y.: An analysis of the intensity factor in X-ray induced chromosomal aberrations in Tradescantia.——In a series of experiments developing microspores of Tradescantia were given equal total doses (308 roentgens) of X-rays at widely different intensities, from 1.3 to 1200 r/min. At the 4-5 day period following irradiation smears were made for an analysis of the percentages of translocations (dicentric and ring types) and of interstitial deletions—small

acentric rings according to Rick and Sax (isodiametric fragments in the terminology of Nebel, Wilson and Marinelli) induced during the resting stage at the various intensities. At 50 r/min. and above (150, 600, and 1200 r/min.) the percentage of aberrations in both classes remains approximately constant— there is little or no intensity effect. At lower intensities (20, 10.3, 5.2, 2.5, and 1.3 r/min.) the percentage of aberrations in both classes decreases progressively, but not linearly with decreasing intensity, until at 1.3 r/min. the number of aberrations per cell is somewhat less than half that found at intensities of 50 r/min. and higher. These results are in accord with the hypothesis that the chromosomal aberration types studied result from two independent potential breaks, and that the reunion of broken ends occurs during the resting stage within a certain time following the initial breakage. When this time is exceeded restitution occurs. Other interpretations involving second order processes may also require consideration.

Glass, H. Bentley, Goucher College, Baltimore, Md.:——For some time I have been interested in the question of the differential genetic response toward X-rays made by the germ cells of Drosophila under varying conditions of age, maturation, and sex. In spermatozoa translocations are readily induced, but in an extensive series of tests, none has been found following treatment of oocytes. During this summer I have endeavored to determine whether or not this differential response also extends to inversions. Mature females with attached-XX chromosomes have been treated with X-rays, and their daughters then tested for a deficiency of female progeny, such as would be expected whenever an inversion in the X-chromosome has been induced. Cultures with a low female ratio are being rechecked and the presence of inversions will be finally confirmed by analyses of the salivary gland chromosomes.——Initial experimentation has also been carried out to determine at what point in the life cycle the differential response of the two sexes to X-rays first appears. Embryos ten hours old, at an age when the gonads are first differentiated, have been treated with X-rays. Their progeny is being tested for the occurrence of translocations and inversions.

Gordon, Myron, The Aquarium, New York Zoological Society, New York, N. Y.——During the summer period work was continued on the general subject of "Genetic and correlated studies of fishes." This work was carried on partly at the Biological Laboratory at Cold Spring Harbor, L. I., and partly at the New York Aquarium. A small battery of aquaria was set up in the Jones Laboratory, where studies were carried forward in the analysis of the sex-determining mechanism in Platypoecilus variatus. It has been claimed that in this species sex factors are heterozygous in the male, homozygous in the female. In a related species, P. maculatus, the reverse is known to be true; here the female is the heterogametic form. It is hoped that the situation in this genus may be clarified by using, as we are, wild-caught fish from Mexico, uncontaminated by hybridization—a condition often found among commercial, domesticated stocks.——With Miss Frances Kuchler, a study has been made of the manifold effect of gene action and interaction with reference to internal and external melanin pigmentation. A series of albino fishes, trout (Salvelinus), molly (Mollienisia), and the swordtail (Xiphophorus) were studied in cleared and sec-

tioned material and compared with normally pigmented and partially albino specimens. It is expected that a paper describing the results will be ready before or during the next summer period.——Another paper is being prepared, probably to be entitled: "Notes on Reproductive Behavior and Systems in Platypoecilus and Lebistes." This will be based upon a manuscript written by Guinevere Christman Smith of the Carnegie Institution of Washington some years ago. It is being brought up to date, together with additional notes.——Work was continued on the genetic study of the Sd, the spotted dorsal, factor, characterized by the presence of a few but closely-grouped macromelanophores in the dorsal fin of Platypoecilus maculatus. This factor was found among the native population of the platyfish near the mouth of the Rio Jamapa in the State of Veracruz, Mexico. A preliminary report was presented on this factor during the meeting of the Genetics Society of America, at Cold Spring Harbor.——Work was completed on the genetic study of another wild gene, Co, the comet. From a slender line of black along the dorsal and ventral margin of the caudal fin, the pattern changes to completely blacken the tail. In addition, all the other fins become blackened, and this blackening of the extremities (like that of the siamese cat) extends to the snout. This change has been traced to the interaction of the primary Co factor with a Co modified termed E. E has never been found among the native population of P. maculatus, but has been detected in four strains of domesticated stocks, in Xiphophorus hellerii and in Platypoecilus couchianus. Intergeneric and interspecific hybrids have blackened fins. Second-generation hybrids revert in part to the comet pattern of the original P. maculatus. (See also Miss Kuchler's report.)

