1946

DESCRIPTIVE PAMPHLET, 1944-1946

The Rockefeller University

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†GEORGE LAURIN GRAHAM, A.B., M.S., Sc.D.; Animal Pathology

*Left before December 31, 1946; not mentioned previously in this appointment
†On leave with the Army of the United States
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Visiting Investigators

*ROLLIN HAROLD BAKER, A.B., M.S.; Hospital (1944)
GUY THOMAS BARRY, B.S., Ph.D.; Chemical Pharmacology
*MAXWELL BOVARNICK, A.B., Ph.D., M.D.; Medicine (1945)
FERNANDO DE CASTRO, M.D.; Physiology
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*WILBUR GEORGE DOWNS, A.B., M.P.H., M.D.; Medicine (1944)
PEHR VICTOR EDMAN, M.D.; General Physiology
*STUART DUNSMORE ELLIOTT, B.S., A.M., M.D.; Medicine (1946)
*LEE EDWARD FARR, B.S., M.D.; Medicine; Assistant Resident Physician (1944)
CUTTING BROAD FAVOUR, A.B., M.D.; Pathology and Bacteriology
TEH-PEI FENG, B.S., M.S., Ph.D.; Physiology
SILVIO FIALA, M.D.; Physical Chemistry

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*JOSÉ GUILHERME LACORTE, M.D.; Pathology and Bacteriology (1945-1946)
YVES FREDERIC MICHEL LAPORTE; Physiology
SAUL MALKIEL, A.B., A.M., Ph.D., M.D.; Plant Pathology
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OTTO SPÜHLER, M.D.; Chemistry
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*ARMINE TAYLOR WILSON, B.S., M.D.; Medicine (1945-1946)

*Left before December 31, 1946; not mentioned previously in this appointment
Special Investigators

*BENJAMIN CRENSHAW BRADSHAW, A.B., A.M., Ph.D. (1944–1945)
*CARL EDWARD DUFFY, A.B., M.S., Ph.D. (1944–1945)
WINSTON HARVEY PRICE, A.B.; General Physiology

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MABEL DENNIS REED; Secretary to the Director of the Department of Animal and Plant Pathology
HAZEL REED OLMSTEAD; Secretary to the Business Manager

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THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

HISTORY

Endowment
The Rockefeller Institute for Medical Research was founded in 1901 by Mr. John D. Rockefeller, as a philanthropic corporation under the laws of the State of New York. Since its beginning, as needs have arisen for buildings, equipment, and additional endowment, to permit more extensive investigations, gifts have very generously been made by Mr. John D. Rockefeller and Mr. John D. Rockefeller, Jr.

Bequests and Gifts
The opportunities for fruitful medical research are almost unlimited and potentially exceed the limits of any given endowment. On the other hand, individuals anxious to make donations that will promote medical research are often at a loss as to how to place funds so that they will be wisely expended. The organization and control of investigation in the Institute are in the hands of a Board of Scientific Directors, selected from the scientific leaders of the country; and donations accepted by the Institute are expended under their direction with the same care as that devoted to the expenditure of the income from the original endowment. Donors, therefore, who are interested in contributing to scientific medical investigation may have confidence that the Scientific Directors will make a wise use of their donations. The Institute is glad to receive such donations when the Directors and Trustees are satisfied that it can, consistently with its existing policies and commitments, do justice to the purposes of the donors. At the present time the Institute is administering several gifts made for the promotion of cancer research. Other gifts made for the Institute's general purposes have been helpful in carrying on its work.

Purposes
The purposes of the Rockefeller Institute are set forth in its charter, which states that:

"The objects of said corporation shall be to conduct, assist and encourage investigations in the sciences and arts of hygiene, medicine and surgery, and allied subjects, in the nature and causes of disease and the methods of its prevention and treatment, and to make knowledge relating to these various subjects available for the protection of the health of the public and the improved treatment of disease and injury."
shall be within the purposes of said corporation to use any means to those ends which from time to time shall seem to it expedient, including research, publication, education, the establishment and maintenance of charitable or benevolent activities, agencies or institutions appropriate thereto, and the aid of any other such activities, agencies or institutions already established or which may hereafter be established."

**Development**

The Rockefeller Institute was conceived, not by physicians or scientists, but rather by laymen who studied the state of medical knowledge at the end of the nineteenth century and concluded that the time was favorable for the establishment in the United States of an institute devoted exclusively to medical research, just as institutions devoted to physical or chemical research might be founded.

In the United States before 1900 the growth of medical science had not kept pace with that of the physical sciences, despite the fact that research in medicine had been carried on in universities at a constantly increased rate. The conclusion reached by Mr. Frederick T. Gates, acting as adviser to Mr. Rockefeller, was, therefore, that "medicine could hardly hope to become a science until it should be endowed, and qualified men be enabled to give themselves to uninterrupted study and investigation, on ample salary, entirely independent of practice." This view was accepted by Mr. Rockefeller, who made the initial contribution toward the eventual permanent establishment of The Rockefeller Institute for Medical Research.

The original gift, amounting to $200,000, was in 1901 placed in the hands of a Board of Directors, composed of William H. Welch, President; T. Mitchell Prudden, Vice-President; L. Emmett Holt, Secretary; Theobald Smith, Christian A. Herter, Hermann M. Biggs, and Simon Flexner. This gift was not made for the immediate purpose of building an institution for medical research, but was to be used by a group of scientifically trained medical men to ascertain the resources in adequately trained younger men of the universities engaged in the pursuit of medical research. It was to be awarded in grants and fellowships and expended within a period of ten years. During this period, and in this way, it was hoped that more precise knowledge would be obtained concerning the advisability of establishing in the United States an independent institute for medical research. This information was secured more quickly than had been anticipated, so that early in 1902 the conception

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of a research laboratory to be located in New York City had taken form in the minds of the scientific directors, and met with Mr. Rockefeller's approval.

The principles of organization of the research laboratory which constituted the beginnings of the present Rockefeller Institute have continued essentially unchanged. They were, briefly, that there should be a Board of Scientific Directors responsible for the appointment of the Scientific Staff and for the general policies of scientific investigations carried on, while the general direction of the scientific work was to be entrusted to a Scientific Director, who was himself an investigator and in intimate contact with other investigators. Each investigator was to be accorded complete freedom, under the general supervision of the Director of the Institute, in the pursuit of problems within his particular field, but it was thought best to avoid, as far as practicable, the overlapping of problems into contiguous fields, except where problems were investigated jointly by two or more groups of workers.

It was apparent that Mr. Rockefeller's initial gift necessitated that the operation of the original laboratory in New York should be on a limited scale. Accordingly a small building was rented at 127 East 50th Street, equipped for investigations in pathology, physiology, pharmacology, and biological chemistry, and opened on October 15, 1904. The original scientific staff consisted of Simon Flexner, pathologist and Director, with whom were associated Hideyo Noguchi, Eugene L. Opie, and J. E. Sweet, pathologists; Samuel J. Meltzer, physiologist and pharmacologist; and P. A. Levene, biological chemist.

The results achieved with grants given in aid of research, and in the first small laboratory, proved to be so encouraging that a tract of land was purchased by Mr. Rockefeller overlooking the East River at 66th Street, upon which was erected a modern laboratory. In order to provide both for the erection of the laboratory and for its cost of operation, Mr. Rockefeller made an additional gift to be expended and not reserved in part as endowment. This laboratory, known as the Central Laboratory, was opened in 1906, and provided suitable space for the study of the above subjects together with experimental surgery, and, later, experimental biology.

