LONG ISLAND BIOLOGICAL ASSOCIATION

ANNUAL REPORT
OF
THE BIOLOGICAL LABORATORY

COLD SPRING HARBOR
LONG ISLAND, NEW YORK
1931

LONG ISLAND BIOLOGICAL ASSOCIATION

INCORPORATED 1924

ANNUAL REPORT

OF

THE BIOLOGICAL LABORATORY

FOUNDED 1890

FORTY-SECOND YEAR

1931

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friend and officer of the Association

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REPORT OF THE DIRECTOR

To the officers and members of the Long Island Biological Association:

Gentlemen:

I have the honor to submit the following report for the year 1931.

The Biological Laboratory has maintained and increased its usefulness as follows:

All Year. 1. In biophysics: (Dr. Fricke in charge). The definite passing from the formative stage to the productive state. (See Dr. Fricke's report).

2. In pharmacology: (Dr. Salant in charge). The accomplishment of further work, which together with that which has been done during the last three years, permits the well rounded interpretation from several angles of approach, of some of the problems undertaken originally. (See Dr. Salant's report).

3. In bacteriology: (Dr. Wharton). The publication of a review of the scientific literature concerning cats as carriers of disease; and the undertaking of experiments upon diphtheria and distemper. (See Dr. Wharton's report).

4. In physiology of reproduction: (Dr. Harris in charge). The search for a practicable test for potency of extract of corpora lutea; the testing of the effect of (1) extracts of corpora lutea upon the cellular lining of the uterus and vaginae of mice and rats, and (2) of the "luteinizing fraction" of the anterior pituitary gland, and (3) of human blood serum, upon the vaginae of mice.

5. In bryology: Dr. Grout made progress in the preparation and publication of his "Moss Flora of North America, North of Mexico", and in other work upon mosses.

6. In protozoology: Dr. Schaeffer, who has been a guest investigator at the Laboratory since June, has continued his researches upon molecular organization in the protoplasm of various amebas.

7. Mr. Parkins, associate in the research in pharmacology, has, in addition to work with Dr. Salant, continued his studies, (1) concerning effects produced by the removal of both adrenal glands in the fowl, and (2) concerning the administration of the Swingle-Pfiffner cortical extract.

8. Drs. Swingle and Pfiffner have made marked advances in their studies on the cortex of the adrenal gland. (See Dr. Swingle's report, and list of publications.) The Association was instrumental in obtaining, for Dr. Swingle's and Pfiffner's researches upon the adrenal cortex, support from the Macy Foundation. The Association further aided in that research by turning over all funds received from, and all rights of funds to be received in the future from, Parke, Davis Company to Princeton University and to the Research Corporation, for the support of the work.

Summer. 1. The extending of facilities to some forty workers from 27 different institutions who carried on research at the Laboratory.

2. The admitting to courses at the Laboratory of 33 students from 18 institutions, 12 of whom carried on research in addition to that given in the courses.

(Total number engaged in research or studying at the Laboratory last summer was 80, representing 41 different institutions, total conducting research, aside from, or in addition to work in course, was 59.)

Research Workers from Other Institutions

Research workers from other institutions continue to utilize all of the Laboratory space and facilities, available at the Laboratory during the summer. The number has of late thus remained practically constant from year to year, the total number of workers at any one time being about fifty to sixty. Forty-one different institutions (for the most part colleges, universities and medical schools) were represented at the Laboratory this year.

The list of research workers, given herewith, is supplemented elsewhere in the report by a discussion of their work. Reference is also made to the individual reports of investigators which are given verbatim, as an appendix to the director's report.

The visiting workers are T. G. Adams, Graduate Student, Columbia University; Doctor Edgar Allen, Dean, University of Missouri, School of Medicine; Doctor Ezra Allen, Assistant Professor of Histology-Embryology, New York Homeopathic Medical College and Flower Hospital; Roy P. Ash, Graduate Assistant, Brown University; Margaret Baskervill, Assistant, College of Physicians and Surgeons, Columbia University; David E. Bass, Undergraduate, Brown University; James H. Birnie, Graduate. Morehouse College; Doctor Ernest W. Blanchard, Associate, Bryn Mawr College; Doctor A. W. Blizzard, Professor of Biology, Coker College; Doctor J. H. Bodine, Professor of Zoology, University of Iowa; Professor Dugald Brown, Assistant Professor of Physiology, New York University, Medical School; Martha Clarke, Undergraduate, Vassar College; Doctor H. S. Conard, Professor of Botany, Grinnell College; Doctor H. J. Conn, Chief of Research in Soil Bacteriology, New York State Agricultural Experiment Station; Frederick Crescitelli, Graduate Assistant, Brown University; Doctor E. E. Ecker, Assistant Professor of Immunology, Western Reserve University, Medical School; Robert Gaunt, Graduate Student, Princeton University; Joseph Hahn, Medical Student, New York Homeopathic Medical College and Flower Hospital; Rebecca Halpern, Assistant, New York Homeopathic Medical College and Flower Hospital; Elmer C. Herber, Instructor, Dickinson College; Ruby Hirose, Graduate Student, University of Cincinnati. School of Medicine; Doctor Franklin Hollander, Assistant Professor of Physiology, New York Homeopathic Medical College and Flower Hospital; John R. Huggins, Instructor in Zoology, University of Pennsylvania; Doctor George B. Jenkins, Professor of Anatomy, George Washington University, Medical School; Percy Jennings, Jr., Student, Cornell University, Medical College; Cornelius Kaylor, Graduate Assistant,

Rutgers College; Doctor I. S. Kleiner, Professor of Physiology, New York Homeopathic Medical College and Flower Hospital; Ruth Kleiner, Undergraduate, Packer Collegiate Institute; Doctor S. I. Kornhauser, Professor of Embryology and Anatomy, University of Louisville, Medical School; Cecile Ludlam, Graduate, Barnard College; Joseph Marzenaski, Assistant, Princeton University; E. C. Nelson, Graduate Assistant, Johns Hopkins University, Department of Hygiene; Louise Palmer, Temporary Investigator, U. S. Bureau of Fisheries; Louis Rogol, Student, Long Island Medical School; Mary E. Schaeffer, Undergraduate, University of Kansas; Julius Schwartz, Graduate Student, Columbia University; Lillian Sheppard, Graduate Assistant, New Jersey College for Women; Irwin Sizer, Graduate Assistant, Rutgers College; T. L. Smith, Instructor, Columbia University; Vera I. Smith, Graduate Assistant, Brown University; Herman T. Spieth, Associate in Zoology, Indiana University; Doctor W. W. Swingle, Professor of Biology, Princeton University; Doctor I. R. Taylor, Assistant Professor of Physiology, Brown University; Doctor Charles Weiss, Associate Professor of Applied Bacteriology and Immunology in Opthalmology, George Washington University, School of Medicine; Doctor Dorothy W. Weiss, Department of Pediatrics, George Washington University, School of Medicine; Helen Whitcomb, Graduate Assistant, Brown University.

Publications

The Laboratory's reply to the difficult times, which have been confronting it during the year, has been more usefulness, more productivity.

Knowledge is not a commodity the production of which should be decreased during a depression. If anything, knowledge is more valuable then than at other times. Knowledge of life, normal and abnormal, healthy and pathological; knowledge of the cause and cure of disease, begin to show, in times of depression, their incomparable value.

Wittingly or unwittingly, man has always had for his greatest interest, the study of life, (biology). With the passage of time a special class of professional students of life (biologists) have arisen. They have developed a vocabulary of their own, for convenience and accuracy. But the urge behind them, the fundamental value and appeal of their work, remain unchanged.

The immediate goal of science is knowledge: the ability to prophesy correctly. The biologist conducts experiments so that he may know that given this and this, under definite conditions, the results will be such and such. The physician and the surgeon proceed, whenever possible, upon a basis of tested prophecy. In general, the better one knows the rules of the game of life, the better one should be able to play.

Staff members, and others who worked at the Laboratory, all or part of last year, wrote more than fifty papers dealing with the results of their inquiries into various aspects of life. In nearly half (twenty-four) of these, the Laboratory had played an important enough part so that the writers felt that its name should appear with the title.

A list of publications by members of the staff and others who worked at the Laboratory this year is given herewith. If there are still other

papers, not mentioned in our list, as no doubt there are, it is because they have not yet come to our attention.

Partial List of Publications by Members of the Staff and Others Who Worked at the Laboratory This Year.

(* signifies mention of Biological Laboratory with title.)

Allen, Edgar—(Pratt, J. P.; Newell, Q. U. and Bland, L. J.) 1930. "Human Tubal Ova; Related Early Corpora Lutea and Uterine Tubes." Publication 414 of Carnegie Institution of Washington. pp. 45-76.

Allen, Edgar—(Bland, L. J.; Pratt, J. P.; and Newell, Q. U.) 1931. "The Human Ovary at Laprotomy." Southern Medical Journal.

Allen, Ezra—1931. "Specific Secretory Cells in the Anterior Lobe of the Hypophysis.—A Review." Journal of American Institute of Homeopathy; vol. 24, pp. 463-465.

Blanchard, E. W.—1931. "An Experimental Study of the Opsonins of the Blood: I. Effect of Bilateral Adrenalectomy." Physiological Zoology. Vol. 4, pp. 302-315.

Blanchard, E. W.—1931. "An Experimental Study of the Opsonins of the Blood. II. Effect of in vitro Irradiation with Ultra-Violet and X-Ray." Physiological Zoology. Vol. 4, pp. 316-323.

*Blizzard, Alpheus W.—1931. "Plant Sociology and Vegetational Change on High Hill, Long Island, New York." Ecology. Vol. 7, pp. 208-223. (Mr. Robert W. deForest contributed toward the cost of publication.)

Bodine, J. H., and Evans, T. C.—1931. "Cyclic or Rhythmic Responses of Organisms to Temperature." Anatomical Record. Vol. 51, p. 23.

Conn, H. J.—1931. "Progress in the Standardization of Stains. Stains for Frozen Sections." Stain Technology. Vol. 6, p. 1.

Conn, H. J.—1931. "Progress in the Standardization of Stains. How Much is Certification Worth?" Stain Technology. Vol. 6, p. 33.

*Fricke, Hugo.—1931. "The Electric Conductivity and Capacity of Disperse Systems." Physics. Vol. 1, pp. 106-115. Also an abstract in Bulletin of the American Physical Society. Vol. 6, p. 45.

*Fricke, Hugo, and Sizer, Irwin.—1931. "The Use of Radiography in Entomology." In press in Radiography and Clinical Photography.

*Grout, A. J.—1931. "Moss Flora of North America, North of Mexico." Vol. III, part 2. 52 pages and 15 full page plates with a page of description for each.

Grout, A. J.—1931. "Bryology by Automobile." The Bryologist. Vol. 34, pp. 51-53.

Grout, A. J.—1931. "Mossses in Landscape Gardening." In press.

Grout, A. J.—1931. Collaboration with Prof. E. J. Dole in the preparation of an up-to-date list of Vermont Mosses. Now in press.

*Grout, A. J.. and Parker, Marian (student at the Laboratory, summer of 1931) 1931. "Mosses of the Campus of Cold Spring Harbor Biological Laboratory." The Bryologist. Nov. 1931.

*Grout, A. J., and Andrew, Barbara (student at the Laboratory, summer of 1931) 1931. "The Hepaticae of Cold Spring Harbor and Vicinity." The Bryologist. Nov. 1931.

*Grout, A. J., and Ross, Josephine (Student at the Laboratory, summer of 1931) 1931. "Some Bryophyte Associations of Cold Spring Harbor, New York, and Vicinity." The Bryologist. Nov. 1931.

*Harris, R. G.—1931. "The Biological Laboratory at Cold Spring Harbor." The Collecting Net. Vol. 6, p. 1.

*Harris, R. G., and Newman, D. M.—1931. "A Practical Test for Potency of Extract of Corpora Lutea." Science. Vol. 74, p. 182.

Hollander, Franklin.—1931. "Adjustable Drop-Control for Burettes." Science. Vol. 73, pp. 45-46.

Hollander, Franklin.—1931. "Studies in Gastric Secretion. I. Gastric Juice of Constant Acidity." Journal of Biological Chemistry. Vol. 91, pp. 151-182.

Hollander, Franklin.—1931. "Studies in Gastric Secretion. II. A Comparison of Criteria of Acidity Used in This Investigation." Journal of Biological Chemistry. Vol. 91, pp. 481-492.

*Hollander, Franklin.—1931. "Studies in Gastric Secretion. III. Evidence in Refutation of the Rosemann Theory of Hydrochloric Acid Formation." The American Journal of Physiology. Vol. 98, p. 551 ff.

Hollander, Franklin.—1931. "What Is the Acidity of Pure Gastric Juice? A Review of the Experimental Literature." Journal of the American Institute of Homeopathy. May, 1931, pp. 491-500.

*Kleiner, I. S.—1930. "Fluctuations of the Concentration of 'Blood-Sugar' in Vitro." Proceedings of the Society for Experimental Biology and Medicine. Vol. 28, pp. 326-327.

(Tauber, H.) and Kleiner, I. S.—1931. "Studies on Crystalline Urease. III. The Toxicity of Crystalline Urease." Journal of Biological Chemistry. Vol. 92, pp. 177-185.

(Tauber, H.) and Kleiner, I. S.—1931. "Studies on Crystalline Urease. IV. The 'Antitryptic' Property of Crystalline Urease." Journal of General Physiology. Vol. 15, pp. 155-160.

*Parkins, William M.—1931. "An Experimental Study of Bilateral Adrenalectomy in the Fowl." Anatomical Record. Vol. 51, p. 39.

*Salant, William, and Nagler, Harold.—1931. "The Effect of Calcium and Potassium on Cardiac Reactions to Mercury." The Journal of Pharmacology and Experimental Therapeutics. Vol. 41, pp. 407-421.

*Salant, William, and Parkins, William M.—"The Effect of Ergotamine on the Intestine, with Observations on the Influence of Calcium on Its Action." In press.