Hollaender, Alexander, National Institute of Health, Bethesda, Md.: Work done in cooperation with Mrs. Mary B. Houlahan, Dr. M. Demerec, and Dr. B. P. Kaufmann, Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor, N. Y.——Eggs of Drosophila melanagaster in certain stages of development were irradiated with measured intensities of restricted regions of ultra-violet radiation. These eggs were tested for survival, visible changes in the adult flies coming from these eggs, and the males for sex-linked lethals.——Considerable time was spent by Mrs. Houlahan, in cooperation with Dr. Ephrussi, on factors affecting artificial insemination in Drosophila.——Drosophila, after irradiation with X-rays, were exposed to (1) near infrared radiation and (2) short ultra-violet radiation, and checked for possible addition effects.——In cooperation with Dr. Carlson, University of Alabama, Rockefeller Fellow, a few preliminary tests were made for the effect of 2537 and 3650A radiation on the different stages of mitoses in the neuroblast of the grasshopper.

Jones, E. Elizabeth, Wellesley College, Wellesley, Mass.:——Experiments in progress during the past year at Wellesley College were continued during the summer, with the assistance of Miss Gertrude Christiansen. These experiments deal with the effects in mice of increasing the metabolic rate, by giving 2,4-dinitrophenol in the drinking water, on the development of spontaneous mammary gland tumors in females, and of estrogen induced mammary gland tumors in males. Since the experiments are still being carried on, no statement can be made at this time as to the results.——During the summer a paper on "The Effect of Testosterone Propionate on

Mammary Tumors in Mice of the C_3H Strain" was prepared for publication. It will appear in Cancer Research in the near future.——Analysis of data previously obtained on the effects in mice of 2,7-dihydroxynaphthalene occupied a large part of the summer. A stimulating effect on duct development in the mammary glands of male mice was demonstrated. Concurrent injection of this substance with an estrogen failed to alter the tumor incidence observed when estrogen alone was injected.

Kimball, R. F., The Johns Hopkins University, Baltimore, Md.:—— Investigations on several aspects of the genetics of the ciliate protozoan, Euplotes patella, were carried out. These investigations can be divided into three parts. The first two of these were continuations of work already in progress; the third was begun at The Biological Laboratory.——(1) Work on the manner of action of the mating type gene was continued. It had already been found that the six known mating types in this species are determined by the six possible combinations of three allelomorphic genes. It had further been found that culture fluid in which animals of one mating type had been growing will induce conjugation among animals of certain other mating types. Studies of the action of fluids from cultures of each of the types indicated that each allele was responsible for the production of a substance which could induce conjugation among animals not having that allele. Further data on this matter were obtained and found to agree with the previous results. A paper on the inheritance of mating types and the action of the mating type genes in Euplotes was written and submitted for publication.——(2) Studies on inheritance of the manner of swimming were likewise continued. It had already been found that the difference between a spiral type of swimming and a circular type is dependent upon a gene pair showing a dominant-recessive relationship. The circular type is dominant to the spiral. Additional confirmatory data were obtained on this problem.——(3) In collaboration with Dr. A. H. Hollaender, a study of the effects of ultra-violet radiation on gene mutation in Euplotes was begun. Information is not yet available on the original problem of the investigation. However, it has been found that at certain dosages the division of the micronucleus is fully inhibited, although the macronucleus and animal as a whole may continue to divide more or less normally. Further studies of this phenomenon are planned.

Kuchler, Frances, Cornell University Medical College, New York, N. Y.:——A study was made of the melanotic pigmentary systems of the trout and the Mexican Xiphophorus and Mollienesia. In the wild forms of these fish, melanotic pigment is found in the retinal and choroid layers of the eye, in the tissue surrounding the blood vessels and the brain and nerve cord, and in the peritoneal tissue, as well as in the dermis.——Albino forms were compared with the others as to the distribution of this pigment. The albino trout was found to be lacking in pigment except for the choroid layer of the eye. The albino Xiphophorus and Mollienesia, however, were completely devoid of any melanotic pigmentation. Other forms of these, such as the gold and the black, had normal eye pigment but varying degrees of pigment in the other locations. The genetic basis for these characters was studied in order to explain their significance.——This work was done under the direction of Dr. Myron Gordon, whose guidance and encouragement were greatly appreciated. (See also Dr. Gordon's report.)