The need for a hospital attached to the Institute, in which disease in
man could be investigated under as favorable conditions as possible, was felt early, inasmuch as investigations had been conducted only in the laboratories, and access to patients suffering from disease had to be secured in a small way at hospitals in the city. In 1908 and shortly thereafter Mr. Rockefeller made gifts for the purpose of erecting a main hospital of sixty beds, and an isolation pavilion, of nine beds, designed for the study of infectious diseases. The hospital was opened in 1910 with Rufus Cole as Director. At that time Mr. Rockefeller provided a suitable endowment for the needs of the Institute as then existing. In 1937 Dr. Cole retired as Director of the Hospital and was succeeded by Dr. Thomas M. Rivers.

The principles of organization of the hospital were, first, that the number of diseases studied at any one time would be limited and only patients suffering from one or another of the diseases under investigation would be accepted; second, that all the scientific staff was to devote its entire time to the duties of the hospital; third, that the work of the hospital staff should consist not merely in observational studies, but in experimental studies equally; and fourth, that no charge was to be exacted from the patients for services rendered. These principles have not been departed from in the thirty-six years during which the hospital has been in operation.

In 1910, with the added endowment and the opening of the hospital, the powers of the Corporation were increased and its membership was enlarged to include the members of a new Board of Trustees as well as the members of the original Board of Directors, the name of which was changed at that time to the Board of Scientific Directors. The new Board of Trustees was composed of two groups: one representing the business or fiscal interests of the Institute and the other the scientific interests. The former group consisted of Frederick T. Gates, as President, John D. Rockefeller, Jr., and Starr J. Murphy; and the latter group of William H. Welch and Simon Flexner. Owing to death and other circumstances, the personnel of the Trustees has changed, and at the present time consists of nine members, with John D. Rockefeller, Jr., as President.

Up to 1914 the Rockefeller Institute was located wholly in New York City and consisted of laboratories and a hospital. In that year a De-
partment of Animal Pathology was created, and Theobald Smith was chosen Director. A suitable country location, about three miles from Princeton University, was secured, on which laboratories and stables for animals were erected. To these buildings were added dwellings for the Director, scientific staff, and employees. This department was created in order to provide facilities for the study of the comparative aspects of the pathology of disease in various animal species, especially in the more valuable domestic animals, and in order to bring to light such processes as are especially clear in animals but obscure or difficult of access in human beings. In 1930 Dr. Carl TenBroeck succeeded Dr. Theobald Smith as Director.

In 1931 the department at Princeton was extended to include a Laboratory of Plant Pathology, and the combined laboratories are now known as the Department of Animal and Plant Pathology. Through the addition of plant pathology the Rockefeller Institute has provided in one organization for the study of disease as it occurs in all the main orders of living things.

In 1935 Dr. Simon Flexner retired from the directorship of the Institute and was succeeded by Dr. Herbert S. Gasser.

**ORGANIZATION**

**Administration**

The Institute's charter provides for a Board of Trustees and a Board of Scientific Directors. The Board of Trustees, of which two members are appointed by the Scientific Directors from their own number, is charged with the maintenance and care of the endowment and property of the Institute. Income from endowment, after taxes and other charges on capital have been paid, is available for expenditure by the Board of Scientific Directors. The Board of Scientific Directors, acting through the Director of the Institute, has control of all the scientific work and of the administration of the several departments of the Institute. Its stated meetings are held quarterly. The expenditures are made under its direction in accordance with an annual budget framed by a Budget Committee consisting of three members of the Board of Scientific Directors and two members of the Board of Trustees. Of the three members of the Budget Com-
mittee chosen by the Board of Scientific Directors at least one shall also be a member of the Board of Trustees.

The Trustees of the Institute, who are the custodians of its property, and the Scientific Directors, who have unrestricted charge of all phases of its scientific work, together constitute the Corporation. The Corporation meets at least once a year to receive reports from the Trustees and Scientific Directors, who consider together, from a common standpoint, the affairs of the Institute as a whole. This organization of the Governing Boards has fostered the aims of the Institute in a most gratifying way, giving as it does to the Scientific Directors the advantage of wise and sympathetic counsel in the relationships of the institution to the community, and affording to the Trustees opportunity to share in the problems, outlooks, and successes which are the inspiration of the scientific staff.

The routine administration of the Institute is in charge of an Executive Committee of the Board of Scientific Directors which acts chiefly through the Business Manager. The fiscal year begins July 1.

**Departments of the Institute**

There are three Departments of the Institute: the Department of the Laboratories, the Department of the Hospital, and the Department of Animal and Plant Pathology. At the head of each of these Departments is a Director, who is also a member of the Scientific Staff. The departmental Directors are appointed by the Board of Scientific Directors, and the Director of the Institute by the Corporation.

The present division of the Institute into the above three departments corresponds with a natural division of medical research into three branches. The Department of the Laboratories deals with the problems of disease in their physiological, pathological, bacteriological, chemical, and physical aspects and admits of the fullest use of the experimental method. The Department of the Hospital studies disease as it actually appears in human beings, facilities being provided not only for scientific observation and treatment of patients, but also—through experiments on animals—for solution of the problems arising from these clinical observations. The Department of Animal and Plant Pathology,
through observation and experiment, deals with all aspects of the diseases of animals and plants.

In the different Departments of the Institute separate laboratories have been organized under the guidance of Members or Associate Members.

The Department of the Laboratories

The Department of the Laboratories, which was organized in 1905, is directed by Dr. Herbert S. Gasser. In this Department, investigations are carried on, at the present time, in the following scientific fields: Chemistry, Pathology and Bacteriology, and Physiology. These are conducted by the following staff groups.

Chemistry

A Laboratory of Chemistry is being carried on by Drs. Moore and Stein, in association with Dr. L. E. Baker.

A Laboratory of Chemical Pharmacology is conducted by Dr. Jacobs, in association with Drs. Craig and Huebner.

A Laboratory of Physical Chemistry is conducted by Dr. MacInnes, in association with Drs. Longsworth, Shedlovsky, Rothen, and Ecker.

Research is also being carried on by Dr. Michaelis, Member Emeritus, in association with Dr. Granick.

Pathology and Bacteriology

Laboratories of Pathology and Bacteriology are conducted by Dr. Olitsky, in association with Dr. Casals-Ariet; by Dr. Dubos, in association with Drs. Chase, Hotchkiss, Middlebrook, and Pierce; by Dr. Goebel, in association with Dr. E. E. Baker; and by Dr. McMaster.

A Laboratory of Cancer Research is conducted by Dr. J. B. Murphy, in association with Drs. Claude, Lynch, Porter, and Hogeboom, and Mr. Sturm.

Research is also being carried on by Dr. Rous, Member Emeritus, in association with Dr. Smith.

Physiology

Laboratories of Physiology are conducted by Dr. Gasser, in association with Dr. Lloyd; by Dr. Lorente de Nó; by Dr. Mirsky, in association
with Dr. Ris; by Dr. Woolley, in association with Dr. Ludutsky; and by Dr. Schneider.

A Laboratory of General Physiology is conducted in Princeton by Dr. Northrop, in association with Drs. Kunitz and Herriott.

Research is also being carried on in New York by Dr. Osterhout, Member Emeritus.

**The Department of the Hospital**

The Department of the Hospital is directed by Dr. Thomas M. Rivers, and was established as a part of the Institute in 1910, in order that experimental investigations which are carried on in the Department of the Laboratories could be complemented by the study of certain diseases as they actually occur in man.

The particular diseases studied in the Hospital vary from time to time, the choice of problems being determined to some extent by the special fitness of the scientific staff for certain kinds of investigation. The staff of the Hospital is divided into several groups each of which is engaged in studying a special class of diseases, the investigation of which demands the employment of the methods of some fundamental science. The interests of a member of a particular group are not necessarily confined to the disease being studied by his group. For instance, a physician studying metabolic diseases may investigate the metabolic disturbances occurring in patients with heart disease or acute infections.