*Salant, William, and Parkins, William M.—"Studies on the Response of the Isolated Intestine to Ergotamine with Special Reference to the Influence of Ions." In press.

*Schaeffer, A. A.—1931. "On Molecular Organization in Ameban Protoplasm." Science. Vol. 74, p. 47.

*Schaeffer, A. A.—1931. "Molecular Organization in the Protoplasm of Chaos Differens Mueller and Several Other Amebas with Pseudopods." Anatomical Record. Vol. 51, p. 80.

*Smith, Christianna.—1931. "Normal Variations in Erythrocyte and Hemoglobin Values in Women." Archives of Internal Medicine. Vol. 47, pp. 206-229.

Sparrow, F. K. Jr.—1931. "The Classification of Pythium." Science. Vol. 73.

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Outside Support Granted the Association

The Laboratory has continued to proceed upon the belief that, while its work is dependent upon the support it receives, that support, in turn, is based upon the extent and value of the Laboratory's work. The Association, upon its incorporation, burst into this circle, and has continually tried to enlarge it.

Each year the Laboratory has accomplished more, and each year the members of the Association, appreciating the accomplishments of the Laboratory, have been more generous in their support of the Laboratory's work. This might have continued indefinitely had it not been for the business depression of the last two years, which has resulted in a shrinkage in the total contributions of members. At the same time we have not found conditions propitious for getting new members to take the place of some of our most generous contributors, whom we have lost by death.

It became necessary to seek outside support.

Carnegie Corporation responded by making a grant of fifteen thousand dollars, partly in support of Dr. Fricke's researches, and partly in support of other work being conducted by the Association.

The Rockefeller Foundation made a grant of $20,000 "toward the work of the Biological Laboratory at Cold Spring Harbor".

The National Research Council, Committee on the Effects of Radiations upon Living Organisms, Doctor W. C. Curtis, Chairman, continued to aid in procuring equipment for biophysical research.

These grants are not for the purpose of relieving the Association of its responsibility in respect to the maintenance of the Laboratory. On the contrary, it is hoped that one of their greatest effects will be to encourage and stimulate the Association in the successful accomplishment of its work. The action of these groups should be taken as showing approval both of the work of the Laboratory, and of the continued support of the Association.

Biophysics

(All year workers: Dr. Fricke, in charge; Dr. Washburn, chemist; Mr. Force, glassblower; Mr. Henderson, instrument maker; Mr. Gallagher, radio engineer. Summer Associates: Dr. Ecker, Mr. Sizer, Miss Ludlam.)

Dr. Fricke's continued systematic studies of the chemical effects produced by X-rays have been productive of very interesting results during the past year. The work is concerned with establishing the laws according to which chemical changes are produced by X-rays, the ultimate purpose being to throw light on the nature of the primary effect of the rays upon the living cell.

For several years one of the major researches being conducted in our biophysical laboratory has dealt with the changes produced by X-rays in water-solutions of certain chemicals. Chromic acid was one of these substances.

It was earlier found that the effect of X-rays upon a solution of chromic acid was about one-half of the effect of the same dosage upon another solution, that of ferro sulphate (containing free oxygen). During this year, however, Dr. Fricke's continued experiments have called for a revision of these figures, under circumstances of great interest.

He has found that the effect of X-rays upon chromic acid, which he had previously noted (as a result of work done with all the care usually employed in the highest grade chemical work) is twice as great as that which he has lately obtained. The reason is as follows: solutions of chromic acid which are pure according to the usual methods of analysis, may contain foreign substances so minute in quantity as to be undetectable by these usual methods of analysis, and yet capable of markedly increasing the effect of X-rays upon the solution. Such a very minute amount of impurity is effective that the solution must be scrupulously protected even from the air of the laboratory.

Now for biological purposes, this discovery is of the greatest interest, for minute quantities of certain organic substances similarly markedly increase the effect of X-rays upon chromic acid. The result is that, by making a mixture of chromic acid and an organic substance, we have an indirect method for determining the effect of X-rays upon organic substances.

From further preliminary studies it likewise appears that the effect of X-rays upon a solution of ferro sulphate, containing free oxygen, is 4 times as great as when no free oxygen is present in the solution. This, of course, indicates that activated oxygen molecules play an important role here.

These results strikingly illustrate how very complex is the problem of the nature of the primary effect of X-rays upon the cell. They also serve to give evidence of the wisdom of Dr. Fricke's method of procedure, namely that of making a systematic study of the effects upon certain relatively simple chemical substances, before attempting direct experimentation upon the more complex organic substances and upon cells.

The technical aspects of the work with X-rays, has proceeded to a point where the X-ray tubes now constructed in the laboratory are cap-

able of utilizing the full power of our generating equipment. These tubes make possible the application of X-ray doses of over one million r-units per hour. An indication of what this means may be found in the facts that one r-unit will blacken a photographic plate, while three hundred r-units are sufficient to cause permanent sterilization of the reproductive glands.

Standardization of X-ray and Radium Dosage

An important result of immediate practical application seems to be emerging from Dr. Fricke's studies of the effects of X-rays upon chemical substances. It is the use of ferro sulphate as an indicator of X-ray and radium dosage. This chemical method, upon which preliminary tests have already been made, appears to have several great practical advantages over the electrical method now used.

For a more complete statement concerning the researches in biophysics, including those dealing with (1) electrolytic polarization, with (2) electric capacity of red blood corpuscles (both normal and with a large amount of amboceptor added), (3) the production of hydrogen peroxide by irradiating water with X-rays, and (4) the possibility of using soft X-ray photography in physiological studies, see Dr. Fricke's report on page 38.

Pharmacology

(Dr. Salant, in charge; Mr. Parkins, associate. Summer Assistants, Miss Sheppard, Mr. Rogol.)

One of the very important aspects of pharmacology is that the orthodox action of a drug may be wholly reversed under certain conditions. Dr. Salant has found another striking example of this during the past year, while continuing his investigations of the relation of calcium to the pharmacological action of different drugs.

Ergotamine (a drug used extensively in medicine, particularly at child birth) normally produced marked increase in the muscular activity of the intestines as well as of the uterus. This is particularly true of the first administration of ergotamine, the effect wearing off with repeated injections.

If, however, the amount of calcium in the blood is decreased (accomplished in the experiments, by the administration of oxalate) then the first dose of ergotamine brings about depression rather than stimulation of intestinal, muscular activity.

This reversal of the normal effect of ergotamine may be, in turn, reversed back to normal by giving calcium chloride. As Dr. Salant says in his report, "In other words, in calcium deficiency ergotamine is always a depressant, whereas in excess calcium it is always a stimulant".

In experiments upon isolated intestine, Dr. Salant found, again in this case, (as he had in the case of mercury, see report for 1930) that potassium has an effect just the opposite from that of calcium. In the presence of sufficient amounts of potassium, ergotamine produces depression.

Action of Sodium Oxalate

Since sodium oxalate was used for reducing the amount of calcium in blood, Dr. Salant studied some of the pharmacological properties of oxalate. The results are given in his report on page 48. They include the interesting discovery that oxalate is less toxic after removal of the parathyroid gland than before. Since the parathyroid is known to regulate the amount of calcium in the blood, Dr. Salant's discovery is very interesting.

Another case of reversal of effect was brought to light in studies on cocaine. In these, Dr. Salant found that cocaine may cause depression or stimulation of the intestine, depending on whether it is in alkaline or in acid solutions. In some cases, however, the difference was quantitative rather than qualitative.

Bacteriology

(Dr. Wharton. Miss Clarke, summer assistant).

Dr. Wharton's experiments, on the role of cats in transmitting disease to man, which centered about cats' susceptibility to diphtheria were perforce temporarily discontinued because of a fatal epidemic of disease among the kittens being used. The disease was found to be similar to canine distemper. Dr. Wharton made preliminary studies in an attempt to find the causal organisms. The studies have developed into an investigation of distemper, and are being continued, arrangements having been made for Dr. Wharton to continue his work here as a guest investigator. For further information regarding the work to date, see Dr. Wharton's report on page 55.

The review of the literature concerning cats as transmitters of disease prepared by Dr. Wharton and referred to in the last annual report, was published by the Laboratory, early this year. (Mr. Thomas Cochran paid for the publication.)

Physiology of Reproduction

(Dr. Harris, assisted by Miss Newman. Dr. J. J. Pfiffner has, whenever requested, prepared and supplied extracts of corpora lutea.)

A practicable and standardizable test for the potency of extract of corpora lutea (structures normally present in the ovaries during pregnancy, and at certain other times) has been very much desired for some time. With the establishment of the fact that the corpora lutea are very important in preparing the uterus for, and maintaining pregnancy, such a test became essential. It is an even further adjunct to the search which must be made for a new source of potent extracts of the hormone involved, since the present source (the corpora lutea) is far too expensive to make clinical use of potent extracts practicable.

It was hoped that a suitable test might be found by examining cellular changes in the lining of the uteri of rats or mice. A series of studies were made, both at this Laboratory, upon rats and mice, and at the Medical School of the University of Rochester (W. M. Allen) upon rats. These studies were mutually confirmatory in establishing the fact that the

cellular changes of the uteri of rats or of mice were not sufficient to constitute a valid test for potency of extracts of corpora lutea.

In August of this year, however, Dr. Harris and Miss Newman came forward with a proposed test. This test was based upon several facts.

The cellular lining of the vaginae of rats normally undergoes marked changes during pregnancy. Indeed the changes are so characteristic that a trained observer, by making a microscopical examination of a section of rat vagina, can not only tell whether or not the animal is pregnant, but can estimate with relative accurracy how long the rat has been pregnant.

It was found that the same type of reaction was produced in non-pregnant mice through the daily injection of an extract of corpus luteum. This reaction occurred invariably in mice which were otherwise untreated, when injections were begun the day after the mouse had been on heat, in spite of the fact that the animals had not been mated, and that under normal conditions they would be expected to be on heat again in four or five days.

Similar tests, made as controls, with Drs. Swingle's and Pfiffner's extract of the adrenal cortex did not bring about a pregnant appearance of the vaginal mucosa in non-pregnant mice.

Since then the workers at the University of Rochester, School of Medicine (W. M. Allen and Roland K. Meyer) have found that a similar (mucification) reaction is obtained, in rodents from which the ovaries have been removed, by daily injections of minute quantities of oestrus (heat period) producing extracts. From their work they conclude that the test suggested by Dr. Harris is not valid for potency of extracts of corpora lutea.

There does not yet seem to be sufficient evidence, however, to accept this view, particularly as Meyer and Allen are working with animals from which the ovaries have been removed, whereas Harris outlined his test for normal, unoperated animals.

The fact that animals with their ovaries intact and those from which their ovaries have been removed may give different reactions to glandular extracts is clearly brought out in a series of tests conducted here.

Among the active fractions produced by the pituitary gland is one known as the luteinizing fraction. This has been found, under certain conditions, to be active in bringing about the formation of corpora lutea in the ovaries of non-pregnant animals. In a series of tests conducted with this substance, Dr. Harris found that daily injections brought about partial, though not typical mucification of the vaginal mucosa of mice from which the ovaries had not been removed. In mice whose ovaries had been removed, however, the same treatment had no apparent effect upon the vaginal mucosa.

Work is being continued with this substance, with human blood-serum, and with theelin (an oestrus producing substance).

Bryology

Dr. Grout has continued to make progress in the preparation and publication of his monographs on "Moss Flora of North America, North of Mexico". In June of the current year, Part 2 of Volume III was

published. It deals with the Hypnaceae-Amblystegieae.

Other workers are collaborating with Dr. Grout in the preparation of other parts of the "Moss Flora". They include Dr. A. Leroy Andrews of Cornell University, Mr. George N. Jones of the State College of Washington, and Professor Winona H. Welch of the University of Indiana.

In addition to the preparation of "Moss Flora", Dr. Grout has written several short papers including "Mosses in Landscape Gardening", and has collaborated with Prof. E. J. Dole of the University of Vermont in the preparation of a list of "Vermont Mosses".

During August and part of September Dr. Grout was in residence at the Laboratory, directing the work of graduate students in Bryology. The results of this work are told under "Instruction".

Protozoology

(Dr. Schaeffer, guest investigator. Miss Olive Schaeffer, Miss Mary Schaeffer, and Mr. Schnorr, Summer Assistants).

Dr. Schaeffer, who has been a guest investigator at the Laboratory since June, is continuing his researches, the general object of which is "the further investigation of the molecular organization of protoplasm".

It will be remembered that in the past Dr. Schaeffer has made many systematic studies of spiral movement in animals, and spiral movement or growth in plants. His observations upon amebas, and upon blind-folded persons, walking, swimming, driving an automobile, or flying, are well known from previous reports.

Dr. Schaeffer has made other interesting observations. He has found that the rate of metabolism (chemical use of energy in the body), the rate of reproduction, and the "field strength", is markedly greater in predominantly left spiralling amebas than in predominantly right spiralling amebas; the size of the body is greater in "right" amebas than in "left" amebas; while changes of intensity of visible and of ultra violet light affect the two forms very differently.

Dr. Schaeffer has been extending his observations, particularly those concerning the "field strength", upon other species. His report, on page 49 gives details, and tentative interpretations, of his findings.

Adrenal Studies in the Fowl

In addition to associating in Dr. Salant's researches, Mr. Parkins has carried on under Dr. Swingle's direction a study of the effect of 1) the removal of both adrenal glands in the fowl, and 2) the subsequent administration of the Swingle-Pfiffner extract of the adrenal cortex.

He found that symptoms of adrenal insuffciency develop more rapidly, particularly at terminal stages, in fowls than in other animals. The survival period, after removal of both adrenals, being only 38 to 146 hours in fowls. The operated birds showed an increase of uric acid in the blood, of from nearly 200 to 600 per cent; the rise being particularly marked in advanced stages of adrenal insufficiency. At the same time there is a fall in blood sugar.

The fowls responded, in some cases very rapidly, to administrations of the Swingle-Pfiffner extract, returning to normal appearance and activity, while the blood returned to its normal chemical content.