Lewis, E. B., California Institute of Technology, Pasadena, Calif.:—— A study of rough-eyed mutants at the Star and asteroid loci in the second chromosome of Drosophila melanogaster was continued during the summer. The dominant Star (S) behaves phenotypically as an allelomorph to the recessive asteroid (ad); the two loci are .02 map units apart. Additional evidence was collected which indicates that the striking difference in phenotype between S ad / + + and S + / + ad is due to a position effect; i. e., from Star and asteroid on the same chromosome it was possible to recover by crossing-over with a normal chromosome an unchanged Star and an unchanged asteroid. By an indirect method three cases of Star and asteroid-4 on the same chromosome were synthesized for use in a comparison of S ad^4/ + + and S + / + ad^4.——A dominant rough-eyed mutant from X-rays, which is apparently normal cytologically, was shown to be an allelomorph of Star and not of asteroid. A genetic and cytological analysis was begun of a minute rearrangement in the region of Star and asteroid which arose spontaneously from a somewhat larger rearrangement, Duplication (2;2) Star. Investigations on the latter tandem duplication were continued. In addition, a number of tester stocks were made up for use in further X-ray studies of the Star and asteroid loci.

McClintock, Barbara, University of Missouri, Columbia, Mo.:—— Through the cooperation of the Department of Genetics of the Carnegie Institution of Washington, facilities were made available for the growing of 7,000 maize plants during the summer months. These plants were the material for an investigation of several cytogenetic problems. Previous investigations had indicated that a specific homozygous minute deficiency would give rise to a distinctive mutant character. In the present investigation, an effort was made to determine the types of mutant characters which would appear when two or more such homozygous minute deficiencies were present in a plant. In most cases, the presence of two distinct homozygous deficiencies gave rise to the two individually recognizable characters. In one case, however, the presence of two homozygous deficiencies resulted in a character distinctly different from that produced by either of the deficiencies individually.——A study of homozygous deficiencies of segments of the short arm of chromosome 9 in maize was undertaken to determine the effect of a graded series of such deficiencies on the development and appearance of the gametophyte, endosperm and sporophytic tissues. A minute deficiency of the end of the short arm produced normal gametophyte development and functioning, normal development and appearance of the endosperm and normal morphological development of the sporophyte. However, no chlorophyll developed in the sporophytic tissues. Longer homozygous deficiencies produced normal morphological development of the gametophytes, but the male gametophyte did not affect pollination. Through special methods, it was possible to determine that relatively long deficiencies may result in a normal development of the gametophytes, a modified development of the endosperm, and a lethal action in the sporophyte. These studies also indicated that in endosperm tissues which are variegated for sectors of normal tissues and sectors of homozygous deficient tissues, a substance or substances diffuse from the normal tissues into the homozygous deficient tissues, resulting in a normal

development of the latter tissues. The extent of the penetration of such substances is limited to a layer of only three or four cells.—Studies of the patterns of chromomeres of pachytene chromosomes were continued. Preliminary maps were made of the chromomere pattern of chromosome 9 and the long or short arm of several of the other chromosomes.

Mirsky, Alfred, Rockefeller Institute, New York, N. Y.:——Spending the summer at Cold Spring Harbor was for me a continuation of the symposium on the gene held at the beginning of the summer. The field I work in (protein chemistry) is beginning to make contact with genetics, and there can be little doubt that these contacts are destined to have a profound influence on both genetics and bio-chemistry. A barrier between neighboring sciences is offered by technical terminology; and to a biochemist the terminology of genetics is formidable. During the summer I was able to learn something of the language and point of view of the geneticist. I am also indebted to Cold Spring Harbor in a more concrete way. Beginning in November, I have, through the courtesy and cooperation of Mr. Stanley Walters, obtained considerable quantities of trout sperm at the Fish Hatchery. Fish sperm has been the classical material for biochemical investigations on the constitution of the cell nucleus since the pioneer investigations of Miescher and Kossel. The development of genetics requires a reinvestigation of the constitution of the sperm head. My work along these lines has only just begun.