The groups of diseases at present under investigation in the Hospital and the names of workers engaged in the study of each of them are as follows:

1. **Infectious Diseases**
   
   (a) **Acute Respiratory Diseases**
   
   Drs. Horsfall, Stillman, Ginsberg, Hardy, Volkert, and Taylor, and Dr. Avery, Member Emeritus.
   
   (b) **Rheumatic Fever**
   
   Drs. Lancefield, McCarty, Rothbard, and Anderson, and Dr. Swift, Member Emeritus.

2. **Metabolic Diseases**
   
   (a) **Nephritis and Nephrosis**
   
(b) Hepatic Insufficiency, Particularly That Associated with Cirrhosis

Drs. Labby, Ahrens, and H. G. Kunkel.

Admission of Patients to the Hospital

The Hospital provides accommodation for a limited number of patients, and it has been so organized that the most approved methods of treatment can be adequately employed. Each physician has only a few patients under his care in order that a considerable portion of his time may be given to investigation. The Hospital employs none but graduate nurses.

The work of the Hospital at a particular time is limited to a small number of subjects; bulletins are issued from time to time stating the forms of disease then the subject of study. Only patients suffering from one of these diseases are admitted for treatment. They are admitted only by the Resident Physician, to whom they are referred by physicians or hospitals, or to whom they may apply directly. While making the fullest use of its opportunities for observation and study, the Institute recognizes at all times the paramount right of the patient to receive the most effective treatment within the power of the attending physicians. A patient does not impair that right by the voluntary character of his application for admission.

Under the By-Laws of the Corporation, no charge for professional care or service rendered, or for board or lodging, is to be made to persons treated at the Hospital.

The Department of Animal and Plant Pathology

The Department of Animal and Plant Pathology is directed by Dr. Carl TenBroeck. This Department was first organized in 1916 as the Department of Animal Pathology, and work was begun in newly erected buildings in 1917. In 1931, it was extended to include a Laboratory of Plant Pathology, and the combined Laboratories at that time became known as the Department of Animal and Plant Pathology. In this Department, investigations are, at present, conducted by the following staff groups.

Animal Pathology

Laboratories of Animal Pathology are conducted by Dr. TenBroeck, in association with Drs. Nelson, J. A. Baker, Little, Trager, and Bang;
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by Dr. Shope; by Dr. Pearce, who is continuing the work of Dr. Brown; by Dr. Glaser, in association with Dr. Ferguson; and by Dr. Stoll, in association with Dr. Graham.

Plant Pathology

Laboratories of Plant Pathology are conducted by Dr. L. O. Kunkel, in association with Drs. Holmes, Braun, Cochran, and Elrod; and by Dr. Stanley, in association with Drs. Knight and Oster.

General Statement

The three departments of the Institute are organized for research only. Under normal conditions no provision is made for the enrollment of individuals or classes for formal instruction in the medical sciences or in laboratory or clinical methods. Thus the Institute absolves its staff from the necessity of devoting time and energy to formal teaching or to the consideration of subjects and problems chosen for reasons other than because of their value and promise for the advancement of science.

The scope of the Institute's work is wider than the study of problems whose solution has an immediate application to human pathology. It has, in fact, been the principle of the Institute's organization that it can best serve medical science by devoting a great deal of attention to the investigation of fundamental biological, physical, and chemical subjects. These aspects of science, as well as those of direct clinical importance, have been constantly under investigation, and together with problems of general biological interest, have largely occupied certain of the scientific staff and have used a considerable share of the Institute's annual budget.

It is not the aim of the Institute to perpetuate the lines of investigation in which it may engage, or even Departments or Laboratories, should the usefulness or promise of these at any time become doubtful, either from changes in the requirements and outlooks of science, or from lack of leaders of vision or achievement. On the other hand, the elucidation of fundamental problems may proceed under favorable conditions and with adequate support for an indefinite period, unhurried and unhindered by the urgency of obviously practical or immediate results. The organization of the Scientific Staff of the Institute is thus flexible and adaptable to the ever shifting requirements of research, so that at any time its Directors may alter the emphasis of its work, and focus its various resources upon different aspects of complex problems.

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While the various phases of research which are being carried forward at the Institute are more or less independently conducted in the several Departments and Laboratories, it is aimed as far as is possible, through coordination and cooperation, to make them mutually helpful and stimulating. Thus through frequent symposia, the common services of publication, library, illustration, and other accessory services, and the lunch room shared by the scientific staff, a helpful community of interest is maintained.

Appointments to the Scientific Staff are made by the Board of Scientific Directors, upon recommendation of the Director of one of the Departments. They are held at the pleasure of the Board for a term not exceeding the period specified. The appointment of a Member of the Institute is without limit of time; the appointment of an Associate Member is for a term of years; all other appointments are for a term not exceeding one year, unless otherwise specified.

The following grades are fixed by the rules of the Board: Member of the Institute, Associate Member, Associate, Assistant, and Fellow. The clinical staff of the Hospital may have in addition to the appropriate Institute titles, as above, the following titles indicating their special functions: Physician-in-Chief to the Hospital, Physician, Associate Physician, Resident Associate Physician, Senior Assistant Physician, and Assistant Physician.

Applications for appointment may be made at any time. Blank forms of application are furnished on request. Appointments are ordinarily made only as vacancies occur. They may be sought for the purpose of permanent or indefinite association with the Institute, or for the purpose of temporary association with the Institute with one of the following objects: (1) experience in methods of investigation generally; (2) training in a special line of investigation; or (3) opportunity to work more or less independently on a particular problem which may be the subject of study at the time. The qualifications for appointments to the scientific staff include preliminary training such as would be represented by an M.D. or a Ph.D. degree and, in addition, a knowledge of research, or a training such as would ordinarily be appropriate to the higher degrees in the biological or physical sciences.
The Institute requires all who serve on its scientific staff to give full time to the work, permitting them to pursue no gainful occupations outside of its organization and paying them a stipend fixed with reference to their complete devotion to whatever may be their special assignments. No part time workers are accepted.

All staff appointees are paid investigators with the exception of a number of visiting investigators and special appointees, usually persons receiving fellowships awarded by various institutions in the United States and abroad. Foreigners who come to the Institute under fellowships are ordinarily privileged to enter the United States as "students" under the Immigration Laws. Visiting investigators give their entire time to the scientific work on which they are engaged, under the direction of one of the heads of laboratories of the Institute. Volunteer investigators wishing to pursue individual subjects of research foreign to the investigations being carried on in the laboratories of the Institute are not, as a rule, acceptable. Language plays no part in the eligibility of visiting investigators. They are expected to be self-supporting, but there are no laboratory charges imposed either for space or materials.

**Technical Employees**

The Institute employs a group of men and women who act as technical assistants to the scientific staff. This group is largely made up of technicians, skilled helpers, and helpers. The technicians have had training equivalent to a B.S. degree, or considerable experience in special laboratory technique. The skilled helper and helper groups are composed mainly of young men and women who are high school graduates and who have a special interest in scientific work. Applications for employment may be filed with the Assistant Business Manager.

**Services Auxiliary to Research**

The organization of the Institute provides for the maintenance of a series of Auxiliary Services for the scientific staff, thus relieving the latter of such personal routine as can be wisely delegated to specially trained persons. The following are now in operation in New York: Publication, Library, Illustration, Purchase and Supply, Culture Media and Glassware Preparation, X-Ray, Animal House, and Instrument-Making.
Also of service to the scientific staff, as well as in maintenance work, are the Power House, Machine Shop, Carpenter Shop, and Paint Shop.

At the Department of Animal and Plant Pathology at Princeton a number of these services are also maintained.

**Discoveries and Inventions**

All discoveries and inventions made by any person while receiving compensation from the Institute, or while using the facilities of the Institute, become the property of the Institute, to be placed by it at the service of humanity in accordance with the beneficent purposes of the founder.

