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LONG ISLAND BIOLOGICAL ASSOCIATION

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THE BIOLOGICAL LABORATORY
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REPORT OF THE DIRECTOR

During this second postwar year our Laboratory, in common with other similar institutions, has been passing through a readjustment period. The research initiated during the war and carried on under contract with the Medical Division of the Chemical Warfare Service was completed in September. This concluded for us a period during which we had branched out into investigations remotely related to our field of interest, had successfully mastered new techniques, had developed new methods for the use of antibiotics, and had made significant contributions for the treatment of certain infections. The experience we acquired during this period has proved a valuable asset in working out plans for our present research program.

In October we inaugurated a research program designed to investigate the potentialities of various groups of microorganisms for production of antibiotics. The strikingly successful application of penicillin and streptomycin in medicine has given an added importance to research in the relatively new field of antibiotics, and intensive work is now going on in a large number of laboratories to find new substances possessing antibiotic potency and to learn more about their biological and chemical properties. We are interested in the fundamental aspect of the biological problem; that is, we wish to obtain some understanding of what various microorganisms can do and of how widespread their capacity is for producing substances that act as antibiotics. Since our approach is a genetical one, we have ample experience for this research and our laboratory is well equipped for the work. The problem is planned on a broad basis. The presence of antibiotic capacity is determined by the induction of mutations. For this purpose, well-known mutagenic agents—X-rays and ultraviolet rays—are being put to use, and a search is also being made for chemicals that may induce mutations. This research is being supported by a grant made by Schenley Laboratories, Inc., of which Dr. E. C. Williams is the director. Drs. Vernon Bryson and Albert Kelner are in charge of the work.

Research

During the greater portion of 1946 the Laboratory was engaged in finishing up projects under its contracts with the Medical Division and the Technical Division of the Chemical Warfare Service. This research was under the supervision of Dr. V. Bryson. The experiments dealt mainly with studies of the penetration of inhaled aerosols into the lungs and of the therapeutic value of penicillin aerosol alone and in combination with certain other chemicals. A study was made also of the synergistic action against bacteria exerted by mixtures of penicillin and several other chemicals. For the Technical Division, an analysis was completed of hydrogen peroxide aerosol as a disinfecting agent for air contaminated with pathogenic and dust-borne microorganisms. In October, studies were begun on the chemical induction of mutations in bacteria, using nitrogen mustards.

As a preliminary to the study of antibiotics, Dr. A. Kelner investigated the effects produced by X-rays and ultraviolet rays on the microorganism *Actinomyces*. He found that the spores are relatively resistant to killing, and that heritable changes are readily induced by irradiation.

In recent years, microorganisms—viruses, bacteriophages, bacteria, protozoa, and fungi—have been receiving considerable attention among experimental biologists. Techniques have been developed for utilizing them in research on a variety of biological problems; and work with these organisms is becoming very productive in opening up new approaches to some of the outstanding questions of modern biology. At this year's symposium we brought together a group of scientists who are studying the processes of variation and heredity among living things through experiments with various microorganisms. This symposium was a logical consequence of the interest in this field that has existed in our group for a number of years. Since the summer of 1941, work with microorganisms has been conducted at the Laboratory; and at present a considerable proportion of our year-round research is focused on these experimental materials.

This summer we again had a strong group working with bacteriophages. Dr. Max Delbruck and his assistant Mr. W. T. Bailey, Jr., of Vanderbilt University, investigated phenomena that have the appearance of mutation and hybridization in this group of organisms, which are too minute to be seen with the ordinary light microscope but can be observed with the electron microscope. They found an apparent transfer of hereditary material from one bacteriophage to another when a bacterium is simultaneously infected with two different but related strains of phage.

Dr. A. H. Doermann, an associate of Dr. Delbruck, investigated the multiplication of bacteriophages. One question to which he was seeking the answer was whether each phage continues to divide—thus increasing the total number exponentially—or whether division is limited to certain individuals only.

Requirements for the growth of phages were investigated by Dr. M. H. Adams, of New York University, who found that the growth of one strain of phage (T5) depends on the presence of calcium in the medium. Studies were made by Dr. S. S. Cohen and Miss C. B. Fowler, of the University of Pennsylvania, on the interruption of the growth processes caused by addition of 5-methyl tryptophane.

Although in recent years many problems relating to heredity are being studied on microorganisms, still the fruitfly (*Drosophila*) remains a very important organism in genetic research. This classical material is still unequalled for work on many outstanding problems. Our Laboratory is well equipped for research with *Drosophila*, and every summer since 1941 we have had several scientists working with this material. Last summer Dr. E. Mayr, of the American Museum of Natural History, studied forces instrumental in the evolution of species by investigating

sexual isolation as conditioned by age differences, strain differences, and species differences. Studies of sexual isolation were carried on also by C. Streisinger, of Cornell University, who experimented with two species of *Drosophila* and observed that sexual isolation may be reduced by selection. Dr. B. Glass, of Goucher College, made a survey of *Drosophila* stocks for the presence of a suppressor of a certain gene.