These same animals, following discontinuance of daily injections of the extract, all died within 2 to 6 days of adrenal insufficiency.

In addition to these specific results, Mr. Parkins' studies set forth the general fact that birds react to adrenal insufficiency much as man and other mammals do, and that the Swingle-Pfiffner extract is effective in birds as well as in mammals.

Seasonal Research

The Laboratory continues to act as a clearing house for scientific methods and ideas, at the same time furnishing the opportunity for biologists to carry on research during the summer. The number of biologists to whom the Laboratory can thus be of service has now reached a relatively constant figure at forty, fixed by present laboratory facilities and living accommodations. This number of research workers is augmented by some twelve or fifteen members of the permanent staff.

A number of the visiting investigators, their institutions and their work, are listed herewith, though others who cooperated particularly with members of the all year staff are omitted from this list as they have already appeared in the statements concerning all year work.

The type of work carried on by visiting investigators covered, of course, a wide range of experimental biology and medicine. As the reports of individual workers are appended to this report their research is merely listed here.

An important change in the Association's aid to medical biology came with the return of its support of the Swingle-Pfiffner researches on the adrenal cortex to a summer basis from an all year basis. This was possible because of the facts that the Association was instrumental in obtaining for this work, a grant from the Macy Foundation. The Association also turned over all funds received from, and all rights of funds to be received in the future from, Parke, Davis Company, directly to Princeton University and to the Research Corporation, such funds to be applied to the support of further researches by Drs. Swingle and Pfiffner. Their investigations have continued to be very productive, under these new arrangements.

Dr. Swingle's work at the Laboratory this summer included testing of further fractions of the adrenal cortical hormone, and testing reextracted cortical glands.

A distinct advance in the technique of extraction has been made by Drs. Swingle and Pfiffner, in that they now have a highly concentrated hormone-product for clinical use, which is several times stronger than their original extract. Indeed the present method of extraction takes all but 5 per cent of the hormone from the glands.

For further indications of the advance made in this work, see papers by Dr. Swingle and others, given in the list of publications on page 16.

Dr. Israel S. Kleiner, Professor of Physiological Chemistry, at the New York Homeopathic Medical College and Flower Hospital, assisted by Mr.

Joseph Hahn and Miss Rebecca Halpern, of the same institution, continued his studies of the condition of the sugar of the blood, particularly in diabetes. Mr. Hahn also did experiments upon the relation of dosage of adrenalin to its action in producing a high blood-sugar.

Dr. Franklin Hollander, Assistant Professor of Physiology, New York Homeopathic Medical College and Flower Hospital, assisted by Mr. Cornelius Kaylor, now of Rutgers University, and Mr. F. Alvin McCann, now of the University of Tennessee, continued his researches on the mechanism of hydrochloric acid formation in the mammalian stomach.

Dr. Edgar Allen, Dean of the University of Missouri, School of Medicine, in addition to being in charge of the course in Surgical Methods in Experimental Biology, organized a book, upon which some twenty-two biologists and medical men are cooperating, on "Sex and Internal Secretions". Together with organizing this book as editor-author, Dr. Allen was writing his own section.

Mr. R. Gaunt, graduate student at Princeton University, working under the direction of Dr. Swingle, completed researches upon the adrenal glands and carbohydrate metabolism.

Dr. Charles Weiss, Associate Professor of Opthalmology, Washington University, School of Medicine, in addition to taking lectures in the course in general physiology, worked over experimental data in preparation for a manuscript on "Search for Agglutinins in the Sera of Trachoma Patients and in Monkeys Infected with Bacterium Granulosis".

Mr. E. C. Nelson, of the Department of Protozoology, School of Hygiene and Public Health, Johns Hopkins University, conducted research upon parasitic protozoa, especially of man.

Dr. I. R. Taylor's illness prevented him from proceeding with his research upon the physiology of metamorphosis. However, one of his graduate students, Mr. Frederick Crescitelli, Graduate Assistant at Brown University, completed sugar-analyses made on bee moth pupae at periodic intervals during metamorphosis.

Miss Helen Whitcomb, also a Graduate Assistant at Brown University, commenced an investigation of the physiological effects of high-frequency electrostatic fields on mouse sarcoma.

Miss Louise Palmer, of the United States Bureau of Fisheries, continued her studies on starfish control, particularly the relative reaction of starfish and of oysters to certain toxic substances.

Miss Margaret Baskervill, now of the College of Physicians and Surgeons, Columbia University, studied the differentiation of tissues in respect to susceptibility to various alkaloids. She made use particularly of marine organisms in these researches.

Mr. James H. Birnie, now Graduate Assistant at Brown University, studied regeneration in Fundulus (killifish) embryos. (Dr. J. S. Nicholas of Yale University kindly instructed Mr. Bernie in the use of his technique.)

Mr. T. L. Smith, graduate student at Columbia University, continued his researches upon the effect of irradiation, by X-rays, upon the production of mutations in the bee-moth.

Mr. Theodore G. Adams, graduate student at Columbia University,

studied the Feulgen Reaction (a dye-staining reaction) in the micronucleus of ciliates.

Dr. S. I. Kornhauser, Professor of Anatomy and Embryology at the School of Medicine of the University of Louisville, extended his observations on the use of vital dyes on the ovarioles of Anisolabis (the seaside earwig), in addition to carrying on other work.

Mr. Herman T. Spieth, Fellow, Department of Zoology, University of Indiana, studied the distribution of mayflies in this region.

Mr. C. H. Curran, Assistant Curator of Entomology, American Museum of Natural History, engaged in a continuation of 1) life history studies of the beetle **Lema trilineata,** and 2) faunistic studies of insects with special reference to Diptera (flies). The first part of the work was carried on, under Mr. Curran's direction, by Misses Lucy W. Clausen, and Marion E. Outerbridge, students in Field Zoology.

Dr. H. J. Conn, Chief in Research, Soil Bacteriology, New York State Agricultural Experiment Station, was engaged in direct microscopic study of bacteria of the soil as a means of finding out the effect of different fertilizer treatments on the soil at Cold Spring Harbor.

Dr. Henry S. Conard, Professor of Botany, Grinnell College, in addition to other work, was engaged in furthering his ecological studies of this region.

Instruction

The courses were maintained upon an advanced basis. No courses were eliminated and no new courses were added, save that advantage was taken of Dr. Grout's presence at the Laboratory to give graduate students in botany an opportunity to work under his direction.

It is of interest to notice that each of the three students who worked with Dr. Grout for the six weeks presented final papers of merit sufficient for publication (as noted in Dr. Grout's report and in the list of publications). In addition to the full time students Prof. Blizzard of Coker College, and Dr. Stella Hague of the University of Illinois worked with Dr. Grout.

The course in Surgical Methods in Experimental Biology was under the capable leadership of Dr. Edgar Allen, Dean of the University of Missouri, Medical School. Of the five students enrolled in the course, three were graduate assistants, one was an instructor, and one an assistant professor.

Dr. I. R. Taylor, of Brown University, was again in charge of the course in General Physiology, but, due to a sudden attack of appendicitis, he was forced to leave before the completion of the course. Dr. J. H. Bodine, head of the Department of Zoology at the University of Iowa, and formerly in charge of General Physiology at the Laboratory, kindly and generously took command of the situation during Dr. Taylor's absence.

The quality of the students of this course, and the consequent opportunity of the instructors to combine advanced instruction and research in it, have improved from year to year since the course was first offered a few years ago. Of the seven full time students this year one was an undergraduate, four were graduate students, one a graduate assistant, and

one an associate professor. Dr. Taylor is taking full advantage of the increasing opportunities, and is an important factor in bringing about the continued improvement.

Field Zoology remained under the competent leadership of Dr. S. I. Kornhauser, Professor of Anatomy and Embryology at the Medical School of the University of Louisville. The plan, inaugurated last year, of having each two students in the course work together upon a problem of research as an important part of their work in course, was utilized again to good advantage. The papers reporting the results of these several researches were a credit, both to the students and to the instructor. Of the fourteen students who took the course, six were undergraduates, three were graduates in 1931 and intended to continue in biology, three were graduate assistants, one a lecturer, and one an assistant professor.

Several of the students in Field Zoology, remained after the closing of the course, to continue their researches, a procedure which is fairly common among students in the courses previously mentioned.

Dr. Kornhauser was assisted again this year by Mr. Howard Curran, Assistant Curator of Entomology at the American Museum. Mr. Herman Spieth from the University of Indiana, and a specialist in fresh water organisms was a new member of the staff of the course.

Dr. H. S. Conard again capably took charge of the course in Field Botany and Ecology. It is our desire to have the course unique in content and method of approach. At present it is planned to give the new method, which will stress plant association, as complete a test as possible next year. Dr. Conard has been working toward this goal, and is unusually well fitted to carry out the new plan. With this change all of the courses at Cold Spring Harbor will offer advantages of method which are not duplicated elsewhere.

Students

The following lists, in addition to naming the students who took courses at the Laboratory last summer, give indications of their sources, trainings and experiences.

In Field Zoology: William H. Bayliff, Assistant Professor of Biology, St. John's College; Adele M. Burcher, Undergraduate, Barnard College; Lucy W. Clausen, Graduate, Long Island University, 1931; Mary Eleanor Davis, Graduate, Smith College, 1931; Brayton Eddy, Graduate, Brown University; Josephine H. Howland, Graduate, Elmira College, 1931; William A. Johnson, Undergraduate, Pittsburgh University; Marion E. Outerbridge. Undergraduate, Smith College; Celia Read, Undergraduate, Mount Holyoke College; Charles Schnorr, Undergraduate, University of Kansas; Vera I. Smith. Graduate Assistant, Brown University; Mable R. Walter, Graduate Assistant, University of Illinois; Anna M. Warshaw, Undergraduate, Brooklyn College, and Morris Winokur, Graduate Student, College of the City of New York.

In General Physiology: David E. Bass, Undergraduate, Brown University; James H. Birnie, Graduate, Morehouse College; R. Irving Blanchard, Graduate Assistant, Brown University; E. Wilbur Cook, Jr., Associate

Professor of Biology, Center College; F. Alvin McCann, Graduate, Maryville College; Josephine M. McIntire, Graduate, Brown University, 1931, and Helen Whitcomb, Graduate Student, Brown University.

In Surgical Methods in Experimental Biology: Roy P. Ash, Graduate Assistant, Brown University; Ernest W. Blanchard, Ph. D., Princeton, 1930; Assistant Professor of Physiology, University of Maryland; Frederick Crescitelli, Graduate Assistant, Brown University; Elmer C. Herber, Instructor, Dickinson College; Ruby Hirose, Graduate Student, University of Cincinnati, School of Medicine.

In Field Botany and Plant Ecology: May Meiselbach, Undergraduate, Adelphi College; Alice Palleri, Teacher, Washington Irving High School; Nazzareno Palleri, Teacher, Lake Junior High School; Edna Sturm, Graduate 1931, George Washington University.

In Bryology: Barbara Andrew, Assistant in Botany, University of Alabama; Marian Parker, Graduate 1931, Adelphi College; Josephine Ross, Graduate 1931, Wellesley College.

Evening Lectures

The public evening lectures delivered at the Laboratory this year maintained the high standard which has been set. They are listed herewith:

Dr. Edgar Allen, Professor of Anatomy, Dean, School of Medicine, University of Missouri, and Doctor Reginald G. Harris, Director, The Biological Laboratory—"Symposium on the Physiology of Reproduction in Mammals".

Dr. Ezra Allen, Associate Professor of Histology-embryology, New York Homeopathic Medical College and Flower Hospital—"An Analysis of the Sex Development Problem in Mammals".

Dr. J. H. Bodine, Head of the Department of Zoology, University of Iowa—"Rhythms or Cycles in Development".

Dr. John T. Buchholz, Professor of Botany, University of Illinois—"Pollen-tube Growth".

Dr. H. S. Conard, Head of the Department of Botany, Grinnell College—"The Plant Association".

Dr. H. J. Conn, Chief of Research in Soil Bacteriology, New York State Agricultural Experiment Station, and Dr. S. I. Kornhauser, Professor of Anatomy and Embryology, University of Louisville, School of Medicine —"Symposium on the Uses of Biological Stains".

Mr. C. H. Curran, Assistant Curator, Department of Entomology, American Museum of Natural History—"Development of Social Life Among the Insects".

Dr. Charles B. Davenport, Director, Department of Genetics, Carnegie Institution—"Relation of Heredity and Environment in Disease".

Dr. M. Demerec, Member of the Staff, Carnegie Institution of Washington, Department of Genetics—"Genes. A Review of Recent Experiments".

Dr. S. R. Detwiler, Professor of Anatomy at the College of Physicians and Surgeons, Columbia University—"Experiments on the Development of the Nervous System". (Illustrated by motion pictures).

Dr. Hugo Fricke, Biophysics, The Biological Laboratory—"The Chemical and Biological Effects of X-rays".

Dr. A. J. Grout, Bryology, The Biological Laboratory—"Mosses".

Dr. Franklin Hollander, Assistant Professor of Physiology, New York Homeopathic Medical College and Flower Hospital—"Gastric Physiology Today".

Dr. Davenport Hooker, Professor of Anatomy, University of Pittsburgh, School of Medicine—"Some Anatomical and Physiological Results of Spinal Section in Vertebrates".

Dr. I. S. Kleiner, Professor of Physiological Chemistry, New York Homepathic Medical College and Flower Hospital—"Gastric Physiology Yesterday".

Dr. H. H. Laughlin, Assistant Director, Department of Genetics, Carnegie Institution—"Differential Fecundity".

Professor H. J. Muller, Professor of Zoology of the University of Texas—"Genetic Effects of X-rays".

Dr. J. S. Nicholas of the Department of Zoology of Yale University —"The Experimental Analysis of Early Stages of Rat Development".

Dr. William Salant, Pharmacology, The Biological Laboratory— "Further Studies on the Effect of Ions on the Action of Drugs".

Dr. Asa A. Schaeffer, Guest Investigator, The Biological Laboratory —"Spiral Movement and the Organization of Protoplasm".