**PRESENT SCOPE OF THE SCIENTIFIC WORK**

As previously stated, in the organization of the scientific work of the Institute the principle has been recognized that the ultimate purposes of medical science may be greatly served by the study of fundamental biological, chemical, and physical problems. It will thus be seen that the scope of the Institute’s work is broader than the study of problems whose solution would have an immediate application in the treatment and prevention of diseases of man, animals, and plants.

**The Department of the Laboratories**

Dr. Herbert S. Gasser, Director of the Institute, is also Director of the Department of the Laboratories, in which investigations are being carried on at the present time in the following scientific fields: Chemistry, Pathology and Bacteriology, and Physiology.

**Chemistry**

Since Dr. Bergmann's death the program of the Laboratory of Chemistry has been continued by Drs. Moore and Stein. The laboratory is engaged in the study of the biochemistry of proteins, peptides, and amino acids. Methods are being developed for the separation and characterization of peptides occurring in partial hydrolysates of proteins and in biological systems. The researches on the products of the partial degradation of proteins are aimed at further elucidation of the composition and structural pattern of protein molecules.

In the Laboratory of Chemical Pharmacology, Dr. Jacobs and his associates are engaged in the study of the chemistry of natural products which have a demonstrated usefulness in medicine or are of pharmacologi-
cal significance. In this connection special attention is being given to certain groups of alkaloids the chemistry of which has been little understood. Following recent work of the laboratory to determine the chemical structure of the alkaloids of ergot, synthetic studies have been in progress for substantiation of the findings and with the aim in view of making such or related substances synthetically available. Studies of the chemistry of the aconite alkaloids and of the veratrine alkaloids are also in progress to determine their structures, the structural interrelationships among the different alkaloids, and the significance of such structures in relation to their pharmacodynamic effects.

Dr. Craig is engaged in the study of certain techniques, especially one, based on the principle of countercurrent distribution, for the isolation, identification, and investigation of biologically important substances such as antibiotics, antimalarials, and their transformation products.

In the Laboratories of Physical Chemistry, work is being conducted as follows:

Dr. MacInnes and his associates are carrying out investigations on physicochemical methods for studying proteins, ampholytes, and salts. These methods include electrophoresis by the moving boundary method, surface films, diffusion, density, refractive index, and high centrifugal fields.

The precision of ultracentrifugal measurements, including particularly the variables temperature and rotational speed, is being improved by a study of typical pure proteins.

A research is in progress on the effect of centrifugal fields on simple galvanic cells. Such measurements will yield transference numbers not readily obtained by other methods.

Experimental and theoretical studies are being made for the purpose of increasing the accuracy of the quantitative interpretations of electrophoretic patterns. To this end various types of moving boundaries are under investigation, together with improvement of the optical systems that make such studies possible. Precision measurements of the refractive indices of protein and salt solutions are also being made.

The reactions between antigens and antibodies as surface films are being studied, with an improved optical method for the determination of the thickness of such films.

Physical-chemical investigations are in progress on non-aqueous solu-
tions of biological interest, particularly with reference to cell permeability and bioelectric potentials.

In collaboration with investigators both inside and outside the Institute researches are under way on proteins of biological and clinical interest.

Dr. Michaelis, Member Emeritus, and his associate are investigating the physical chemistry of reversible oxidation and reduction in organic compounds. The occurrence of intermediate steps of oxidation in the form of free organic radicals has been made the subject of investigation during the past years, and the studies have led to the conclusion that the existence of such radicals as intermediate steps is the condition sine qua non for the reversibility of oxidation-reduction. To the previous methods of experimental approach to this problem the measurement of magnetic susceptibility has been added. The magnetic equipment has been utilized also for the measurement of magnetic properties of other compounds of biological interest, such as the crystallizable iron-containing protein called ferritin which has been shown to be a combination of iron with a specific crystallizable protein called apoferritin. The metabolism of iron is being studied with respect to the function of this protein, and to the rôle of iron in combination with various porphyrin compounds in microorganisms. Photoelectric spectrophotometry has been added as a further tool for the study of these problems and also for the study of the nature of the adsorption of dyes such as are used in histological staining methods.

A Spectroscopic Laboratory is conducted by Dr. Lavin, in which a central service for spectroanalysis is maintained for various laboratory groups throughout the Institute.

Pathology and Bacteriology

This laboratory was the first to be established and has been in operation since 1904. Until his retirement from the directorship of the Institute in 1935, the laboratory was in general charge of Dr. Flexner. The investigations are now being carried on in a number of laboratories in charge of the persons indicated below.

Dr. Olitsky and his associate are studying neurotropic viruses and the diseases induced by them. Their chief interests are the mechanism of immunity in virus infections, diagnostic methods, and the principles
underlying such laboratory procedures as virus-neutralization and complement-fixation tests. The differences between non-specific resistance and true immunity, characterized by the presence of specific antibody, are under active investigation. One approach to the problem has been a study of the differences in the immune responses as they develop in animals of different ages; another, the relationship of virus-neutralizing antibody to resistance to active virus introduced by various routes. Specific prevention and serotherapy of virus diseases are also being studied. The viruses of equine encephalomyelitis and Russian spring-summer encephalitis lend themselves conveniently to these experiments and they are, therefore, mainly used. The readily available virus of spontaneous encephalomyelitis of mice (so called poliomyelitis of mice), in view of its similarity in many characteristics to the virus of human poliomyelitis, is also being employed. At present infectious hepatitis is under investigation, in continuation of work originally requested by the Commission on Neurotropic Virus Diseases of the United States Army.

Dr. Dubos and his associates are studying bacterial physiology and metabolism, with the view in mind that the sciences of immunity and chemotherapy have much to gain from a more accurate knowledge of the structure and metabolism of bacterial cells. It is possible to study microorganisms by physiological and chemical methods analogous to the ones used for the investigation of higher forms of life, and the information thus obtained can serve as a rational basis for the development of immunity processes and of chemotherapeutic agents useful in the study and treatment of disease.

In the past, the attention of the laboratory has been focussed on the group of pyogenic cocci (pneumococci, streptococci, staphylococci, etc.). This led to the discovery of bacterial enzymes capable of destroying the polysaccharides which constitute the capsules of pneumococci, and to the finding of chemical substances (gramicidin and tyrocidine) which are elaborated by soil bacteria and which are endowed with bactericidal power against many pathogenic agents.

During the war, analysis of the factors which affect the growth of the Shiga dysentery bacillus led to the formulation of a practical method for the large scale production of Shiga neurotoxin and of a toxoid which permits immunization against this bacterial poison.
More recently a new program has been instituted for the study of the tubercle bacillus: its growth requirements, and the chemical nature and the biological properties of its cellular components and products. It is hoped that, in this case again, more accurate knowledge of the structure and behavior of the causative microorganism will permit the development of better diagnostic methods and more effective therapeutic procedures for the control of tuberculosis.

Investigations in the newer field of experimental allergy are also being carried out, especially in relation to the problems of hypersensitivity to tuberculin and to simple chemical compounds (certain types of drugs for example). Study of factors affecting the production and prevention of the allergic state may be expected to throw light on the mechanism of the sensitization process in general and on its relation to known aspects of immunity.

Dr. Goebel and his associate are engaged in researches in the field of chemical immunology. The isolation and chemical characterization of the toxic somatic antigens of microorganisms belonging to the dysentery group are being studied, and the rôle of these substances in infection and resistance is under investigation. Other researches concern the relationship of the chemical constitution of bacterial polysaccharides to the specificity of the parent microorganisms. In addition, studies on the chemical nature of bacterial heterophile antigens and the related human blood group specific substances are being pursued.