Biochemical studies were carried on by Dr. E. Racker, of New York University, with enzymes; by Dr. M. Levy, also of New York University, on protein denaturation; and by Dr. L. Michaelis, of the Rockefeller Institute, with dyes.

Dr. H. A. Abramson investigated the effect of alternating currents on the transfer of drugs through the skin, as well as the passage of substances through the lungs when applied as aerosols.

Drs. I. J. Deyrup and R. Guttman, of Columbia University and Brooklyn College, studied the effect of electric current on the nerves of the horseshoe crab and the spider crab.

Dr. M. A. Rudzinska, of New York University, collected protozoa (*Lacrymaria*) in the Cold Spring Harbor lakes, and worked out a method for culturing them.

Several scientists utilized the time spent at the Laboratory for writing. Dr. M. D. Kamen, of Washington University, prepared the manuscript for a book on radioactive tracer isotopes in biology; Dr. B. Glass worked on a book on evolution; and Drs. M. A. Rudzinska and S. Spiegelman wrote scientific papers.

Brief statements written by these investigators about their research at the Laboratory are presented in the section of this report entitled "Reports of Investigators."

Symposium

After an interval of three years imposed on us by the war emergency, we were again able to continue with the yearly Symposia on Quantitative Biology. The topic for this year's meeting—Heredity and Variation in Microorganisms—was selected two years ago, when it was thought that a symposium could be held in the summer of 1945; the meeting had to be postponed, however, because of travel restrictions. During the last two years, research on problems connected with the genetics and physiology of microorganisms has made very remarkable progress in the laboratories of the United States. Moreover, when contact with continental Europe was reestablished we found that during the war many new discoveries in the same field had been made in France. For these reasons, the continued delay of one year was fortunate, because it gave us an opportunity to broaden considerably the scope of our program.

This was the eleventh in the series of Cold Spring Harbor Symposia on Quantitative Biology, which have become widely known throughout the scientific world since they were started in 1933. The first meeting

after the war was of special importance in bringing together workers who have had little opportunity during the last four years to hold unlimited discussion of their research, and who have until recently been completely cut off from the progress of research in other countries. The group considered the mechanisms that operate in the transmission of heredity in the smallest known living organisms—namely, bacteriophages, bacteria, fungi, and protozoa. Since it is a well-established fact that the fundamental laws of nature apply in general to all forms of life, it is sometimes easier to solve a biological problem by using simple organisms, and, if necessary, testing the validity of the solution later on more advanced organisms. The discussion included also the behavior of tumor cells and leukemia cells, which in many respects exhibit the same individuality as unicellular organisms.

Some distinguished foreign scientists who took part in the program were: Dr. N. W. Pirie, Harpenden, England; Dr. M. J. D. White, University College, London; Dr. G. Pontecorvo, Glasgow University, Scotland; Dr. Andre Lwoff, Pasteur Institute, Paris; Drs. Raymond Latarjet and Jaques Monod, of the same institute; Dr. Boris Ephrussi, University of Paris; Dr. F. Kauffman, State Serum Institute, Denmark; and Dr. T. Johnson, Winnipeg, Canada.

Some of the European scientists on the program were brought to this country by the Biological Laboratory especially for the purpose of taking part in the Symposium. Although this year it was possible for only a limited number of foreigners to be present at the meeting, it was felt that this represented a good beginning in the extremely important task of re-establishing contact and cooperation among researchers in similar fields who had been cut off from communication by six years of war. Funds for the traveling expenses of invited European participants were provided from a special grant made by the Rockefeller Foundation.

American scientists came from all parts of the country, including the states of Alabama, California, Illinois, Indiana, Maryland, Missouri, Tennessee, Texas, and Wisconsin. There was also a large attendance from the hospitals, universities, research institutes, and commercial laboratories of New York City and vicinity. Lecture-room space and living accommodations limited the number of participants, and it was not possible to accept the registrations of all who wished to attend. Of the foreign scientists taking part, four each were from Canada, England, and France, two were from Chile, and one each from Denmark and Sweden.

Course on Bacteriophages

The primary purpose of this course, introduced in the summer of 1945, is to familiarize scientists with new methods that have been developed recently and to stimulate interest in research with bacterial viruses. The course this year had a capacity registration of twelve. A majority of the registrants were established research workers, eight of them having doctors' degrees.