Dr. Morris Steggerda of the Department of Genetics, Carnegie Institution of Washington—"Anthropological Studies in Yucatan".

Dr. W. W. Swingle, Professor of Biology, Princeton University— "Physiological Studies on the Adrenal Cortex".

Dr. D. R. A. Wharton, Bacteriology, The Biological Laboratory— "Lipoids in Immunity".

Women's Auxiliary

The Women's Auxiliary has been very active this year in improving living conditions at the Laboratory. The most outstanding effects of this activity are to be seen in the purchases of 96 new mattresses, 40 springs and cots, and other furnishings. The Auxiliary also aided appreciably in renovating two floors of the old Cold Spring Harbor fire house, which was purchased and moved to the Laboratory grounds last winter.

For their several purposes the Women's Auxiliary Board raised and expended, during the year, $2,947.90.

Wawepex Society

The Wawepex Society, under the leadership of Charles M. Bleecker, Governor; Jesse Knight, Scribe, and Walter J. Whipple, Custodian, continues to lease certain buildings and grounds, and to give financial support to the Laboratory in the generous manner of its founder, Mr. John D. Jones. The support of the Society is very much appreciated.

Cooperating Institutions

Forty-one colleges, universities, and medical schools were represented at the Laboratory this year.

The following institutions cooperate in the work of the Laboratory by granting scholarships in their institutions applicable to the Biological Laboratory, or by a loan of equipment, or by giving financial aid to members of their institutions in residence at the Laboratory.

Adelphi College
American Mumeum of Natural Hist.
Brown University
Center College
Coker College
Columbia University
Johns Hopkins University
Long Island University
Lucius N. Littauer Foundation
New York Academy of Medicine
New York Homeopathic Medical College and Flower Hospital
New York Univ., Medical School
Princeton University
St. John's College
Smith College
United States Bureau of Fisheries
University of Pennsylvania
University of Pittsburg
Yale University

Contributions

Contributions from members of the Long Island Biological Association were somewhat adversely affected this year by the unfortunate general business situation. In the emergency, the Association received aid from outside sources (as related under "Outside Support Granted the Association"). By far the majority of members contributed as they have in the past. Some found it necessary to reduce contributions. To all who contributed, however, the Association is very grateful. The larger contributors are listed herewith: from $1,000 to $20,000: Carnegie Corporation, Henry W. de Forest, Mrs. Leonard Elmhirst, Marshall Field, Walter Jennings, Russell C. Leffingwell, Wilton Lloyd-Smith, Mr. and Mrs. Van-Santvoord Merle-Smith, George D. Pratt, Harold I. Pratt, Rockefeller Foundation, Mrs. W. Emlen Roosevelt, Mortimer Schiff, William K. Vanderbilt, Wawepex Society; from $500 to $1,000: Mrs. Ethel Clyde, Anton G. Hodenpyl, Acosta Nichols, John Schiff; from $100 to $500: Dr. James C. Ayer, Frank L. Babbot, Thomas Cochran, W. R. Coe, John W. Davis, Mrs. H. P. Davison, Mrs. Henry W. de Forest, Robert W. de Forest, F. N. Doubleday, Mrs. Walter B. James, Mrs. Walter Jennings, Miss Mabelle F. Lane, Gerald M. Livingston, A. G. Milbank. Ogden Mills, J. P. Morgan, Mrs. Acosta Nichols. I. R. Oeland, Frederick B. Pratt. John K. Roosevelt, Thomas Roulston. Mrs. C. C. Rumsey, Carl J. Schmidlapp, Henry L. Stimson. George Whitney, Mrs. Timothy S. Williams, Mrs. Willis D. Wood, Willis D. Wood.

General and Recommendations

The fact that two of the most conservative and competent bodies in the country have, of late, given their approval to the Biological Laboratory, through aiding in the support of its work, is a significant indication of the success with which our general policies and work have been accomplished. The bodies referred to are (1) National Research Council; (2) Rockefeller Foundation. In addition, Carnegie Corporation helped support certain definite work of the Laboratory this year.

It will be remembered that some five years ago we decided to modify the policy of the Laboratory; to make the summer-courses for students

more advanced, introducing the students to research-methods; to place the greatest emphasis on research in the summer, and throughout the year. Such was our new general policy. It is now timely to consider specific applications in some detail.

Four years ago we invited Dr. Fricke to join our all-year staff and to establish here a laboratory for biophysics. This laboratory and Dr. Fricke's work have become one of our major enterprises. This is partly due to the man, partly to biophysics itself. Biophysics is one of the most modern, and one of the most promising, fields of research. It is promising, in large measure, because as an untrod territory it presents almost unlimited opportunity for discovery. At the same time, its method (in which accuracy of measurements and caution of interpretation are outstanding characteristics) is one which cannot fail to be of value to biology. Such characteristics make biophysics a most valuable part of a laboratory such as we are operating at Cold Spring Harbor.

The task of establishing the laboratory for biophysics was large. Equipment had to be collected and put in place; and a large part of it had to be designed and constructed in our own laboratory. Even the X-ray tubes, used in much of the work, had to be of home-manufacture, as commercial and clinical tubes were not satisfactory for the work which Dr. Fricke wished to carry out.

Our early reports were, perforce, largely limited to statements of progress in the formation of the biophysics laboratory. Now we can report that that laboratory has completed the chiefly formative stage, has entered the productive state.

The department of biophysics is well staffed for its technical work. It has a glass-blower, an instrument-maker, a radio-engineer. But Dr. Fricke is not so well supported in his research staff. At present he has but one associate in research—a chemist. (Last summer Dr. Fricke had three additional assistants and associates.)

It is highly desirable that immediate attention should be given to procuring additional assistance in research for Dr. Fricke. The extent of productivity of the laboratory for biophysics depends upon it.

In the second place, biophysics should be supplemented, at Cold Spring Harbor, with general physiology. If there is any division of biology which is the basis of modern biological research, I believe I am safe in saying that, it is general physiology. As an indication of this, we need only turn to Woods Hole, which is now predominantly a summer-laboratory of general physiology.

A laboratory, situated as is our Laboratory at Cold Spring Harbor, should have an outstanding department of general physiology. Marine and fresh-water organisms form the backbone of material for research in this field.

Fortunately, biophysics and general physiology go hand in hand. In general, they require similar technical help, and the same type of machine-shop, while equipment-requirements are often similar, or mutually supplementary. This means that we already have a good start toward the formation of a department of general physiology. There is the further benefit that a competent staff in general physiology is of great benefit to

those working in biophysics as well as in other branches of biology. The reverse is equally true.

Summer Work

General physiology should be built up during the summer as well as being suitably represented in our all year work. During the summer the easiest means of approach is probably through our course in general physiology. The staff of this course should be increased; the period in which students remain at the Laboratory should be lengthened, to permit them to make a good start upon their research; and the equipment for the course should be made more nearly adequate.

Additional scholarships should be given for general physiology and for other summer work. Last summer we had more, worthy applications for scholarships than ever before. Three special and temporary scholarships were given to aid in the emergency. I believe the urgent call for scholarships this coming season will be still greater. At least one university has voted to discontinue, this year, its scholarships, both to Woods Hole and to Cold Spring Harbor. I do not doubt that other universities in which these scholarships are not endowed, have taken, or will take, similar action.

We must provide scholarships so that young men and women of promise in biology may be suitably trained for their work in the future. Training that is postponed is seldom taken up at a later date, (this is apparent in the present relative poverty of productive biologists in France) and advance in knowledge suffers accordingly.

Funds For Scientists on Sabattical Leave or Out of Jobs

Quite as important as fostering its own programs of research, the Laboratory recognizes its duty in respect to helping biologists, when circumstances warrant. This attitude was the basis of our action in support of Dr. Swingle's work. That work, as a result of the Laboratory's putting its shoulder to the wheel, has gone forward to an amazing degree.

The Laboratory is in a peculiar position whereby it can evaluate work and need in stages and circumstances into which Foundations seldom enter, or at least under which they seldom give support. The Association can and should, at times, say, "To him that hath little shall be given".

The foregoing recommendations have all met with the approval of the Scientific Advisory Committee. Beyond these needs which stand out even in times of great financial conservatism, the Committee has recommended that I present the need of a more adequate library and a building to house it. I scarcely need say that I support this recommendation.

During the eight years since the transfer of the Biological Laboratory to the Long Island Biological Association, marked progress has been made in the work of the Laboratory. This has been made possible, in large measure, by the fine support of officers and members of the Association, and, during the last few years, by the constant work of our President, Arthur Page. It is to be most fervently hoped that that fine support will continue during the present difficult times.

Reginald G. Harris.

Report of the Scientific Advisory Committee for the Year 1931

The policies adopted by the laboratory some two years ago, wherein especial emphasis was to be given the question of research and the more rigid selection of students for courses offered at the laboratory, have shown marked evidence of their soundness and the committee strongly feels that they should be continued. Needed additions and improvements to the living facilities for research workers have been well taken care of during the past year.

Further questions of policy, primarily relating to courses and course work offered during the summer, have been considered and the committee feels that the present plans will, in the course of a few years, bring about the desired results.

Quality and amount of research produced during the past year have been especially gratifying in view of the rather stringent policies adopted.

Questions of continued financial support, endowment, library, etc., have been discussed and all are agreed that these are points of vital interest for the future welfare of the laboratory.

J. H. Bodine,
Chairman.

Report of Special Scientific Advisory Committee on Biophysics

The Advisory Scientific Committee is glad to report that the construction of X-ray tubes in the Biophysical Laboratory has reached a high stage of efficiency. It is essential to have tubes of large capacity, since the effect produced in solutions must be great enough to be measured by chemical means.

Dr. Fricke has discovered that the action of X-rays on certain solutions is affected to an extraordinary degree by minute traces of foreign substances which may come from the air. The bearing of this on biological studies is obvious.

He has determined the effect of X-rays in activating oxygen in certain cases, a matter of fundamental importance for biology, as is also the fact that hydrogen peroxide can be produced by action of X-rays on water. This latter fact was found by Miss Cecile Ludlam, working under Dr. Fricke's direction.

It seems possible to use some of these chemical methods to measure X-ray dosage in hospitals.

The X-ray has the useful property of picking out particular constituents or structures in living organisms, and Mr. Irwin Sizer, working under Dr. Fricke's direction, has made very interesting photographs showing some of these structures in insects. It seems possible to follow in this manner certain physiological processes in the living body.

Much important information regarding living cells is obtainable by observing their behavior when subjected to alternating electric currents. Dr. Fricke's studies on this subject are outstanding. He has continued this work and has made interesting observations on the effects of temperature in this connection. The method has also been applied to certain phases of immunity, which have to do with the surfaces of red blood corpuscles.

W. J. V. Osterhout.
Chairman.

Report of the Secretary

During the year 1931 there were held three meetings of the Board of Directors as follows:

The 24th meeting of the Board of Directors was held in New York City, February 2nd, 1931, 14 members being present. The director gave a report on the operations of the Laboratory for 1930, as it has subsequently appeared in the annual report. The president presented a budget and it was voted that the summer work be continued as hitherto; that the work of Drs. Fricke, Salant and Grout be continued and that the work of Dr. Wharton on diseases carried by cats which is supported by special gifts be also announced. Mrs. Van Santvoord Merle-Smith was elected to the Board of Directors, class of 1932 in place of Mr. Harold I. Pratt, resigned; also Dr. James Cook Ayer was elected to the Board of Directors, class of 1933, in place of Col. Williams, deceased.

The secretary reports the deep sense of loss in the deaths of former members of the Association. Mr. Robert W. deForest, who died May 7th, 1931, has been regularly a supporter of the laboratory since its foundation. Mr. Mortimer L. Schiff, who died June 4th, had been a member of the Board of Directors of the Association since its incorporation. By virtue of his generous gifts he had been elected to the class of founders. The leading characteristic of Mr. Schiff was his ability to meet crises by appropriate action, even though at considerable personal cost. He thus met crises in the history of the Association. Mr. Oran W. Rice died May 3, 1931. He established the Dorothy Frances Rice scholarship in memory of his daughter, a former student at the Biological Laboratory. This scholarship has been given annually since its establishment and Mr. Rice provided for its gradual increase.

The 25th meeting of the Board of Directors was held at Blackford Hall, Cold Spring Harbor, August 14th, 1931, 10 members being present. The officers whose names appear in the current annual report were re-elected. An executive committee was chosen consisting of: Arthur W. Page, Walter Jennings, Marshall Field, W. J. V. Osterhout, John K. Roosevelt, Acosta Nichols, C. B. Davenport. The president reported for the treasurer that the Carnegie Corporation would pay to the Association in November $15.000 and this action of the Corporation was gratefully acknowledged. Recommendations from the scientific advisory committee were presented, as printed elsewhere in the annual report. On account of contraction of income support of the work of Dr. Salant after May 15, 1932, was found impracticable.

The 26th meeting of the Board of Directors was held in New York City, December 22nd, 1931, 16 members being present. The president spoke briefly on the work of the year, stressing the fact that the Association is maintaining what is probably the most important biophysical laboratory in the country and that work in general physiology should be provided for to secure the proper biological cooperation with Dr. Fricke's work. He referred to the gift of the Carnegie Corporation of $15.000 to be used, in part, for the support of Dr. Fricke's work and, in part, for general purposes, and he expressed the appreciation of the Board

of the act of the Carnegie Corporation in making this grant. He called attention to the grant from the Rockefeller Foundation of $20,000, a recognition of the quality of the work of the Laboratory which must be gratifying to all of the directors. It was understood that these grants are given with the understanding that the contributions from local sources shall be maintained and despite the depression they have been maintained nearly intact. He expressed the appreciation of the Board of the continuation of the support of the Laboratory by the community. Director Harris presented a report which appears in print in this annual report. He also presented a budget for 1932, showing an anticipated expenditure of $58,100. The budget, as presented, was approved with a provision that the Executive Committee be authorized to make necessary adjustments in it. It was voted that if more funds become available the director should devote himself to finding a man trained in general physiology and anatomy for the laboratory staff.