Dr. McMaster is carrying on a study of the physiology of the lymph vessels and the tissue conditions influencing the transformation of extracellular fluid to lymph. The production for this purpose of highly antigenic, deep blue azo-proteins which can be seen within cells has led to an inquiry into the mechanism of antibody formation by lymph nodes and other lymphatic tissues.

In the Laboratory of Cancer Research, Dr. Murphy and his associates are conducting studies on induced, transplanted, and spontaneously occurring leukemia in rats and mice. Several conditions have been shown to modify the inherited tendency in a strain of mice having a high spontaneous leukemia rate. Prominent among these is the disturbance of the endocrine balance. The adrenal cortical hormone which normally controls the activity of the lymphoid system has proved to have a definite effect on malignant cells of this system, lymphosarcoma and lymphatic leukemia.
To secure definite information on the difference between malignant and normal tissue units, an extensive detailed study of the cell is in progress. A recently developed method makes it possible to separate the various cell components by mechanical means. The chemical composition and some functions have been determined for mitochondria and other cytoplasmic structures. The development of a technique for the study of animal cells by means of the electron microscope has opened a new field of study. Clear pictures of the complex structure of cytoplasm not only give new information on the known elements but reveal previously undetected structures. Structural differences between normal and malignant mammalian cells can be demonstrated and the transmitting agents of the filtrable fowl tumors clearly depicted. It has been demonstrated that the electron microscope can be used for the precise localization of certain intracellular chemical reactions and for the study of the distribution of substances and reactive groups.

Dr. Rous, Member Emeritus, and an associate are engaged in inquiries on how tumors come about, with reference both to the nature of the primary change whereby a normal cell becomes a tumor cell and the factors determining multiplication of the latter into a perceptible mass. An effort is under way to learn more about the conditions which are critical to the neoplastic alteration. A considerable proportion of cells which become neoplastic lie latent afterwards, as the work of the laboratory has shown, and the reasons for this latency and the nature of the influences which cause them to manifest themselves are being sought. The implications of a recent finding, that the cells of the tissues of embryos can be rendered neoplastic, are under experimental scrutiny, as also are the widely various growths which result from the procedure.

**Physiology**

Dr. Lloyd (in Dr. Gasser's laboratory) is conducting studies on the properties of monosynaptic reflex arcs, with particular reference to facilitation and inhibition of the motoneuron, on the determination of the reflex effect of the several known nerve fiber types encountered in afferent nerves, and on the integrative pattern of neuron linkages involved in the transmission of characteristic spinal reflexes. Analysis of the direct connections between afferent fibers and motoneurons has revealed the exclusive rôle such connections play in myotatic reflexes, and the manner in which the muscles of a given joint are bound together by direct reflex
connection to form a functional unit at the myotatic level of postural performance. At the present time attention is being directed to the analysis of the more complex reflex reactions of the spinal cord involving, in even the simplest cases, the transmission of activity through internuncial relays. The reflexes being examined are the flexor reflex, the reflex of ipsilateral extension, and the incompletely resolved complex at present known as the long spinal reflex.

Dr. Lorente de Nó is investigating problems of physiology of the nervous system. A systematic study of the physiology of nerve, carried out during the past eight years, has led to the establishment of detailed correlations between nerve activity and polarization phenomena. The study has included the three main aspects of the polarization of the nerve fiber, the resting membrane potential, the electrotonic potentials produced by applied currents and the action potential, in nerves in a variety of states produced by changes in the ionic environment or in metabolic conditions. The information obtained has made it possible to define in concrete terms the conditions under which nerve impulses can be initiated, as well as the mechanism of the initiation of single impulses and of rhythmic trains of impulses. On the other hand, the theory of the distribution of action currents in volume conductors has been elaborated and submitted to experimental test.

The acquired knowledge of the physiology of peripheral nerve is now being used in an investigation of problems of the physiology of the neuron. Detailed study of the anatomy of selected pools of neurons is being carried out in order to determine the most favorable situations for experimentation, and to obtain the information needed for the analysis of differences of electric potential recorded during activity. The purpose of the analysis, itself, is to define more precisely the flow of action currents during the propagation of impulses and the residual effects of activity in individual neurons and in groups of neurons.

Dr. Mirsky and an associate are studying the chemical composition of chromosomes. Methods for the isolation of chromosomes have been developed. From some tissues it is now possible to prepare isolated chromosomes in such quantities that the composition of these bodies can be investigated by direct chemical procedures which would be inapplicable to chromosomes lying inside cells. Since chromosomes of only certain cells can be isolated, knowledge gained from the study of isolated masses
of chromosomes is being used for development of cytochemical procedures that can be applied to single chromosomes, or even to portions of chromosomes. Work on the chemistry of chromosomes is directed toward an understanding of their structure and genetic activity.

Dr. Woolley and his associate are studying the natures and modes of action of the vitamins. A peptide named strepogenin has been detected in some proteins and shown to be necessary for the maximal growth of animals and microorganisms. Studies on the chemical nature of this growth factor are being made. Other new and as yet unidentified dietary essentials for animals are being investigated. The synthesis and use of substances related in structure to vitamins and hormones but possessing the ability to produce deficiencies of these latter by competing with them are being studied. These substances are being used to investigate the ways in which vitamins act in metabolism and also to explain the causation of some diseases.

Dr. Schneider is engaged in studies in experimental epidemiology. The problem of the genesis of epidemics of infectious disease is being investigated from the standpoint of the physiology of the host, especially as it is modified by diet. By use of population models of defined genetic composition, both of host and of pathogen, it has been possible to define the biological circumstances in which nutritional forces can operate in altering resistance and susceptibility to infectious disease.

In the Laboratory of General Physiology at Princeton, Dr. Northrop and his associates are engaged in the study of physiologically active proteins, especially enzymes, viruses, and antibodies. The ultimate aim of this work is to determine the chemical structure which is responsible for the physiological activity. The first step in such a problem is to isolate the substance in pure form. The general chemical nature of the substance may then be determined. The more detailed chemical structure may be studied, either by exposing the compounds to reagents known to react with certain groups or to decompose the compound into smaller and less complicated fragments. Six enzymes and diphtheria antitoxin have been obtained in pure crystalline form. Several of the enzymes are formed from inert proteins called precursors and this reaction may be carried out in vitro. Three precursors have also been isolated and crystallized.

Information concerning the chemical structure responsible for the
activity of some of the enzymes has been obtained by means of reagents which are known to react with certain groups in the molecule.

Dr. Osterhout, Member Emeritus, is continuing in New York his studies on the fundamental properties of protoplasm and the forces that create and control its activities. Use is made of large plant cells, which have especial advantages for such studies, particularly in dealing with the interior of the cell. The investigations center about the non-aqueous protoplasmic surface layer which has a low conductivity, low dielectric constant, and large capacity. The electric potentials of the cell appear to depend largely on diffusion potentials in this layer.

The permeability of the surface layer in all its variable aspects is being studied as a means of analyzing the structure and composition of the surface. An examination of the apparent mobilities of inorganic ions in the layer has revealed that the mobilities differ greatly from those in water, and that they can be changed by the addition of organic substances or by the removal of organic substances normally present. The effect of the addition or removal of these substances is being studied on the action current. The action current resembles that of muscle and nerve; and under the relatively simple conditions in which it occurs it provides a favorable source of information fundamental to the theory of excitation.

A further understanding of the behavior of the cells is gained by the setting up of physicochemical models that imitate features of the cell activity.

The Department of the Hospital

The Hospital was established as a Department of the Institute in 1910 in order to "extend the field of its [the Institute's] research so as to include the study of disease in the clinical aspects, under conditions as near as possible to standards of laboratory exactness and efficiency." From its beginning to the time of his retirement in 1937, Dr. Rufus Cole was the Director. In that year he was succeeded by Dr. Thomas M. Rivers.