Muller, H. J., Amherst College, Amherst, Mass.:——One of the main tasks undertaken was an investigation, carried out in collaboration with P. N. Bridges, of the nature of a group of mutations that had been obtained at Amherst, consequent or following upon ultra-violet irradiation of the spermatozoa of the fruit fly, Drosophila melanogaster. The mutations were studied through breeding tests carried out by Muller, and parallel observations on the chromosomes of the salivary glands by Bridges. Among this group of mutations one was established as having involved the translocation of parts of chromosomes—a result indicating that this type of irradiation is not completely ineffective in breaking the chromosomes. However, the remaining mutations showed no signs of having involved breakages of chromosomes or rearrangements of parts of them large enough to include more than one recognizable gene. Therefore, it becomes probable that ultra-violet rays are much less effective than X-rays of the same gene-mutational potency in producing breaks of chromosomes or rearrangements of microscopically detectable parts of them. This in turn strengthens the conclusion that the genes constitute discrete segments of the chromosome thread. In view, however, of conflicting results that may have been obtained by Slizynski (reported in a personal communication), this work is being carried further.—— A second line of investigation concerned itself with the characteristics shown by the small fourth chromosome of Drosophila simulans after it had been transferred into the related species, D. melanogaster. It was proved that, although this substitution may be effected without causing death of the flies, the males are rendered sterile, and both sexes show a series of deviations in visible characteristics, some of which it was possible to refer to differences in definite loci. These results help to confirm

the author's conception that the genes of related species present many "cryptic" differences, though the sum total of the differences may be such as to bring about a balance of developmental and physiological processes leading to characters that are superficially very much alike. This aids in explaining why species hybrids so frequently have low viability and/or fertility, or are even quite inviable or sterile.——A third line of work consisted in the carrying out of crosses directed towards the construction of a number of stocks, which when completed would serve as valuable tools in genetic analyses. Among these was a stock (now completed) carrying convenient markers, both dominant and recessive, in the X-chromosome, of high viability and fertility both when homozygous and when heterozygous, and allowing practically no crossing-over with X-chromosomes of normal structure. Another was a stock (now nearly completed) so constituted as to allow the obtaining and recognition (if viable) of individuals homozygous for any chosen second chromosome, without the necessity (usually imposing serious practical restrictions on such work) of obtaining virgin females in the penultimate generation. With the aid of these stocks it should be possible to attack much more effectively than heretofore some of the problems of population and mutation study which in the past have proved very troublesome because of the difficulties in genetic technique.——Two papers were prepared for the symposium on genes and chromosomes, including one summarizing the symposium as a whole.

Neel, James, Dartmouth College, Hanover, N. H.:——Study of a case of high mutation rate in Drosophila melanogaster was continued. Previous work had shown that the rate of occurrence of visible mutations in a certain long-inbred strain of this species was approximately five to ten times greater than the rates usually encountered. During the summer the rate of occurrence of lethal mutations in the X-chromosome of this strain was measured, and was found to be considerably greater than normal in two sub-lines of the strain, but normal in a third sub-line. The scarcity of figures on the normal frequency of occurrence of visible mutations renders it impossible to decide at present whether the rates of occurrence of visibles and lethals are increased to the same extent when both are increased, or whether there is a disproportionate increase in the frequency of visibles. An attempt to analyze the causes of this phenomenon was begun during the summer. It is probable that the factor responsible for the increase is at least partially dominant, since mutations continue to appear in outcrosses involving this strain, although probably not as frequently as in the original inbred line.

Rhoades, M. M., Columbia University, New York, N. Y.:——Approximately 35,000 corn plants were grown in the summer of 1941 at Cold Spring Harbor in connection with studies on the heredity of the maize plant. Earlier work had shown that a fragment chromosome consisting of the short arm of chromosome 5 had a terminal centromere. This telocentric chromosome proved to be unstable—giving rise to ring chromosomes as well as smaller rod chromosomes. The behavior of these secondary derivitatives was studied this past summer. Small rod fragments with a terminal centromere were unstable—giving rise to small

iso-chromosomes. Rod fragments with interstitial centromeres were somatically stable, while the ring-shaped fragments underwent frequent changes in constitution.——Studies were continued of the unusual breeding behavior of a type of chromosome 10 possessing an extra segment of chromatin at the distal end of the long arm. When plants heterozygous for this abnormal type of chromosome 10 were used as the female parent approximately three-fourths of the offspring had the abnormal chromosome whereas only half should have possessed it on the basis of a random distribution of the chromosomes during megasporogenesis. The deficiency of eggs with normal chromosomes 10 was not due to ovule abortion or to megaspore competition; it follows that the excess of ovules with the abnormal type of chromosome 10 is due to non-random segregation at meiosis resulting in the abnormal chromosome passing to the basal pole, from which the embryo sac arises, more often than expected by chance. Although the female gametes contain an excess of the abnormal chromosome 10, equal number of mate gametes with the two types of chromosome 10 are formed. However, the pollen grains carrying the abnormal chromosome 10 were at a disadvantage in competing with normal grains, only 40 per cent of the functioning grains carrying the abnormal tenth chromosome.——Studies were also continued on the genetic control of mutability in maize. The Dotted gene which causes the normally stable a allele to become highly mutable was found to be located seven crossover units beyond the yg2 locus in the short arm of chromosome 9. Earlier work had shown the yg2 locus to be only one crossover unit distant from the terminal knob on the short arm. The low percent of recombination between yg2 and the knob is probably due to the depressing effect on crossing-over of the large heterozygous knob. In the Dt-yg2 linkage studies both chromosomes 9 have a small terminal knob. These data place Dt very near the end of the short arm close to or within the knobbed region. Several new mutations of the a allele were analyzed. All of these proved to be to the A allele although mutations to five alleles have occurred in all.——A number of routine linkage tests were also carried out. A new gametophyte gene linked with the a locus in chromosome 3 was found. Tests were made of the new gametophyte gene with the lg2 locus which lies proximally to a. The data at hand suggest that the gametophyte factor lies between a and lg2.