C. B. Davenport,
Secretary.

Mr. Adams' Report

The Feulgen Reaction and the Micronucleus

Recently investigators have had some difficulty in staining the micronucleus of ciliates with the Feulgen reagent due either to the dye used in making sulphurous fuchsin or the use of the technique.

Dr. Conn of the experimental station at Geneva New York State has advised the use of a basic fuchsin of the certificate number C. F. 10 Coleman and Bell Co.

Using this dye and the method given in Lee's Vade mecum ninth edition, it was possible to stain the micronucleus in the ciliate Prorodon the color intensity of the micronucleus is the same as that of the macronucleus. Also I obtained the reaction in the chromidial net of Arcella vulgaris the granules of which strangely enough do not stain with or rather do not react with the usual iron hematoxylin stain.

I have spoken to Dr. Conn about this peculiarity of the basic fuchsins which he thinks, are due to impurities in the dye.

Therefore to obtain a successful Feulgen reaction with American made dyes it is necessary to use the batch C. F. 10 Basic fuchsin put out by the Coleman and Bell Company.

Dr. Edgar Allen's Report

Besides repeating a few experimental procedures with the class, Surgical Methods in Experimental Biology, I did little research at Cold Spring last summer. Most of my time was taken up organizing the group for work on our book on "Sex and Internal Secretions" and in writing my own section of that book. This is now pretty well along and I expect to have the manuscripts from some twenty-two contributors before the Christmas Holidays.

Miss Baskervill's Report

The Effects of Alkaloids on Developing Eggs

Preliminary experiments were carried out on the effects of certain Alkaloids on the developing eggs of Fundulus. The effects of these Alkaloids on the undifferentiated eggs and on eggs at different stages of development were studied.

The object was to determine when, in the specialization of the tissues, the specific effects of Alkaloids on the nervous tissues become apparent.

An insufficient number of experiments were carried out to report results at this stage.

Professor A. W. Blizzard's Report

I wish to state that I did not complete the work last summer at Cold Spring Harbor in which I was engaged, and have not found time this autumn to take it up. The particular problem I had in hand was the revision and classification of certain Hypnaceus Mosses. I also continued a study of plant sociology.

Dr. Conard's Report

The botany class this year was entirely in charge of Dr. Conard, without the usual assistant. Consequently nearly all of the daylight hours were occupied with the lectures, field trips and supervision of laboratory work. Between whiles Dr. Conard, with the aid of Dr. Grout, identified a large collection of mosses from northeastern Iowa, as a part of a project on the occurrence, distribution and social relations of mosses in Iowa. Several species new to the state were found in the collection. A collection from Owen Sound, Ont., was also identified, including a number of rare boreal forms. Last year's key to the mosses of Cold Spring Harbor was further tested by use with the class.

Near the end of the season a re-survey was made of the "denuded area" along the railroad east of Cold Spring Harbor station. This is probably a final survey, preparatory to a final report on work first published in 1913 and again in 1923. A little progress was made on the description of the flora of the laboratory region from the sociological viewpoint. Visits were made to the residence-estates of H. deForest, O. Kahn and Senator Cutting, and to the High Hill property of the R. deForest estate. On this property some young sporelings and a withered gametophyte of Botrychium obliquum were found. A short paper on this rare specimen is in preparation.

Dr. Conn's Report

The Direct Microscopic Study of Bacteria in Soil

For nearly fifteen years I have been employing a method for the microscopic study of bacteria in soil, using the dye rose bengal to stain dried soil infusion. Recently a Russian, Cholodny, has modified this method by allowing slides to stand in the soil, and in this way securing a film of the micro-organisms that has grown naturally on the slide. I was using this method this summer in the study of the effect of different fertilizer treatments on the soil at Cold Spring Harbor. Certain interesting observations were made in this connection; but as the work was entirely new, the data so far collected are not sufficient to permit any definite statement.

Mr. Curran's Report

(Includes Work of Miss Clausen and Miss Outerbridge)

As in the year 1930, research work at the Biological Laboratory was divided into two sections, (a) Life history studies of **Lema trilineata** and (b) Faunistic studies of insects with especial reference to Diptera.

(a) **Lema trilineata.** The investigations this year were entrusted to Misses Marion E. O. Outerbridge and Lucy W. Clausen, students in the Field Zoology course, and considerable progress was made toward the solution of the problems outlined in last year's report. A brief summary of the results obtained over the two years' investigation might prove of interest. Unfortunately the work has extended over a period of only five weeks in each year and only a limited amount can be done in such a short time.

The life cycle during the summer averages about one month; the eggs hatch in five to seven days, the larval stage lasts for eleven to twenty days, depending upon conditions and the pupal stage from eleven to eighteen days. It will be seen from this that there may be a great variation in the completion of the life cycle, that is from twenty-six to forty-five days, and an additional five or six days elapses between the emergence of the adult and egg laying.

This difference is due entirely to varying conditions. In the case of the egg the temperature is an important factor while the abundance and palatability of the food affects the larvae.

During 1931 determination of the effect of soil conditions on the larvae received most attention and produced very interesting results. In wet clay all of the larvae pupated, but 16.6 of the pupae died, pupation in this soil taking place about one inch below the surface. Where dry clay was used 3.3 percent of the larvae died after entering the soil and 11.4 per cent of the pupae formed failed to develop. Wet sand gave the highest mortality, 46.4 per cent of the larvae failing to pupate and 25 per cent of the pupae dying. Experiments to determine pupal mortality when buried at various depths were started but were not completed. This phase is important since, it may be possible to destroy the pupae by plowing them under if it is found that the newly emerged adults are unable to reach the surface from a depth of three or four inches.

(b) The collection of insects in connection with the faunal studies was continued. In order to obtain a more representative collection several visits to the Laboratory were made before the opening of the course in Field Zoology and after its close a very large number of seasonal forms being secured. Many rare insects were secured as well as several new to science. Among the great rarities I should mention **Glutops singularis,** a Leptid Fly of which only a dozen specimens are in collections. The identification of the collections made is being done at the American Museum of Natural History and considerable progress has already been made. A complete report on the fauna of the region, however, must await further collecting and the assistance of specialists in the various orders of insects.

Dr. Ecker's Report

Dr. Fricke and I made some preliminary studies as to the effect of sensitization of sheep red blood corpuscles with an anti sheep amboceptor and the capacity (electrical) of such a cell. To our surprise we found no difference. The sensitized cells packed much better, had a greater resistance but the capacity remained unaltered. This fact is important since a great deal has been said in relation to changes (electrical) on surfaces of cells when specifically treated with an antibody.

Dr. Fricke's Report

(Includes Statements of the Work of Dr. Washburn, Dr. Ecker, Miss Ludlam and Mr. Sizer)

The construction of X-ray tubes has been carried to a temporary conclusion, in so far as tubes are now made of a power rating equal

to that of our high potential generating equipment, 10 K. W. These tubes are used in studies of the chemical effects of X-rays, making possible the application of dosages of over one million r-units per hour. It is essential to have tubes of large capacity for this work since the amount of chemical transformation produced by X-rays is very small.

The reduction of aqueous solutions of chromic acid by X-rays has been carefully studied. Serious difficulties have been encountered in this work due to the fact that the sensitivity of these solutions to irradiation is markedly affected by traces of foreign substances so minute as to be undetectable by the usual methods of analysis. The solution must be scrupulously protected from the laboratory air, since substances are contained therein which have the power to change the effect. Impurities encountered thus far increase the effect. Substances of organic origin are probably active in this respect, at least the addition of minute amounts of organic substances, like sugar, greatly increases the effect. A state of saturation is soon reached when a chromic acid solution is contaminated, further addition of impurities thereafter causing no further increase of the effect of the rays. When this state is reached the effect is about 100 percent larger than for a pure chromic acid solution. This was responsible for a very peculiar situation. When the action of X-rays on a chromic acid solution was determined several years ago in Cleveland, as well as last year here at Cold Spring Harbor, we obtained effects which were reproducible and nevertheless, as we know now, were much larger than the true values. This earlier work was done with all the care usually employed in the highest grade of chemical work, which was found to be quite sufficient when working with aqueous solutions of ferro sulphate. While we earlier found that the effect of X-rays on a solution of chromic acid was about one-half of the effect of the same dosage on a ferro sulphate (containing free oxygen), we now find that the ratio of these two effects is actually 1:4, both effects being expressed in terms of number of equivalents transformed.

Preliminary studies have been made of the effect of X-rays on solutions containing a mixture of chromic acid and an organic substance. These studies are expected to throw light on the nature of the activated water molecules produced by X-rays, and in addition, they form an indirect method for determining the effect of X-rays on organic substances, a method which we expect to use in the study of the effect of X-rays on organic substances of biological importance, such as proteins.

Further preliminary studies have also been made of the effect of X-rays on solutions of potassium permanganate.

Earlier work has produced evidence that the oxidation of ferro sulphate produced by irradiating a solution of ferro sulphate containing free oxygen was partly due to an activation of the oxygen molecules. This has been confirmed by direct experimentation and the ratio of the effects of X-rays on solutions of ferro sulphate containing free oxygen, and oxygen free, has been determined and found to be 4:1. The effect of X-rays on an oxygen-free ferro sulphate solution is thus the same as on a solution of chromic acid. When pure water is irradiated, the water is decomposed into hydrogen and oxygen. Assume that we irradiate with

so large a dosage that one gram molecule of water is decomposed. The same dosage applied to a solution of chromic acid or ferro sulphate will cause the transformation of two gram equivalents in either case.

Miss Cecile Ludlam, who stayed at the Laboratory during the summer, made a preliminary study of the production of hydrogen peroxide by irradiating water with X-rays, using the titanium test, titanium sulphate being added to the water before the irradiation. By using this test, which is a specific test for hydrogen peroxide, it could be shown definitely that hydrogen peroxide is produced, and the amount produced could be determined.

We have started work to determine the practicability of using the chemical method for standardization of X-ray and radium dosage. Cooperating with the biophysical department of the Cleveland Clinic Foundation, solutions of ferro sulphate were sent to Cleveland, irradiated and returned to us for analysis, the dosage given being thereby determined. This method has great advantage over the present electrical method, and it is proposed to continue this work during the coming year.

Mr. Irwin Sizer, who stayed here during the summer, made a large number of X-ray photographs of insects, working with a special X-ray tube constructed in the Laboratory. About four hundred pictures were taken of forty-two different species. Many interesting pictures were obtained, for instance, a picture of a hydropsyche, showing the Malpighian tubules to be practically impermeable to X-rays, thus demonstrating the presence in them of inorganic chemical substances of a relatively high atomic weight. It is evident that such pictures may be helpful in physiological studies of insects, dealing with the absorption and excretion of various inorganic substances.

The fact that electrolytic polarization plays a most important role in the activity of living matter, while its nature is, to a great extent, still obscure, prompted theoretical studies of the physical nature of electrolytic polarization. One of these studies has been completed. A relationship between the rate at which the polarization capacity changes with the frequency of the alternating current and the value of the polarization resistance has been derived and verification of this relationship made by a comparison with existing experimental data. Other studies under way are still incomplete.

Experimental studies of the electric capacity of the red corpuscle have been continued. They have been particularly concerned with a further increase of the experimental accuracy. The temperature coefficient for the capacity has been determined. It is the same for rabbit, chicken and turtle. Its value is one-sixth per cent per degree, the capacity increasing when the temperature is increased. The sign of the coefficient seems to be in contradiction with the idea that the capacity is due to the static capacity of a cell-membrane, as previously assumed, since the dielectric constant of all substances decreases with increasing temperature. The coefficient has the sign to be expected if the capacity were due to polarization, but it is much smaller than the temperature coefficient usually found for polarization capacities.

The dependence of the capacity on the frequency has again been

investigated with a much increased accuracy. The independence of frequency earlier established was confirmed.

In cooperation with Dr. E. E. Ecker, of Western Reserve University, a comparison was made of the capacity of a normal suspension of rabbit corpuscles and a suspension to which a large amount of amboceptor was added. Since it is to be assumed that the amboceptor is absorbed to the surface of the corpuscle, it was expected that the addition of the amboceptor would change the capacity. No difference in the capacity in the two cases could be established, however.

Publications

1. The Electric Conductivity and Capacity of Disperse Systems. Physics, August, 1931. (The contents of this article were also given on the Colloid Program of the meeting of the American Physical Society at Washington, May 1931).
2. The Use of Radiography in Entomology. (With Irwin Sizer). Radiography and Clinical Photography. In press.

In Preparation

3. X-ray Photographs of Insects. (With Irwin Sizer).
4. The Effect of X-rays on Aqueous Solutions of Chromic Acid. (With Dr. M. Washburn).
5. A Note on the Theory of Electrolytic Polarization.
6. The Electrical Resistance and Capacity of Living Tissues at Different Frequencies.
7. The Electrical Capacity of Red Corpuscles.

Mr. Gaunt's Report

The Adrenal Glands and Carbohydrate Metabolism

The question has been of interest for some time as to what the suprarenal glands have to do with carbohydrate metabolism. Also there has been the question as to whether it is the cortex or medulla or both that are involved in any possible effect on carbohydrate utilization. This summer we attempted to throw further light on this question.

Cannon, McIver and Bliss pointed out in 1924 that animals with the adrenal medulla inactivated resisted an insulin-induced hypoglycemia less well than a normal animal. Britton, Geiling and Calvery, 1928, elaborated this work and came to the same conclusion. But Stewart and Rogoff had previously, 1923, denied that adrenalectomized rabbits reacted to insulin hypoglycemia any differently than normal animals. This they included along with their blanket denial of any demonstrated functional significance of the adrenal medulla.

That the adrenal cortex was involved in carbohydrate metabolism was strongly suggested by the fact that a blood sugar fall, almost to the convulsive level, generally accompanies the terminal symptoms of adrenal insufficiency. Swingle and Pfiffner showed that the normal blood sugar level returns upon administration of **The Cortical Hormone** extracted by them.