Although the ultimate purpose of the work carried on in the Department of the Laboratories is the prevention of disease and the relief of suffering, it has been found that in order to accomplish these ends it is frequently necessary that the studies undertaken shall concern fundamental biological processes which may not have a direct relationship to
special diseases. On the other hand, the studies carried on in the Hospital, and in the laboratories directly connected with it, have in general a fairly direct relationship to the diseases being investigated at any given time and are undertaken with the more immediate objectives of prevention and cure. Even in the Hospital, however, it has been deemed important that the work shall consist not merely in observation of the more superficial manifestations of disease, but that an effort shall be made to determine the causes of disease and the nature and the course of the abnormal symptoms. For carrying out these investigations, laboratories in the Hospital have been equipped for the employment of methods developed in the contributing sciences of physics, chemistry, physiology, microbiology, and immunology. Moreover, it is important that the physicians caring for the patients shall themselves engage in these studies, since not infrequently careful observation of patients yields suggestions for lines of research which might otherwise be overlooked. The present scope of the investigations being carried on in the Hospital is outlined below.

1. Infectious Diseases

(a) Acute Respiratory Diseases. The various forms of acute infection of the respiratory tract are being investigated, especially the commoner acute respiratory diseases; these include the syndromes which usually are designated the common cold, influenza, primary atypical pneumonia, and bacterial pneumonia. Efforts are being directed toward learning more about the environmental and physiological factors which influence acute respiratory infections and about the nature of the infectious agents associated with these diseases.

A wide variety of bacterial species as well as certain groups of viruses appear to be intimately associated with the pathogenesis of some acute respiratory infections. However, the causal factors responsible for many acute respiratory diseases have not yet been established despite numerous careful investigations and the use of many different experimental techniques. If measures adequate for the control of these diseases are to be developed, it seems evident that information on the nature of the primary incitants is of great importance and that knowledge of the pathogenesis of the several infections is essential.

Laboratory models suitable for the close study of acute respiratory
diseases as seen in experimental animals have been developed. In cer­
tain instances these infections are analogous to those of human beings
and suggest avenues of investigation not previously traversed.

Studies on the biology of pneumococci are being continued, especially
on the biological specificity of certain chemically identified com­
ponents of the bacterial cell. Investigations carried on over many
years have demonstrated that the type specificity of pneumococci is
dependent upon the chemical composition and structural configuration
of the capsular polysaccharide. More recently it has been found that
desoxyribonucleic acid is intimately associated with the structural or­
ganization of pneumococci and, indeed, that certain nucleic acid polymers
of the desoxyribose type possess the capacity, under appropriate condi­
tions, to induce transformation of the various types of pneumococci.
Thus, the nature of the capsular polysaccharide appears to be dependent
upon a metabolic system which at some point is specifically oriented by
desoxyribonucleic acid.

(b) Rheumatic Fever. Clinical studies extending over many years
have demonstrated the chronic and recurring nature of this malady, and
have indicated the deleterious rôle of the relapses in the evolution of
chronic heart disease. The protean manifestations and the frequent
paucity of clinical symptoms of active rheumatic infection often make it
difficult to separate atypical rheumatic fever from some other diseases.
Efforts are being made, therefore, to find additional signs indicative of
active infection, because continuing and recurring rheumatic carditis
are important factors in the development of heart failure. Many
different techniques have been employed in attempts to transmit this
disease to laboratory animals, or to induce typical histopathological
lesions in them, without success. Because of the close relationship
between hemolytic streptococcal infections in patients and the subse­
quent development of rheumatic fever, extensive studies of hemolytic
streptococci have been made; and a system of immunological classifica­
tion has been elaborated, whereby the myriad varieties of these micro­
organisms can be differentiated into groups and types. This system of
classification has opened new methods of studying streptococcal infec­
tions in respect to the variety of streptococcus concerned; and recently
detailed comparative investigations of the reactions of rheumatic and
non-rheumatic individuals to hemolytic streptococcal infections have
been undertaken.
2. Metabolic Diseases

(a) Nephritis and Nephrosis. At present, some of the metabolic studies of the Hospital are being concentrated on problems developed in the study of nephritis. It has been found during this work that until more than 90 per cent of the functioning renal tissue has been destroyed no serious inconvenience may be felt by the patients as long as complications are absent. Such complications are circulatory disorders, disturbances of mineral metabolism, anemia, malnutrition, and particularly edema, which is often the result of malnutrition. Success in controlling these complications frequently means prevention of years of invalidism, even when the progress of renal destruction cannot be stopped. After nephritis has become chronic, the best therapeutic aim apparently attainable at present is maintenance of activity and well-being in the best possible state up to the onset of the terminal uremia, which does not occur until approximately 95 per cent of the glomeruli are destroyed. Achievement of this aim appears attainable in proportion to our understanding of the metabolic conditions. Studies are being carried out to clarify the problems of metabolism, nutrition, and renal physiology involved, and to provide methods for prosecution of these problems.

(b) Hepatic Insufficiency, Particularly That Associated with Cirrhosis. Progress in understanding the chemical nature of vitamins, biocatalysts in general, and their rôle in normal and abnormal metabolic processes has made desirable an extension of studies on these systems to a larger group of diseases than is represented by simple or mixed deficiencies. Since the functions of vitamins and other biocatalysts are for the most part mediated through enzyme systems, certain diseases in which there is a reason to suspect changes in the normal enzyme processes have been selected for investigation. At the present time studies are being conducted on advanced, non-malignant diseases of the liver, such as chronic hepatitis and cirrhosis, in which a marked depression of hepatic function is known to occur.

The Department of Animal Pathology was organized as the Department of Animal Pathology in 1916, and the laboratories were opened in 1917. From its beginning in 1917 up to the time of his retirement from administrative work in 1929, its Director was Dr. Theobald Smith. Dr. Smith was succeeded by Dr. Carl TenBroeck, who became Acting Director in 1929 and

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Director in 1930. In 1931 Plant Pathology, under the direction of Dr. Louis O. Kunkel, was added.

Animal Pathology

The purpose of the establishment of the Laboratory of Animal Pathology was the investigation of animal diseases in the broadest way, unaffected by immediately practical considerations. The original objective was the development of the comparative aspects of pathology by a study of disease in various animal species. A comparative pathology of this kind must be preceded by a continuously expanding, accurate knowledge of specific animal diseases. To bring this about, the Laboratory has been preoccupied from the start with such a study devoted to diseases affecting the more valuable food-producing domesticated animals, such as cattle, swine, sheep, and poultry, and to diseases of the common laboratory animals. The work can be divided roughly into the study of infectious, parasitic, and constitutional diseases.

Infectious Diseases. Dr. TenBroeck and his associates have been studying: various neurotropic virus diseases, especially with respect to the causative agents, the epidemiology, and the production of vaccines; several respiratory diseases of the smaller laboratory animals, with special emphasis on an epidemic pneumonia of rats; and certain cattle infections.

Dr. Shope is continuing his work on the possible rôles played by parasitic worms in the epidemiology of various swine diseases and in a further study of swine influenza.

Parasitic Diseases. Dr. Glaser, Dr. Stoll, and their associates are concerned with the in vivo cultivation of a number of parasites and with problems which involve the successful cultivation of these parasites. They are also concerned with the interaction of the hosts and parasites, that is, the disease produced or the immunity that follows infection.

Constitutional Diseases. Dr. Pearce is continuing the investigations of the rôle of constitutional factors in disease, based on an animal population. These studies are now concerned primarily with metabolic disorders and the degenerative processes which occur throughout the life span including such conditions as cardiovascular, renal, and hepatic disease and dental affections of various types.
Plant Pathology

The plant pathology laboratories were added to the Department of Animal Pathology in 1931 with the purpose of bringing animal and plant pathology into a closer relationship than they had enjoyed previously anywhere in the world. It was hoped that the work in plant pathology would aid in the control of certain plant diseases and thus be of value to agriculture, but this purpose was secondary to that of using suitable plants as experimental objects in studies on fundamental problems of disease, the solution of which might or might not be of immediate practical importance. Since plant diseases caused by bacteria and by viruses were less well understood than those produced by fungi and other plant parasites, attention was concentrated on diseases due to these agents. Studies on the nature of viruses and on the mechanisms of plant responses to infections by viruses and by bacteria have been pursued since 1932 and are still in progress. Some of the subjects recently investigated or currently under study are listed below.