Ruttle, Mabel L., New York State Agricultural Experiment Station, Geneva, N. Y.:——Approximately one thousand snapdragon and marigold plants were grown at the Carnegie Institution this past summer.——The snapdragons represented both diploid and tetraploid progenies from colchicine-treated material. The autotetraploids of snapdragon varieties are highly sterile. The F_1 hybrid between two tetraploid varieties is highly sterile. In the F_2 the hybrid tetraploids show considerable segregation in color, in plant habit, and in fertility. Chromosome quadrivalents occur in both auto- and allotetraploids. A new character was observed to occur in eleven per cent of the F_2 of a self-pollinated diploid population, the F_1 of which was derived from a parental plant treated with colchicine. No such character appeared in comparable checks.——

The marigolds represented populations from the cross, African induced tetraploid x French Dwarf. Some of the plants bore flowers only a little larger than Normal Guinea Gold; the plants were sturdier, of better branching habit, and withstood winds better.

Sonnenblick, B. P., Queens College, Flushing, N. Y.:——The major portion of the time was spent in extending the work on the normal embryonic development of Drosophila melanogaster. Preparations were examined, and photomicrographs were taken of various selected stages. The pictures were taken at the neighboring laboratory of the Carnegie Institution of Washington, for which courtesy I am indebted to Dr. M. Demerec and to Miss Ruby Gay Stewartson, the Carnegie photographer, for her excellent technical work. A number of the prints were demonstrated at the summer meeting of the Genetics Society of America. During the summer, two articles were prepared and submitted for publication. These have now appeared in press.——It was especially interesting to become acquainted with and to discuss projects with a number of resident investigators.

Warren, Charles O., Cornell University Medical College, New York, N. Y.:——The subject under investigation was the metabolic behavior of bone marrow at lowered oxygen tensions. The problem was suggested by the known ability of bone marrow to form red blood cells at an increased rate under conditions of lowered oxygen tension (as at high altitudes). The experiments were a continuation of those of the preceding summer, in which it had been found that at reduced oxygen tensions bone marrow respiration decreases and glycolysis (lactic acid formation) increases in a reciprocal fashion. It was desirable to know the absolute level of the oxygen tension at which these changes first occur. For such experiments, we found it necessary to use suspensions of discrete bone marrow cells, rather than tissue slices as in earlier experiments. Methods of preparing such suspensions were devised, and the experiments showed that with such material the oxygen tension could be lowered to about 1.8 per cent of an atmosphere (14 mm. Hg) before changes in either respiration or glycolysis were observed. These experiments form an important part of a paper on "The Pasteur Effect in Bone Marrow" which is now in press in the Journal of Cellular and Comparative Physiology, and in which the kind offices of the Biological Laboratory are gratefully acknowledged.

Wright, Sewall, University of Chicago, Chicago, Ill.:——I spent the summer of 1941 at Cold Spring Harbor in studies in the field of statistical genetics. One project was an analysis of data obtained by Dr. Th. Dobzhansky on the occurrence and allelism of lethals in wild populations of Drosophila pseudoobscura. The decreasing chance of allelism as the distance between the source localities increases, and other data, give a basis for estimating the effective size and other properties of the populations in the localities studied. Theoretical studies of other questions, especially of the distribution of gene frequencies in populations of limited size under irreversible mutation, were made in preparation for a lecture before the American Mathematical Society on September 3.

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D. Rittenberg
Resume and Perspectives of the Symposium on Genes and Chromosomes.
H. J. Muller

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* Not in attendance.

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Wright, Sewall—University of Chicago, Chicago, Ill.