The preparation by Swingle and Pfiffner of the life-maintaining hormone of the suprarenal cortex in extract form afforded a means of investigating this question with a greater certainty than heretofore. By the use of this extract animals can be kept in a healthy condition while deprived of their adrenal glands, and hence totally without their medullary adrenal secretion.

So a comparison was undertaken of the reaction of normal and of adrenalectomized cats given insulin doses. It was found without exception in our series that after adrenalectomy a cat will show a strikingly greater susceptibility to insulin hypoglycemia. Inasmuch as the active principle of the adrenal cortex was, in part of the experiments, being supplied by injection, it must have been the loss of the adrenal medulla that accounted for this difference.

Further proof that the medulla only is concerned in this process was offered by the fact that adrenalectomized cats, not treated with the **Cortical Hormone** and in the early stages of adrenal insufficiency, did not react with any significant difference from those treated with the hormone. Thus the lack or presence of the cortex does not alter the animal's reaction to insulin. The medulla only appears to be involved.

It has long been admitted that when insulin and adrenalin are injected simultaneously there is an antagonism between the two that prevents the fall in blood sugar that would be expected. These experiments add further evidence that after the administration of insulin an accelerated physiological secretion of epinephrine combats a blood sugar fall in the same way.

These and the results of Harrop, Pfiffner, Weinstein and Swingle, (1931), who found that huge doses of **The Cortical Hormone** made no significant variation on the blood sugar level of a normal dog, indicate that any relationship of the adrenal cortex to carbohydrate metabolism is a very obscure and indirect one.

Experiments were begun concerning the relationship of the anterior lobe of the pituitary to ovulation and other sexual phenomena in the rabbit. This work yielded very suggestive results but it will take several months for it to be completed.

Dr. Grout's Report

(Includes the work of Dr. Blizzard, Dr. Hague, Miss Andrew, Miss Parker and Miss Ross)

During the entire year work has proceeded steadily on the preparation of manuscript for the Moss Flora of North America.In June of the current year part 2 of Vol. III was published and sent to subscribers. It consisted of 52 pages 8 x 10 inches and 15 full page plates with a page for description of each and at the present time manuscript for about thirty more pages is ready. It is hoped that by next June part 3 of Vol. III may be ready for issue.

Press notices and letters from prominent botanists have been very encouraging.

There are about 160 regular subscribers to the work and a number

of odd copies have been sold. A small number of subscribers have cancelled their subscriptions on account of economic conditions.

Besides the direct work on the "Flora" six weeks were spent on a motor trip to Florida and return for the purpose of exploring and collecting. An account of this trip is now in type for the next Bryologist under the title of "Bryology by Automobile".

Another paper on "Mosses in Landscape Gardening" based on observations made on the Cutting estate will also appear shortly in the same periodical.

The Vermont Botanical Club has in progress of preparation a new Flora of that state. As a charter member of that club I accepted an invitation to collaborate with Prof. E. J. Dole of the University of Vermont in the preparation of an up-to-date list of Vermont Mosses.

This work was undertaken partly because of a natural interest in the undertaking and partly that it might agree with the "Flora" in arrangement and nomenclature. The manuscript for this moss list was finished in November and is, I believe, now in the hands of the printer.

From July 31st to September 10th I was in residence at the Laboratory directing the work of graduate students in Bryology.

There were three full course students: Miss Marion A. Parker, a graduate of Adelphi College; Miss Barbara L. Andrew, an instructor in the University of Alabama, and Miss Josephine H. Ross, a graduate of Wellesley.

Miss Parker's thesis, "A List of Mosses Growing on the Campus of the Biological Laboratory"; Miss Andrew's, "A List of the Hepaticae of Cold Spring Harbor", and Miss Ross' on "Some Moss Associations", were considered of sufficient merit for publication and will appear in the November Bryologist (now overdue). Copies of all these papers will be forwarded as soon as published.

Besides these regular students, Prof. A. W. Blizzard, of Coker College, spent about two weeks working on a small genus of mosses for the "Flora" under my direction and Miss Stella M. Hague of the staff of the department of botany of the University of Illinois, spent a week studying mosses with my assistance.

As I believe I mentioned in a previous report, other workers have been enlisted to help along the progress of this large and difficult undertaking. Mr. George N. Jones, of the State College of Washington, has the manuscript almost ready for a monograph of the North American Grimmiaceae as Vol. II, part 1. Dr. A. Leroy Andrews, of Cornell University, is at work on the Bryaceae and the Minaceae for the final part of Vol. II. Prof. Winona H. Welch, of the University of Indiana, is at work on the Fontinalaceae for the final part of Vol. III, and Mr. E. B. Bartram has about agreed to work on the Tortulaceae as soon as he has finished with the mosses of Hawaii, upon which he is now at work.

During the year more than 500 specimens of mosses have been determined for colleges and private students, representing nearly one-half the States of the Union. It is of interest to note that a West Virginia collector sent mosses to the British Museum for identification and that institution promptly sent them to me.

Packages of co-types and other mosses of special interest were made up and sent to the various European institutions that had co-operated by loans of types of North American species and to several American institutions who had also co-operated. A list of these institutions is found on the second cover page of part 2, Vol. III.

The co-operation of these institutions has been of invaluable assistance toward making the work comprehensive and authoritative. My association with the Biological Laboratory has greatly assisted in obtaining this assistance. The library and laboratories of the New York Botanical Garden have been at my disposal and free use has been made of this opportunity.

Fifty numbers of the exsiccati, N. American Musci Perfecti have been issued during the year.

The books on mosses previously published have had a reasonably good sale, especially "Mosses with a Hand-Lens", which is in general use as a college text as well as a manual for amateurs.

Dr. Harris' Report

See Physiology of Reproduction, page 20.

Dr. Hollander's Report

The work of the past year has been a continuation of that previously reported on, the mechanism of hydrochloric acid formation in the mammalian stomach. It can be shown historically that the numerous hypotheses which have already been advanced in explanation of this process derive their origins from the ideas of either of two investigators. The first of these is the great Russian physiologist, Prof. Pavlov, who has contended in substance that the secretion of the parietal cells retains certain outstanding properties independently of variations in the velocity of its formation. The other is R. Rosemann, who, in contradistinction to the former, has maintained that there exists a very specific relation between the composition of this fluid and the rate at which it flows into the lumen of the stomach. During the last decade, the preponderance of evidence as well as of opinion has favored the latter of these two theories. My own observations. however, have in substance supported the ideas of Pavlov. Accordingly, my recent investigations have been designed to harmonize the apparently contradictory findings of other workers with my own extension of Pavlov's theory, and at the same time to invalidate the opposing explanation of Rosemann.

In detail, the work completed during the past year has taken two different directions. On one hand, a study has been made of the variations in the concentration of chlorine in gastric juice collected from stomach pouch dogs under a variety of conditions. As a result of this work. a hitherto unsuspected mathematical relation has been shown to exist between the acidity and the total chlorine concentration of this fluid: a relation which lends me further support in the controversy discussed above. The second line of investigation has dealt with some physical and chemical properties of mucus-free gastric juice, a fluid which is almost pure parietal secretion. The analyses have already been completed and

are now being written up. The data are of such a nature as entirely to justify my physico-chemical working hypothesis, formulated to explain the synthesis of hydrochloric acid in the gastric glands; at the same time, the results serve to discredit the several hypotheses previously offered for this purpose.

Several papers covering the above material are being prepared at present for publication. Also, work has already been started on a comprehensive and critical review of the entire problem of hydrochloric acid formation in the stomach.

Publications for 1931

Studies in Gastric Secretion. I. Gastric Juice of constant acidity. (With G. R. Cowgill). J. Biol. Chem., 91, 151 (1931).

Studies, etc. II. A comparison of Criteria of Acidity Used in This Investigation. J. Biol. Chem., 91, 481 (1931).

Studies, etc. III. Evidence in refutation of the Rosemann Theory of Hydrochloric Acid Formation. Am. J. Physiol., 98, 551 (1931).

An Adjustable Drop Control for Burettes. Sc. 73, 45 (1931).

What Is the Acidity of Pure Gastric Juice? A Review of the Experimental Literature. J. Am. Inst. Hom., 24, 491 (1931).

Dr. Kleiner's Report

(Includes statements of the work of Miss Halpern, Mr. Hahn and Miss Kleiner)

Since reporting to you a year ago, a brief paper has been published embodying some of the results of the work carried on at the Laboratory. This is entitled "Fluctuations of the Concentration of 'Blood Sugar' in Vitro", and appeared in The Proceedings of the Society for Experimental Biology and Medicine, vol. 28, p. 326, 1931. This was a preliminary paper and I have continued my studies along the same general lines during the past summer.

To summarize this work, it may be said that it is a study of the condition of the sugar of the blood, particularly in diabetes. For this purpose dogs are rendered diabetic by surgical removal of the pancreas. The facilities of the Laboratory for this type of work are quite adequate and we were successful in having two depancreatized dogs for experimentation. Blood from such animals contains high concentrations of sugar. I have evidence which indicates that this sugar is not in simple solution, but is in some combined form which is less diffusible. Moreover, a short period of dialysis of blood seems to initiate a curious fluctuation in the blood-sugar curve.

In the blood-sugar investigations, Miss Rebecca Halpern has assisted me, both in the analytical work and on the surgical side. Mr. Joseph Hahn aided in the surgical procedures and in the care and handling of the animals.

Mr. Hahn has also done some experiments on the relation of dosage of adrenalin to its action in producing a high blood sugar. This can be done to good advantage now on rabbits, since we have a reliable method at our command for the determination of sugar in 0.2 cc. of blood. This

results in a negligible loss of blood for even such a small experimental animal, and the course of the blood-sugar curve for several hours can easily be followed.

Miss Ruth Kleiner has undertaken a study of the distribution of catalase in the tissues of one of the mussels found in abundance at Cold Spring Harbor, namely **Mytilus edulis.** Catalase is the enzyme which decomposes hydrogen peroxide. Although she has not completed the study, she was able to demonstrate quantitatively a wide variation in the concentration of this enzyme in different tissues. She plans to continue this next summer.

I have again had the generous financial assistance of the Lucius N. Littauer Foundation and am very grateful for it, as well as for the facilities of the Laboratory so kindly and liberally placed at my disposal.

Dr. Kornhauser's Report

I wish to report that my activities outside of teaching at Cold Spring Harbor were as follows:

1. Reading of literature on hermaphroditism in preparation for publication of papers.
2. Extension and rechecking of observations on use of vital dyes on ovarioles of Anisolabis.

Incidentally I did several batches of sea urchin fertilizations to determine the viability of the material from Woods Hole transported to Cold Spring Harbor, and aided somewhat in work on photomicrography.

Mr. Nelson's Report

The following is a report of my work at the laboratory this last summer:

1. Continuation of a study of Balantidium which I had already begun at the School of Hygiene. This work was done on prepared slides, the result of the work which I had already done.
2. Examination of a large number of insects for intestinal protozoa.
3. The successful cultivation of an intestinal flagellate from a white grub, a beetle larva.
4. Attempted cross-infection of frogs with intestinal flagellates from a white grub, a beetle larva.

At the present time I am working on Balantidium with special reference to life cycle in culture.

As to papers I have one still in press entitled, "The Cultivation of a Species of Troglodytella, a Large Ciliate from the Chimpanzee".

Miss Palmer's Report

During 1931 a preliminary study was made to determine the physiological processes of starfish which were most sensitive to the presence of toxic substances in the water and if possible utilize this sensitivity in combating starfish as enemies of oysters and other food molluscs. There are several morphological structures which might conceivably offer a mode of attack, namely: 1. An open water vascular system; 2. An aboral ciliated ectoderm; 3. An exposed respiratory mechanism, and 4. Exposed thin membrane susceptible to permeability changes.

The effect of forty different heavy metal salts was tried on the ciliated ectoderm and the branchae. No significant difference was noted in the effect of anions but the cations showed a varying range of toxicity thus: Hg>Cu>Co>Ag, and while in the same concentrations iron, zinc, aluminum, and lead were not lethal. Of course, these results must be evaluated according to the chemical reactions of each salt with sea water.

The open water vascular system and exposed respiratory organs of starfish present a mode of attack on the respiratory process and the respiratory pigments and cells. Investigations were made to determine the effect of copper salts on respiration by measuring oxygen consumption and carbon dioxide output. As the technique was just perfected and insufficient experiments performed, no conclusive results can be reported. However, preliminary tests show a steady lowering of oxygen consumption in the presence of even minute amounts of copper.

Mr. Parkins' Report

An Experimental Study of Bilateral Adrenalectomy in the Fowl.

The following is an abstract of a problem suggested and directed by Dr. W. W. Swingle. Published in the abstracts of the meeting of the American Society of Zoologists. Anat. Rec., 1931, Vol. LI, p. 39.

Complete removal of both adrenals was accomplished by careful blunt dissection, freeing the gland from its highly vascular connections, clamping off with mosquito haemostats, and cauterizing, without recourse to ligatures. The survival period of eighteen fowls deprived of their adrenals, in two stages, with an interval of from 6 to 8 days between operations, ranges between thirty-eight and 146 hours, the average being eighty hours. Symptoms of adrenal insufficiency in the bird resemble with a few exceptions, the syndrome of the cat and of the dog, although in fowls they develop more rapidly, particularly at terminal stages.

Studies of the blood of the bilaterally adrenalectomized birds show a marked increase in uric acid, the normal value being 2.9 to 3.8 mgm. per 100 cc., whereas values ranging from 6.2 to 24.2 mgm., the average being 11.8 mgm., were observed in seven animals, showing marked symptoms of adrenal insufficiency. A sharp rise is noted especially at terminal as well as during the advanced comatose stages. The blood sugar values for fourteen unilateral operated fowls average 166.7 mgm., whereas the amount found in seven cases with marked symptoms of cortical insufficiency ranged from 121.9 to 151.5 mgm., the average being 133.5 mgm. per 100 cc. These blood changes at any stage may be correlated with symptoms. They rapidly return to normal, following treatment with cortical extract.