Dr. L. O. Kunkel and associates have continued to use dodder parasites in transmission of viruses, that cannot be transferred mechanically except by grafting, to plants on which the natural hosts cannot be successfully grafted. Alfalfa witches' broom, X-disease of peach, and carrot yellows have been added to the list of infections that can be transmitted by the dodder, Cuscuta campestris, to plants that will not form graft unions with alfalfa, peach, or carrot. A second species of dodder, Cuscuta subinclusa, is being compared with C. campestris as regards ability to transmit viruses that are refractory to mechanical transfer.

Demonstration of relationships of plant viruses in closely related groups has not been difficult, but demonstration of relationships between viruses with unlike properties has been lacking until recently when it was shown that the host ranges of tobacco mosaic and tobacco etch viruses are strikingly similar. The 83 species of plants known to be susceptible to the latter also are susceptible to the former, but some hosts of tobacco mosaic virus are immune to etch virus. The two viruses, though both members of the mosaic family, have unlike properties and are not considered genetically closely related. However, the similarities in their host ranges suggest that they are more closely related than any other two of the known mosaic viruses.
The etiology of a new tumor disease of plants is being investigated. The disease has been shown to follow infection by a virus that is transmitted by certain agallia leafhoppers. However, virus infection alone seems insufficient for tumor production. Most and probably all tumors on infected plants occur at points where wounds are made. Both virus and wound stimulus seem to be required for the initiation of tumors. This is not the first plant virus shown to be associated with tumor formation in plants, but it is the first that seems to act only as a contributing factor in tumor production. Pure cultures have proved that the virus-infected tumor tissues can be grown indefinitely without differentiation into roots, stems, or leaves.

In 1942 Dr. Stanley and associates discontinued work on plant viruses in order to undertake, in support of the war effort, work on viruses affecting man. The work was carried out under a contract initially between the Institute and the Committee on Medical Research, and subsequently between the Institute and the War Department. A method for the concentration, purification, and inactivation of influenza virus for use as a vaccine was developed. Simultaneously, studies were made of the fundamental properties of purified and concentrated influenza virus from infectious allantoic fluid and from infected mouse lungs. Studies on the biochemical, biophysical, and immunogenic properties of Japanese B type encephalitis virus and vaccines were also made. Two lots of influenza virus vaccine, concentrated and purified by means of the Sharples centrifuge, were manufactured by commercial organizations and subjected to clinical trial under the auspices of the Committee on Medical Research. As a result of these tests the method of preparation developed at the Institute was accepted for the production of influenza virus vaccine for use by the Army. Large scale commercial production of this vaccine for the Army and subsequently for civilian use has resulted. The war work was largely completed in 1945 and major attention was once again directed towards plant viruses. At present attempts are being made to secure additional information regarding changes in chemical structure that accompany virus mutations. This and other approaches have been adopted in an effort to establish the nature and mode of virus reproduction.
BUILDINGS AND EQUIPMENT

New York City

The Departments of the Laboratories and the Hospital are housed in a group of buildings situated in New York City, on the cliff overlooking the East River and lying between 64th and 68th Streets (see frontispiece). This location ensures excellent light and air, and greater quiet than could be secured in the more accessible parts of the city. The group consists of three laboratory buildings, a main hospital building, an isolation pavilion, a library building, an animal house, a building combining laboratory and animal house facilities, and a central power house. All these buildings are connected by service tunnels.

Of the laboratory buildings, the Central Laboratory was first erected. It was occupied in 1906, and contains laboratories and administration offices. It covers an area of 136 feet by 60 feet and has five main floors, a light basement, and a suite of surgical rooms and kennels on the roof. The second, or Middle Laboratory was opened in 1916. It contains six floors and two basements and covers an area of 150 feet by 62 feet. The third laboratory building, known as the North Laboratory, occupies a ground area of 197 feet by 60 feet, and has seven floors and two basements. At the present time five floors are occupied for general and laboratory purposes; unoccupied laboratory space has been left free of partitions pending future development.

All the above buildings are fireproof and so constructed that all interior partitions may be altered or removed as occasion requires. Provision is made for supplying hot and cold water, steam, gas, compressed air, suction, and electricity to all laboratories. Numerous cold rooms refrigerated by means of a brine circulation system, and also incubator rooms, are located in central positions in the buildings and form part of their permanent equipment. Pipes, drains, vents, and conduits are either exposed or carried in accessible ducts wherever possible, to facilitate inspection or alteration. In these buildings, largely devoted to laboratories, are also an assembly room and quarters for various auxiliary services.

The Hospital, opened in 1910, consists of a main structure 165 feet long by 54 feet wide, and an Isolation Pavilion 78 feet long by 44 feet wide. The main building has eight main floors, with two additional basement
floors in the wall of the East River cliff. It is connected by a covered bridge at the third floor level with the Isolation Pavilion, which is a four story and basement building containing an isolation ward, laboratories, an operating room, and living quarters for the Hospital personnel. The first floor of the hospital provides for administration and reception rooms, and for quarters of the resident staff. The second floor is entirely occupied by nurses’ quarters. The third floor contains a number of small rooms for the accommodation of one or two patients each, with a solarium at its easterly end. The fourth and fifth floors are arranged for ward patients. On the fourth floor is situated the diet kitchen which is arranged for special dietary studies. On the same floor there has been built a chamber in which the oxygen content of the air can be accurately regulated. This chamber will accommodate two patients and is being used for the study of the therapeutic effects of oxygen in patients suffering from pneumonia or heart disease. The hospital is so planned that the staff and nurses may give an unusual amount of attention to each of a small number of patients. The general wards contain six to eight beds each and the open air balconies at each end of the building are large enough to accommodate all of them. The sixth, seventh, and eighth floors are devoted to laboratories, including an electrocardiograph station.

The *Library Building*, covering an area 89 feet by 70 feet, is located to the east of the Central Laboratory. It has two high stories above ground and three levels of basement floors below. The library is located on the top floor, and with a mezzanine has a capacity of 38,500 volumes. There is also on the lower levels additional storage space to provide for future expansion. On the ground level is located a room with a floor space of 72 feet by 35 feet, which serves as a staff dining room and assembly hall. There are also on this floor a small formal dining room, and a dining room for women employees. In the basement levels are located a kitchen, stack space for the storage of publications of the Institute, and other rooms reserved for general purposes.

The *Animal House*, which occupies a building by itself adjoining the Middle Laboratory at the east, has an extension to the north. The older part of the animal house is six stories in height and occupies an area of 77 feet by 62 feet. The new section occupies an area of 96 feet by 83 feet and contains four floors. In these buildings are kept small animals such as rabbits, guinea pigs, monkeys, etc., as well as sheep,
goats, and horses. Their special equipment includes cold rooms for serum and aquaria, rooms for the storage and preparation of foods, the sterilization of cages, the incineration of refuse, and a garage. All walls are finished so that they can be washed down, and cages are suspended from the ceiling on metal racks rather than being placed on the floor.

The Low Laboratory Building, constructed as a partly detached wing at the east of the North Laboratory, is 94 feet by 60 feet in area. It is a four story building, with the foundation planned to carry additional floors to the height of the main laboratory.

A Power House built and operated by the Institute provides the buildings with heat, light, electric power, compressed air, refrigeration, suction, and filtered water.