LABORATORY STAFF

* Blount, Alvin—Kitchen assistant
* Blount, William—Kitchen assistant
* Boccia, Josephine—Laboratory assistant
Brazauskas, Margaret—Clerical assistant
* Brehme, Katherine S.—Editor of Symposium volume
* Brown, Mable—Maid
Demerec, M.—Director
* de Tomasi, James A.—Stockroom manager
Dorsey, Henry—Laborer
* Dorsey, Emma—Maid
* Dubar, Isabelle (Mrs.)—Dining hall manager
* Ensign, Helen—Cook
* Hoyt, J. Southgate Y.—Instructor of Nature Course
Klem, Dorothy V.—Secretary
* Montgomery, Dorothy—Cook
Reddy, William—Painter
Roberts, William—Laborer
* Thompson, Marie—Maid
Tworzyanski, Stella—Clerical assistant
Vinal, Muriel—Clerical assistant
Wheeler, Thomas—Superintendent of Grounds

* Summer Staff

SCIENTIFIC ADVISORY COMMITTEE

George W. Corner, Chairman, Carnegie Institution of Washington, Baltimore, Md.
L. C. Dunn, Columbia University, New York City.
Alexander Hollaender, National Institute of Health, Bethesda, Md.
E. C. MacDowell, Carnegie Institution of Washington, Cold Spring Harbor, N. Y.
Alfred Mirsky, Rockefeller Institute for Medical Research, New York City.

CERTIFICATE OF INCORPORATION

We, the undersigned, all being of full age, citizens of the United States and residents of the State of New York, desiring to form a membership corporation for the purposes hereinafter mentioned, pursuant to the Acts of the Legislature of the State of New York, do hereby CERTIFY AND DECLARE:

1. The name of the corporation shall be LONG ISLAND BIOLOGICAL ASSOCIATION, INC.

2. The principal office of the corporation shall be at Cold Spring Harbor, Town of Oyster Bay, in the State of New York; and the territory in which its operations are to be principally conducted is Long Island, New York and vicinity.

3. The purposes of the corporation shall be

(a) To establish and maintain an institution and laboratories for scientific research in biology and other kindred subjects.

(b) To conduct special investigations in agriculture, horticulture, the breeding of domestic animals, the promotion of oyster culture and marine fisheries, the protection and conservation of animal and plant life, zoology, botany and biology; and to diffuse information and give instruction relating thereto.

(c) To furnish specimens, materials and facilities for biological and medical investigation through the agency of other educational institutions, medical schools and hospitals, particularly in Greater New York.

(d) To take, hold and convey real property by grant, lease or otherwise for the purposes of the corporation.

(e) To take, hold and use for the purposes of the corporation moneys, securities or other property received by gift, bequest, membership dues, or otherwise.

(f) To act as Trustee of any Trust created for the carrying out of any or all the purposes of the corporation.

4. The number of Directors of the corporation shall be twenty (20) (amended to read "28", July 26, 1927.)

5. The names and places of residence of the persons who shall be Directors of the corporation until the first annual meeting of the members shall be as follows:

Names	Residence
Charles B. Davenport	Oyster Bay, N. Y.
Henry W. De Forest	Oyster Bay, N. Y.
George Draper	New York City, N. Y.
G. Clyde Fisher	Douglaston, N. Y.
Harold D. Fish	Pittsburg, Pa.
Marshall Field	Huntington, N. Y.
Henry Hicks	Westbury, N. Y.
Walter Jennings	Cold Spring Harbor, N. Y.
Walter B. James	Cold Spring Harbor, N. Y.
Duncan S. Johnson	Baltimore, Maryland
Mrs. Addie Wolff Kahn	Cold Spring Harbor, N. Y.
Frank Overton	Patchogue, N. Y.
Howard M. Parshley	Northampton, Mass.
Mary H. Rumsey	Wheatley Hills, N. Y.
Wilbur W. Swingle	New Haven, Conn.
John H. J. Stewart	Oyster Bay, N. Y.
Mortimer L. Schiff	New York City, N. Y.
William K. Vanderbilt	New York City, N. Y.
Herbert E. Walter	Providence, Rhode Island
Timothy S. Williams	Huntington, N. Y.

6. At the first annual meeting of the members of the corporation, or as soon thereafter as practicable, Directors shall be elected by the members of the corporation in four classes, of five Directors in each class, as follows: Directors of the first class who shall hold office for the term of one year; those of the second class for two years; those of the third class for three years; and those of the fourth class for four years. As the term of office of the Directors of each class shall expire, their successors shall be elected by the members of the corporation for a term of four years each.