Four small birds bilaterally adrenalectomized and verging on coma, were restored to normal activity, appetite and general appearance within 24 hours, by a single intravenous injection of 2 cc. of the cortical extract of Drs. Swingle and Pfiffner. Three others that received subcutaneous injections of 2 cc. of extract showed similar but less rapid improvement. These animals all died of adrenal insufficiency within two to six days following the withdrawal of daily injections of the extract.

A study of the relation of the adrenals to the gonads is also in progress.

Dr. Salant's Report

(Includes work of Mr. Parkins, Miss Sheppard and Mr. Nagler)

The investigations on the relation of calcium to the pharmacological action of different drugs carried on during the preceding year have been continued with marked success. The progress made is indicated by the following summary of the results: 1. Ergotamine given to different animals produced a marked and sometimes very striking increase in the movements of the intestines, but this effect was obtained when none was given previously in the course of the experiment. If the injection of ergotamine was repeated its action was greatly reduced and in some cases no effect could be observed. A study of the relation of calcium to the effect of ergotamine has shown that depression instead of stimulation may be obtained if the first dose is given after a sufficient amount of oxalate which lowers blood calcium. If calcium chloride is given after several doses of ergotamine a subsequent injection of this produces stimulation instead of depression. In other words, in calcium deficiency ergotamine is always a depressant, whereas in excess calcium it is always a stimulant. 2. That calcium modifies the action of ergotamine was also shown in experiments on the isolated intestine of different animals. This study also included observations on the effects of potassium and on the effect of acid and alkali, that is the pH of the solution, on the response to ergotamine. The results indicated that in the presence of sufficient amounts of potassium, ergotamine produced depression. Similar results were obtained in some cases with this substance when the intestine was suspended in acid Locke solution. 3. As the study of the effect of calcium on the action of drugs and poisons necessitated the use of sodium oxalate for reducing the concentration of blood calcium, experiments were carried out with that substance, the main object being to determine the duration of the effect and the minimum amount necessary to lower the blood calcium. The results obtained show that a small dose, ineffective at first, may, when repeated at intervals of about 24 hours, produce a considerable reduction in the blood calcium. Larger doses 30 mgs. oxalate per kilo or more, always decreased blood calcium whether given subcutaneously or intravenously. Recovery set in within 2 or 3 hours and was completed in 24 hours in the case of smaller doses; 45 to 50 hours after larger doses.

We carried out these experiments with special reference to the role played by the parathyroid in the replacement of calcium precipitated by the oxalate injected, and made the very interesting and unexpected observation that oxalate is much less toxic after than before, removal of the parathyroid. The importance of this finding made a study of the underlying causes of the behavior of oxalate in these conditions necessary and is one of the investigations in progress.

4. Closely allied with the calcium problem in its relation to pharmacological action is the effect of changes in the hydrogen ion concentration of the surrounding medium. This question which received attention in our studies on the effects of ergotamine on the isolated intestine was also raised and answered in connection with other drugs such as cocaine and novocaine. The results show that the intestines respond differently to

cocaine in acid and alkaline solutions causing stimulation in this one and depression in the other, but in some animals the difference was quantitative and not qualititative. The above investigations have been completed. Two of them are in press and two more will be submitted for publication at an early date. A number of investigations are in progress and will require some time before all of them will be completed. A list of these studies follows:

1. The effect of calcium on the response of the intestine to cocaine.
2. The pharmacology of sodium oxalate.
3. The toxicity of sodium oxalate and the role of the parathyroid in modifying its effect.
4. Studies on the pharmacology and toxicology of mercury with special reference to the effect upon it of Ca. Mg. K and diet.
5. The effect of mercury on blood calcium.

These investigations, although incomplete, justify the expectation that valuable results will be obtained with which those already given in the above summary as well as those published would contribute towards better understanding of the action of drugs and then be of practical value in therapeutics. The results are also suggestive in connection with studies dealing with the resistance in nervous pathological conditions.

Publications

1. The Effect of Calcium and Potassium on Cardiac Reactions to Mercury. William Salant and Harold Nagler. Jour. Pharmacol. and Exp. Therap., 1931, XLI, 407.
2. The Effect of Ergotamine on the Intestine with Observations on the Influence of Calcium on Its Action. William Salant and William M. Parkins. In press.
3. Studies on the Response of the Isolated Intestine to Ergotamine With Special Reference to the Influence of Ions. William Salant and William M. Parkins. In press.
4. The response of the Isolated Intestine to Cocaine and Novocaine at Different pH Levels. William Salant and William M. Parkins. Work finished, to be submitted soon for publication.
5. The effect of Oxalate on Blood Calcium with a Study of Its Toxicity and of the Influence of the Parathyroid. William Salant, William M. Parkins and Lillian Sheppard. Work finished, to be submitted soon for publication.

Dr. Schaeffer's Report

(Includes statement of the work of the Misses Olive and Mary Schaeffer, and Mr. Schnorr).

The general object of my work here at the Laboratory is the further investigation of molecular organization in protoplasm. The experiments are carried out primarily on various species of amebas, but occasionally observations are made on other animals and also on plants, to test in a preliminary way the general applicability of the theory underlying molecular organization in living matter.

In the 1930 annual report of The Biological Laboratory and in "Sci-

ence" for July 10, 1931, preliminary statements are published on what had been accomplished in the investigation of this subject up to the time of publication of these statements. Since July a considerable amount of new evidence has been obtained which not only fully confirms the published conclusions on molecular organization, but greatly extends them; and, what is more important, the new data bring several mathematical relationships to the surface which tie all the main groups of observations into a close-knit system.

All the evidence from this investigation tends to show that the molecule is the actual structural unit out of which the organism is built and that the molecules are arranged in definite patterns. The most deep-seated or widespread characteristic of the molecules is their stereoisomerism, which, as has been shown in my earlier papers. is probably universal for organisms. This property is used as the key for the discovery of other molecular characteristics. So far as the experiments have gone, the left isomers differ from the right in every characteristic (nine) which it has been possible to measure. Since the stereoisomers are held to be right-twisted when the organism possesses a right spiral structure, and left-twisted when it has a left structure, it follows that any differential in the characteristics when it is in one of these two states as compared with the other, is a further description of the particular isomeric stage of the molecule. It may be pointed out that this method of research is also employed in stereochemistry where right and left crystal-form or its correlate, optical activity, is the fundamental condition with which the other properties of the compound: melting point, osmotic pressure, etc., are associated.

It has been stated in previous reports that the rate of metabolism and reproduction, and the "field strength" of the molecules at the nodal points, is markedly greater in predominantly left-turning amebas than in predominantly right amebas; that the size of the body is larger in right amebas than in left, and that changes of intensity of visible and ultra violet light effect the right amebas very differently from the left. From the standpoint of molecular patterns in protoplasm, however, the discovery of a difference in field strength seems at present the most significant because it varies systematically in the four species of amebas studied. That is, the field strength may be represented by the reciprocals of the square roots of 2, 2, 3, 4 of the four species, respectively. In other words. the quantities. .7, .7, .57, .5 represent statistically the degree of probability with which the four species maintain the direction of movement past any node.

On account of the very interesting mathematical relationship between the field strengths of the nodes of the four amebas, it was decided to make a more detailed investigation of nodal characteristics and, if possible, find another species of ameba in which more accurate measurements can be made. Fortunately a pseudo-pod-forming species was found which not only satisfies this desideratum but also affords a new angle from which nodes may be studied.

In this ameba the nodes are of variable length, but if these lengths are plotted as a frequency curve, the curve has a number of well marked modal points, the highest of which comes at a value close to one-third the

length of a fully grown ameba. The absolute node length is, however, the same for amebas of two-thirds this length or for sizes in between. But the most striking result is that the five most prominent modal points have values which lie very close to square roots of numbers in the geometrical series, 1, 2, 4, 8, 16, etc. Moreover, when the nodes in left sections are plotted separately and those in right sections are similarly plotted separately, the highest modal points on the left curve alternate with those on the right curve, the highest point on the right curve being .7 the value of the highest point on the left curve. In this case it appears to be the left series rather than the right which originates in unity, mathematically. Every normally moving ameba from a growing culture, when observed until some 400 nodes are recorded, will show three or four or more of these modal points. Amebas from very rapidly growing cultures are predominantly left turning and have a proportionally larger number of short nodes; slowly growing cultures, on the other hand, have a proportionally larger number of predominantly right turning amebas and these also show a proportionally larger number of long nodes.

This series of node lengths in which left nodes differ quantitatively and systematically from the right nodes is the most definite difference which has yet come to light between the left and right isomers; and the tentative interpretation of the series of node lengths is that it represents changes by steps in the molecules of the amount of inter-molecular attraction (cohesion) produced by metabolic (and other?) processes.

In addition to increasing theoretical validity and the experimental scope of the molecular hypothesis, these new experimental results also foreshadow a new conception of unity of the organism, a conception which will become increasingly better defined, however, only as the number of quantitative observations on molecular organization increases.

The work on molecular organization is in progress.

Some experiments on the effect of deliberate sharp turns in walking and swimming blindfolded in man were also carried out, especially on identical twins. The tests were preliminary, but there is good indication that the expected high correlation in path patterns of identical twins is real.

A preliminary test was also made of the frequency distribution in space (in the field) and in number of right and of left twist and of number of flowers per twist, in two orchids, **Spiranthes gracilis** and **S. cernua,** comprising 1004 plants. The observations were made in the field. The results are of considerable interest and indicate that at least certain phases of the hypothesis of molecular organization might profitably be attacked in these and other plants. I am greatly indebted to Misses Olive and Mary Schaeffer and to Mr. Charles Schnorr for collecting the data.

Publications

On Molecular Organization in Ameban Protoplasm. Science, Vol. 74, pp. 47-51. (July 10, 1931).

Molecular Organization in the Protoplasm of **Chaos diffluens** Mueller and Several Other Amebas with Pseudopods. Anatomical Record, Vol. 51, p. 142. (Nov. 25, 1931).

Mr. Smith's Report

Resume of Work on Galleria Mellonella to Date—January, 1932

The work on the genetics of the bee-moth, Galleria mellonella, Linn. was begun in the fall of 1930. Stocks were obtained from Dr. I. R. Taylor of Brown University at The Biological Laboratory, Cold Spring Harbor, L. I. Dr. Taylor very kindly gave, with the stocks, a number of valuable suggestions on methods of culturing them. Throughout the school year of 1930-1931 the work was carried on in the Department of Genetics at Columbia University. The larvae were treated, an attempt being made to catch the germ cells in their early dividing stages, with dosages of X-rays varying from 500 to 2250 r-units. Dosages of over 1200 r-units proved lethal some time before eclosion of the imagoes. Many of the larvae spun their cocoons but were apparently unable to metamorphose into pupae. However, a few characters appeared in the offspring of the ones that did come through.

In the summer of 1931 Columbia kindly granted the John D. Jones scholarship for further work on the animal and with the courteous aid of the administration and staff of workers at The Biological Laboratory in supplying the needed materials, the work was carried on more intensely. At the advice of Dr. H. J. Muller, who was doing some work at the time at the Carnegie Institute at Cold Spring Harbor, the adults were treated, especially the males. It was thought that due to the condensed condition of the nuclear material in the sperm heads there might be a better chance to get a "hit". This inference has been largely substantiated, for there has occurred a marked increase in the number of probable mutants in the offspring of the treated individuals. The dosages used on the adults so far range from 1500 to 2500 r-units. Larger dosages tend to completely sterilize them. Among some 12000 F1s and F2s from treated parents there have occurred to date forty or more abnormalities (a few of these were recurrences). Of these there are eight which are breeding true. To date these have not been crossed among themselves and thus there is no linkage data to report. Cultures of untreated moths have been maintained as a control. In some 8000 offspring from these there have been one or possibly two hereditary abnormalities.

A suspicion arose that probably the females would reproduce parthenogenetically. To test this, eighty females were isolated in the pupal stage and put in sealed vials with pieces of sterile comb. All the females oviposited on the comb. Nine of the vials produced larvae ranging from one to thirty-two larvae in each vial. Among the enclosed were both males and females.

The chromosomes have been observed in sections of the developing testes. A cursory observation seems to indicate that the diploid number of chromosomes is sixty. They are short, or bluntly oval rods, typical Lepidopteran chromosomes.

Mr. Spieth's Report

During the summer of 1931, collections of mayflies were made in some of the streams and ponds of Long Island. Because the nymphs

of the mayfly have a much longer existence than do the mayfly adults, and are far less secretive in their habits, the most feasible method of surveying the mayfly fauna of a region is to make a thorough and intensive collection of the nymphs of each stream or body of water, and then at a later date, after having become acquainted with the various forms found in each stream, to make systematic attempts to collect the adults. During the summer of 1931, this plan of procedure was employed. Unfortunately, in many instances specific determinations can not be made of nymphal material, but must await the collection of adults.

The following fourteen species, representing six genera, were taken: Pseudocloeon, 3 species; Baetis, 3 species; Callibaetis, 1 species; Ecdyonurus, 2 species; Leptophlebia debilis Wlk., 1 species; Ephemerella attenuata McD., 1 species; E. deficiens Morg., 1 species; E. dorothea Need., 1 species; and E. bicolor Clem., 1 species.

The distribution of the material shows two important facts:

(1) There is an extreme dearth of species to be found in the streams of the north shore in comparison to the south shore. The north shore is represented by six species which belong to four genera, while in the south shore streams eleven species belonging to six genera were found.

(2) Not only is there a distinct difference in numbers of species on the two sides of the island, but also there is a decided difference in the fauna of the two sides, since only three species representing three genera have been found on both sides of the island.

Just why these differences exist, it is impossible to say at present. Further collecting may eliminate some of the differences. Physical factors in the streams are probably the most important. Many mayfly nymphs are very restricted as to the habitat in which they can live. Temperature, rate of flow of the water, kind of bottom, type of vegetation, etc., all play important parts in determining whether or not a given species may live in a certain body of water. It is hoped that in the future further and more intensive nymphal, along with adult, collections can be made and that measurements of various physical factors in the streams and ponds can be taken.