7. A vacancy occurring in the office of any Director before the expiration of his term shall be filled by the remaining Directors for the remainder of the term.

8. The By-Laws of the corporation shall prescribe the qualifications for membership in the corporation, and may provide for the classification of members.

9. The annual meeting of the corporation shall be held at the office of the corporation on the first Saturday of August in each year (amended to read "last Tuesday of July", August 7, 1926.)

10. Subject to action by the members, the Directors may adopt and amend the By-Laws of the corporation.

IN TESTIMONY WHEREOF, we have made and signed this Certificate in duplicate this thirteenth day of February, 1924.

Walter Jennings	Cold Spring Harbor, N. Y.
Marshall Field	Huntington, N. Y.
Henry Hicks	Westbury, Nassau Co., N. Y.
Phoebe E. Hewlett Willets	Cold Spring Harbor, N. Y.
Charles B. Davenport	Cold Spring Harbor, N. Y.
Timothy S. Williams	Huntington, N. Y.
John L. Wells	Northport, N. Y.
A. F. Blakeslee	Cold Spring Harbor, N. Y.
John Chase	Cold Spring Harbor, N. Y.

Approved by Norman S. Dike, a Justice of the Supreme Court of New York, February 15th.

Filing consented to by Frank P. Graves, President of the University of New York and Commissioner of Education, February 19.

Certificate of incorporation filed with the Secretary of State, at Albany, February 19, 1924.

BY-LAWS

ARTICLE I

Members

Sec. 1. Any person may become a member of the Association, subject to ratification by the Board of Directors or Executive Committee, upon his or her enrollment in any one or two of the following classes:

Class I. Founders—consisting of those who by bequest or gift have each contributed to the capital funds of the Association at least $5,000 in money or property.

Class II. Patrons—consisting of those who have each contributed at least $500 to the Association but less than an amount sufficient to qualify them as founders.

Class III. Sustaining Members—those who contribute fixed annual sums for the support of the Association.

Members of all classes shall have equal voting powers.

ARTICLE II

Meetings

Sec. 1. The annual meeting of the members of the Association for the election of Directors and such other business as may be specified in the call, or as may be duly brought before the members, shall be held at the Biological Laboratory, Cold Spring Harbor, on the last Tuesday of July in each year.

Sec. 2. Special meetings of the members may be called by the Board of Directors, to be held at such time and place, and for such purposes, as shall be stated in the call, provided that at least one week's notice of such meeting be given to the members. A special meeting shall be called by the Board of Directors when requested in writing by at least thirty members.

Sec. 3. At both annual and special meetings ten members shall constitute a quorum. Each member present shall be entitled to one vote.

ARTICLE III

Directors

Sec. 1. The Board of Directors shall consist of twenty-eight members, who shall be elected as provided in the Certificate of Incorporation. Nine Directors shall constitute a quorum. The Board of Directors shall have general control and management of the affairs of the Association. It shall elect the officers and, except as otherwise herein provided, appoint all other employees, prescribe their duties and fix their compensation and tenure of employment. It shall choose annually an Executive Committee of seven Directors of whom the President shall be one. The Executive Committee shall have all the powers of the Board between meetings of the Board and their acts and proceedings shall be reported to the Board at the next meeting thereof. Three members shall constitute a quorum of the Executive Committee.

Sec. 2. Stated meetings of the Board shall be held in the months of January and July of each year at such place and time as may be stated in the call. Special meetings of the Board, and meetings of the Executive Committee, may be called by the President at any time upon reasonable notice, and shall be called by him upon the written request of any three Directors.

Sec. 3. A vacancy in the office of any Director before the expiration of his term shall be filled by the remaining Directors for the unexpired portion of the term.

Sec. 4. Any Director residing more than 50 miles from New York City shall be entitled to have reimbursed to him from the Association's treasury his necessary railroad fare incurred in attending meetings of the Board of Directors.

Sec. 5. Any Director who is engaged in administration, instruction or research may receive such salary as shall be voted to him from time to time by the Board.

ARTICLE IV

Officers

Sec. 1. The officers of the Association shall be: A President, 3 Vice Presidents (all of whom shall be Directors), a Secretary, an Assistant Secretary, a Treasurer, and a Laboratory Director, each of whom shall be elected by the Board of Directors and shall hold office during the pleasure of the Board. Such additional officers may be appointed as the Directors may deem advisable.

Sec. 2. No officer shall receive compensation for his services except the Laboratory Director, whose salary shall be fixed by the Board of Directors.