Dr. Swingle's Report

With regard to the work done this summer: 1. Testing of further fractions of the adrenal cortical hormone. We now have a highly concentrated hormone product for clinical use which is several times stronger than our original extract. One-tenth of a cc. per kilo of adrenalectomized dog per day holds the animals in perfect health and physiological behavior. This represents a very distinct advance insofar as clinical work is concerned.

2. Another portion of my summer's work at Cold Spring Harbor was testing an extract of the adrenal cortex for which high potency had been claimed by certain workers (Zwemer, 1931. Proc. Soc. Exp. Biol. & Med.) We could find not the slightest trace of activity (1) upon length of life of adrenalectomized cats and (2) giving it in large doses to animals presenting symptoms. Since we returned to Princeton, we have had Dr Harrop of Johns Hopkins repeat our tests upon dogs. He likewise obtained only negative results.

3. - The third and final work at Cold Spring Harbor was testing re-extracted cortical glands, i. e. re-extraction to determine what portion or per cent of the hormone we were leaving behind at all stages of extraction. We found that our original extraction takes out 95 per cent of the hormone from the tissue and that but 5 per cent is recoverable by repeated re-extraction processes. Upon my return to Princeton the work was repeated upon adrenalectomized dogs and put on an exact quantitative basis by means of our new bio-assay method. (See abstract).

Dr. Taylor's Report

(Includes Statements of the Work of Mr. Crescitelli, Miss Whitcomb and Mr. Birnie.)

During the early part of the summer I was occupied with the teaching of the course in General Physiology, but before the course had terminated illness necessitated my absence from the Laboratory for the remaining part of the season. Doctor Bodine conducted the course for the week that remained and his kindness in so doing is deeply appreciated.

Although I was unable to continue my own research on the physiology of metamorphosis at the Laboratory, I am pleased to report that certain graduate students made noteworthy progress in connection with problems in which I have an active interest. Mr. Crescitelli completed sugar analyses made on bee moth pupae at periodic intervals during metamorphosis. These analyses have been in progress for over a year and show that the sugar (glucose) content is relatively high at the beginning of the pupal period (0.23 per cent) but that it decreases steadily reaching a minimum of 0.16 per cent about the middle of pupal development. The percentage of sugar then increases rapidly, attaining a maximum of 0.29 per cent just before emergence. Mr. Crescitelli also carried on biochemical analyses to determine fat content and its changes throughout the pupal period. This work, together with results of sugar analyses, will form part of a paper which he and I hope to publish shortly.

Miss Whitcomb commenced an investigation of the effects of high frequency electrostatic fields on mouse sarcoma and this work is being continued. While this work is in part a repetition of what has already been done by another investigator, it is being extended and the encouraging results that are being obtained will likely merit publication.

Mr. Birnie studied regeneration in Fundulus embryos. Seven-day-old Fundulus heteroclitus embryos which would normally hatch in sixteen days were removed from the chorion by the technique of Dr. Nicholas and were cut so as to remove the ventral half of the basal plate of the tail together with the differentiated and undifferentiated rays. New rays definitely appeared seventeen days later at room temperature at the free edge of the basal plate although the latter had not replaced itself. When the entire basal plate was removed no regeneration of the fin rays occurred and the experiments indicate the necessity of the presence of articulating margin of the basal plate for regeneration of the fin rays.

A paper entitled "Respiratory Metabolism During Pupal Development of Galleria mellonella (Bee Moth)" by Ivon R. Taylor and H. B. Steinbach was published in Physiological Zoology, Vol. IV, October, 1931.

Dr. Weiss' Report

During the summer of 1931 I occupied my time at the Biological Laboratories of Cold Spring Harbor in a two-fold manner. First, I took the lecture course in general physiology and second, I spent a good deal of my time working over experimental data in preparation for a manuscript which is to be entitled, "Search for Agglutinins in the Sera of Trachoma Patients and in Monkeys Infected with Bacterium Granulosis." This manuscript is now being prepared for publication and will appear sometime in 1932.

Dr. Wharton's Report

As indicated in an earlier report, experimentation on the role of cats in transmitting disease to man centred about the susceptibility of the cat to diphtheria, a subject which has undergone much controversy without being decided. Kittens of three to four months of age were used for the purpose and a certain number were exposed to a supposedly virulent diphtheria—diphtheritic membranes being unavailable.

These results were, however, completely unsatisfactory, owing to an epizootic which killed all the kittens that were brought in during the late spring and summer and necessitated the abandonment of this phase of the work until the infection could be curbed. (A procedure which would, in any case, have been advisable in view of the many children arriving during the summer and living in close proximity to the exposed animals.) Close observation of the diseased animals resulted in the conclusion that the cats were suffering from a type of infection similar to canine distemper, and in many cases this was supported by the findings in **post mortem** examination. Cultural examination of the blood, spleen, lungs or other organs were either sterile or gave a growth of colon organisms. These organisms, where they occurred, consisted chiefly of **B. coli** and were found at autopsy or during the weakened and moribund condition of the animals. They were not the primary infecting agent, however, and were never considered as such.

There was, nevertheless, a circumstance which proved to be very misleading. Filtered material from the cat when injected into apparently healthy guinea pigs resulted in symptoms of a disease having something in common with that of the cat, and the animals were affected in a similar manner following the injection of material of canine distemper. From such guinea pigs a Gram negative organism was obtained which belonged to the **Pasteurella** group of organisms. Being in pure culture, and inasmuch as it was at one time held to be intimately connected with distemper, this bacillus offered definite material for consideration. It was not, however, until severe isolations were attempted from other kittens and from dogs, and selected guinea pigs had been tried out, that the **Pasteurella** infection was shown to have its source in the first group of guinea pigs, which had maintained their health until the critical moment of the test.

When it became clear that none of the organisms isolated had a primary connection with the disease, the step was taken to secure and

develop clean puppies and to abandon kittens as being too delicate to withstand the conditions encountered.

At the time of writing a number of puppies are on hand, isolated into two groups, healthy and infected with distemper, and others are being bred for the purpose.

Examination of the blood of distempered dogs indicated, as far as it has been carried, that there is a marked reduction in the number of red cells, and that the white cells, besides being reduced in count, are also low in the differential; which makes it seem as though the blood forming organs are blocked or else the cells themselves undergo marked destruction. There is, however, no increase in fragility to be observed in the red cells.

Persons in Residence at the Laboratory in 1931

In Addition to Members of the Staff

Name	Registration	Institution	Status
T. G. Adams	R.	Columbia University	Grad. Student
Ezra Allen	R.	N. Y. Homeo. Med. Col. and Flower Hosp.	Asst. Professor
Barbara L. Andrew	B.	University of Alabama	Grad. Asst.
Roy P. Ash	S. M., R.	Brown University	Grad. Asst.
Margaret Baskervill	R.	College of Physicians and Surgeons	Assistant
David E. Bass	G. P., R.	Brown University	Undergraduate
William H. Bayliff	F. Z.	St. John's College	Asst. Professor
James H. Birnie	G. P., R.	Morehouse College	Graduate
Ernest W. Blanchard	S. M., R.	Bryn Mawr College	Associate
R. Irving Blanchard	G. P.	Brown University	Grad. Asst.
Dugald Brown	R.	New York University	Asst. Professor
Adele Burcher	F. Z.	Barnard College	Undergraduate
Martha Clarke	R.	Vassar College	Undergraduate
Lucy W. Clausen	F. Z.	Long Island University	Undergraduate
H. J. Conn	R.	New York State Agricultural Experiment Station	Chief of Res'ch
E. Wilbur Cook	G. P.	Center College	Asst. Professor
Frederick Crescitelli	S. M., R.	Brown University	Grad. Asst.
Mary Eleanor Davis	F. Z.	Smith College	Graduate
E. E. Ecker	R.	Western Reserve University	Asst. Professor
Brayton Eddy	F. Z.	Brown University	Grad. Student
Robert Gaunt	R.	Princeton University	Grad. Student
Stella M. Hague	B.	University of Illinois	Instructor
Joseph Hahn	R.	N. Y. Homeo. Med. Col. and Flower Hosp.	Med. Student
Rebecca Halpern	R.	N. Y. Homeo. Med. Col. and Flower Hosp.	Assistant
Elmer C. Herber	S. M., R.	Dickinson College	Instructor
Ruby Hirose	S. M., R.	University of Cincinnati	Grad. Student
Josephine H. Howland	F. Z.	Elmira College	Graduate
John R. Huggins	R.	University of Pennsylvania	Instructor
George B. Jenkins	R.	George Washington Univ.	Professor
Percy Jennings, Jr.	R.	Cornell University	Med. Student
William A. Johnson	F. Z.	Pittsburgh University	Undergraduate
Cornelius Kaylor	R.	Rutgers College	Grad. Asst.
Ruth Kleiner	R.	Packer Collegiate Institute	Undergraduate
Cecile Ludlam	R.	Barnard College	Graduate
Joseph Marzenaski	R.	Princeton University	Assistant
F. Alvin McCann	G. P.	University of Tennessee	Grad. Asst.

B.: Bryology
E.: Endocrinology
F. B.: Field Botany and Plant Ecology.
F. Z.: Field Zoology.
G. P.: General Physiology.
S. M.: Surgical Methods in Experimental Biology.
R.: Research.

Name	Registration	Institution	Status
Josephine M. McIntire	G. P.	Mt. Holyoke College	Instructor
May Meiselbach	F. B.	Adelphi College	Undergraduate
Marion E. Outerbridge	F. Z.	Smith College	Undergraduate
Nazzareno Palleri	F. B.	Lake Junior High School	Teacher
Alice Palleri (Mrs.)	F. B.	Washington Irving H. S.	Assistant
Louise Palmer	R.	U. S. Bureau of Fisheries	Temp'y Inves.
Marion Parker	B.	Adelphi College	Graduate
Celia Read	F. Z.	Mt. Holyoke College	Undergraduate
Louis Rogol	R.	Long Island Med. School	Junior
Josephine Ross	B.	Wellesley College	Graduate
Mary E. Schaeffer	R.	University of Kansas	Undergraduate
Charles Schnorr, Jr.	F. Z.	University of Kansas	Undergraduate
Julius Schwartz	R.	Columbia University	Grad. Student
Lillian Sheppard	R.	New Jersey Col. for Women	Grad. Asst.
Irwin Sizer	R.	Rutgers College	Grad. Asst.
T. L. Smith	R.	Columbia University	Instructor
Vera I. Smith	F. Z., R.	Brown University	Grad. Asst.
Edna L. Sturm	F. B.	George Washington Univ.	Graduate
Mable R. Walter	F. Z.	University of Illinois	Grad. Asst.
Anna M. Warshaw	F. Z.	Brooklyn College	Undergraduate
Charles Weiss	R.	George Washington Univ.	Associate Prof.
Dorothy M. Weiss	R.	George Washington Univ.	Dept. of Pediatrics
Helen Whitcomb	G. P., R.	Brown University	Grad. Student
Morris Winokur	F. Z.	Col. of City of New York	Grad. Asst.

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THE LABORATORY STAFF

*Reginald G. Harris ..... Director, The Biological Laboratory
Physiology of Reproduction

*Hugo Fricke ..... The Biological Laboratory
Biophysics

*William Salant ..... The Biological Laboratory
Pharmacology

*Denis R. A. Wharton ..... The Biological Laboratory
Research Associate, Bacteriology, Parisitology

*A. J. Grout ..... The Biological Laboratory
Bryology

*Asa A. Schaeffer ..... The Biological Laboratory
Guest Investigator, Research in Protozoology

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Endocrine Biology. Surgical Methods in Experimental Biology.

H. S. Conard ..... Professor of Botany, Grinnell College
Field Botany and Plant Ecology

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Research in General Physiology, Chairman Scientific Advisory Committee

S. I. Kornhauser ..... Professor of Anatomy and Embryology
University of Louisville, Medical School
Field Zoology

Edgar Allen Dean, University of Missouri, School of Medicine
Surgical Methods in Experimental Biology

Justin Andrews ..... Associate Professor of Protozoology, School of
Hygiene and Public Health, John Hopkins University
Research in Protozoology

J. S. Nicholas ..... Assistant Professor of Zoology, Yale University
Research in Embryology

W. J. V. Osterhout ..... Rockefeller Institute for Medical Research
Research in Physiological Botany

Christianna Smith, Associate Professor of Zoology, Mount Holyoke College
Research in Physiology

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New York Homeopathic Medical College and Flower Hospital
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*Member of All-Year Staff.

I R. Taylor ..... Assistant Professor of Biology, Brown University
General Physiology

Franklin Hollander ..... Assistant Professor of Physiology
New York Homeopathic Medical College and Flower Hospital

C. H. Curran ..... Assistant Curator, Department of Entomology,
American Museum of Natural History
Associate in Field Zoology

Herman T. Spieth ..... Associate in Zoology, University of Indiana
Assistant in Field Zoology

A. W. Blizzard ..... Professor of Biology, Coker College
Research in Plant Ecology

*Martha Washburn ..... The Biological Laboratory
Chemist

*Dorothy Newman ..... The Biological Laboratory
Technician

*William M. Parkins ..... The Biological Laboratory
Associate in Pharmacology

E. C. Nelson ..... School of Hygiene and Public Health
Johns Hopkins University
Chemical Supplies

R. Irving Blanchard ..... Brown University
Assistant in Chemical Supplies

Charles B. Davenport ..... Director, Department of Genetics,
Carnegie Institution of Washington
Lecturer

*Catherine Robertson ..... Secretary

*Catherine Brown ..... Secretary

*Frank Allen ..... Carpenter and Boatman

*Thomas Wheeler ..... Collector and Caretaker

*J. J. Force ..... Glass-Blower

*Christopher Henderson ..... Instrument-Maker

*D. M. Gallagher ..... Radio Engineer

*Henry Jordan ..... Animal Caretaker

*Gertrude Bundgus ..... Stenographer

*Member of All-Year Staff.

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W. J. Crozier