ARTICLE V

Duties of Officers

Sec. 1. The President shall preside at all meetings of the Board of Directors and Executive Committee. He and the Secretary shall jointly execute on behalf of the Association all contracts, leases and other corporate instruments.

Sec. 2. The Vice President shall perform the duties of President in case of the absence or inability of the President.

Sec. 3. The Secretary shall keep a list of the names and addresses of members, have the custody of the seal, the records and file of the Association, give due notice of all meetings, keep the minutes of the Board of Directors and Executive Committee, and attach the seal, together with his signature, to all instruments requiring sealing which shall have been executed by the President or Vice President. The Assistant Secretary shall perform the duties of the Secretary in case of the absence or inability of the Secretary.

Sec. 4. The Treasurer shall receive, collect and hold, subject to the order of the Board, all dues, subscriptions, donations and other revenue of the Association. He shall deposit all funds, in the name and to the credit of the Association, in such financial institution or institutions as the Board of Directors may designate. He shall pay all salaries, make deposits to laboratory bank account as authorized in advance by the Board of Directors or Executive Committee, and shall pay all bills of the Association, shall keep proper books of account and shall make such reports from time to time as the Board of Directors or the Executive Committee may require. Drafts upon Association funds shall be by voucher checks bearing the signature of the Treasurer and the Laboratory Director or such other officer as the Board of Directors or the Executive Committee shall designate. Funds not required for current operations shall be invested and reinvested in such manner as the Board of Directors or Executive Committee shall determine.

Sec. 5. The Laboratory Director shall be responsible executive officer of the Association in matters pertaining to the immediate conduct of the Laboratory and such other of the activities of the Association as may be assigned him. He shall prepare and issue the general announcements, after their approval by the Board of Directors, provide for the needs of instructors, investigators and students at the Laboratory. He shall attend the meetings of the Board of Directors and Executive Committee and furnish them, from time to time, with information regarding the operations of the Laboratory and his other activities in connection with the Association. Subject to approval of the Board of Directors or Executive Committee he shall appoint instructors, lecturers, laboratory assistants and other laboratory employees. Prior to the beginning of each fiscal year he shall submit for approval to the Board of Directors or Executive Committee a budget of estimated expenditures and receipts for the coming year; and no expenditures in excess of those approved shall be incurred except with like approval. There shall be established a separate laboratory bank account in the name of the Director of the Laboratory. In this account shall be deposited such amounts as the Board of Directors or the Executive Committee shall determine and such additional moneys as may be received by the Laboratory Director on behalf of the Association. Drafts upon such account shall be made by voucher check signed by the Laboratory Director or, in emergency, by the Treasurer, or such other person as the Board may designate. All revenues of the Association received by the Laboratory Director shall be paid over to the Treasurer of the Association periodically. The Laboratory Director shall make reports to the Board of Directors, or Executive Committee, from time to time of his receipts and disbursements.

ARTICLE VI

Seal

Sec. 1. The seal of the Association shall be in circular form with the name "Long Island Biological Association" in the circumference and the words "Corporate Seal" in the center.

ARTICLE VII

Amendments

Sec. 1. These by-laws may be amended by a majority vote of those present at any regular meeting of the Board of Directors, provided notice of such proposed amendment has been given to each director at least two weeks in advance of such meeting, or without such notice they may be amended at any meeting of the Directors with the unanimous vote of those present. They may also be amended at the annual meeting of the members of the Association or at any special meeting thereof called for such purpose.

ARTICLE VIII

Women's Auxiliary Board

Sec. 1. The Board of Directors or the Executive Committee may appoint annually a Women's Auxiliary Board, with such powers as may be prescribed from time to time. Such Auxiliary Board shall determine its own organization and cooperate with the Board of Directors in all matters relating to the welfare of the Association. Particularly it shall arrange for a visiting day at the Laboratory, for the formation of children's classes for nature study, for increasing the membership and funds of the Association and shall endeavor in all ways to promote the mutual interests of the Laboratory and the community. All funds received by the Auxiliary Board shall be paid over to the Treasurer of the Association.

ARTICLE IX

Conveyance of Land

Sec. 1. Pursuant to the provisions of Section 13 of the Membership Corporation Law, the Association may from time to time convey to a member of the Association a portion of any real property owned by the Association for the erection thereupon of a dwelling house.

Sec. 2. The Board of Directors is hereby authorized to convey real property for residence purposes to such members of the Association and to impose such restrictions in the covenants as in the opinion of the Board will result in a residential development attractive to scientists and promote the best interests of the association.

March 10, 1942.

SUSAN COOPER