A Greenhouse has been erected on the grounds of the Institute in which various plants can be grown under controlled conditions.

Children's Gardens and Playgrounds. The founder of the Institute has made generous provision for its future physical growth by gifts of land lying between York Avenue and the East River water-front and extending from 63rd Street to 68th Street. Pending the development of the work of the Institute, the Trustees have arranged for temporarily assigning the unused portions of this property adjoining York Avenue between 64th and 68th Streets to the New York Plant and Flower Guild for maintenance of Children's Gardens. The use of the block between 63rd and 64th Streets as a park-playground has been temporarily extended to the Department of Parks.

Near Princeton, New Jersey

In the autumn of 1914 the Institute acquired for the Department of Animal Pathology a tract of land, which, with subsequent additions, now comprises approximately 780 acres, situated on the easterly side of Lake Carnegie, opposite Princeton, in the township of Plainsboro.

Those general features of the building plan which have been carried out (see frontispiece) are as follows:

1. A Laboratory Building which is equipped for work in pathology, bacteriology, parasitology, biochemistry, and allied subjects. This contains the library, general offices, and assembly room. It is of hollow tile, 140 feet long by 37 feet wide with a wing 62 feet by 37 feet, and is placed on the highest part of the land, facing Princeton and overlooking
Lake Carnegie. It is three and a half stories high, the floor of the first being below ground level. The equipment is such as to be easily changed as new problems are taken up. The furniture is largely movable, except in the chemical laboratory. It is furnished with the modern requirements of biological laboratories, such as hot and cold water, steam, gas, electricity, refrigeration, pressure, and suction.

2. Animal Buildings which are designed for the maintenance of large and small animals. Two of the buildings are divided into units in which animals may be kept isolated for the study of infectious diseases. Each unit contains hot and cold water, steam, gas, and electricity, and the floor is drained. Provisions are made for the changing of the outer garments and footwear of attendants.

A third building, erected in 1917, has been remodeled to provide isolation units for the housing and observation of large animals. A fourth unit 235 feet long and 39 feet wide was completed in 1928. This structure conforms in general architecture with the existing animal houses but differs in that space is provided for the development of laboratory suites.

3. Combination Laboratory and Animal Unit, in three connected sections, two of which are 131 feet long by 36 feet wide, and the other approximately 42 feet long by 36 feet wide, for the housing of a breeding and experimental animal colony, and for laboratories, required for studies on constitution. The buildings are one story high and are of a sectional type constructed almost entirely of metal. They are fireproof, well insulated and ventilated, and are built in such a way that they can be taken down and reassembled. Laboratory services, heat, and light are supplied from the general heating and power plant.

4. A Greenhouse 34 feet long by 20 feet wide is provided adjacent to and at the rear of the laboratory building for study of diseases of insects and other problems requiring greenhouse facilities. It is equipped with thermostatic control, gas, electricity, and compressed air.

5. Outdoor Enclosures for large and small animals under experimentation.

6. A Power House which supplies the necessary heat, electricity, refrigeration, and water from two deep driven wells.

7. An intermittent filtration Sewage Plant to provide for the safe disposal of fluid wastes from laboratory and animal buildings.
8. **Farm.** As a necessary adjunct to the scientific work conducted by the laboratories a considerable part of the land is under cultivation, requiring an organization and equipment of farm buildings sufficient for its needs.

9. **Staff and Employees' Houses.** The location of the Department being remote from thickly settled sections of the town, it has been necessary to develop the community by the erection on the Institute property of a number of homes which are rented at moderate cost to the staff and employees.

10. **Theobald Smith House.** The Director’s house occupied by Dr. Theobald Smith up to the time of his retirement has been remodeled inside and furnished for use as a Staff House, thus providing dining space and facilities for recreation for the general use of the scientific staff, and living rooms for a small number of the staff and guests.

11. **Laboratory Buildings for Plant Pathology.** New buildings for plant pathology were constructed and occupied in the fall of 1932. The main building measuring 143 by 39 feet is of the same type as the laboratory building for animal pathology. It is equipped with lean-to greenhouses opening directly from the laboratories at each end of the basement, and with an underground constant temperature cellar. To the rear of the building, and connected with it by a glass-enclosed corridor are four greenhouses, each 66 feet long by 25 feet wide, four greenhouses each 66 feet long by 18 feet wide, and a potting shed with sterilizing facilities. There are in addition twelve garden frames, each 30 feet long by 7 feet wide, located on either side of the connecting corridor. All of these buildings are served by the present central heating and power plant.

**PUBLICATIONS**

In order to assist in the dissemination of the reports of scientific investigations conducted at the Rockefeller Institute, and elsewhere, the following publications are maintained by the Institute.

The **Journal of Experimental Medicine.** This journal, edited by Peyton Rous, Herbert S. Gasser, and René Dubos, is designed to cover the field of experimental medicine. It is a medium for the publication of investigations conducted at the Institute and it also accepts contributions of a suitable character from other sources. It is issued monthly,
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two volumes appearing in a year. INDEXES for Volumes 1 to 20, 21 to 40, and 41 to 60 have been published.

Contributions should be sent to the editors of THE JOURNAL OF EXPERIMENTAL MEDICINE. They should be limited preferably to twenty printed pages, not counting the space occupied by illustrations. Articles which exceed in length twenty-five printed pages will be returned to the authors in order that their contents may be reduced to this maximum. Authors can obtain reprints of their papers at cost.

The Journal of General Physiology. This journal, the first number of which appeared in 1918, was founded by Jacques Loeb, and is edited by W. J. Crozier (Harvard University), Wallace O. Fenn (The University of Rochester), John H. Northrop (Rockefeller Institute), and W. J. V. Osterhout (Rockefeller Institute). It is issued bimonthly, one volume appearing in a year, and is devoted to the interpretation of vital phenomena on the basis of the physical and chemical constitution of living matter.

The editors invite contributions relating to the physicochemical explanation of life phenomena, in whatever field of science they may originate. These should be sent to the editors of THE JOURNAL OF GENERAL PHYSIOLOGY, York Avenue and 66th Street, New York 21, N. Y. The papers should be limited preferably to twenty printed pages, not counting the space occupied by illustrations. Authors can obtain reprints of their papers at cost.

Studies from The Rockefeller Institute for Medical Research. Results of investigations made under the auspices of, or with the cooperation or support of the Rockefeller Institute are first reported in a variety of publications. These papers are ultimately assembled in volumes designated STUDIES FROM THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH, which appear serially, but at irregular intervals. The first volume was published in 1904, and in April, 1947, the one hundred and thirtieth volume appeared. Each volume contains about 600 pages, and is indexed. The number of volumes of STUDIES appearing annually averages four. An AUTHOR AND SUBJECT INDEX for Volumes 1 to 25, and one for Volumes 26 to 50, have been published. An AUTHOR INDEX for Volumes 51 to 116 has also been published.

Monographs. The MONOGRAPHS consist of scientific papers which are so extensive, or which require such elaborate illustration, that they are unsuitable for current periodical issues of journals. They are
published at irregular intervals, determined by the available material on hand. In a small number of instances the results of investigations carried out by other laboratories have been included in this series. Twenty-three Monographs have appeared during the years 1910 to 1947. The publication of new Monographs is advertised on the covers of The Journal of Experimental Medicine, The Journal of General Physiology, and the Studies.

Studies from The Rockefeller Institute for Medical Research and Monographs are distributed gratis to a selected list of libraries and laboratories throughout the world, and a small number of the volumes as they appear may be secured through subscription.

Semiannual List. This list enumerates the title and place of publication of the reports mentioned above, as well as of preliminary reports and reviews which are not republished in the Studies. Copies of this list will, upon request, be sent regularly to persons interested. Semiannual List No. 61 was published in January, 1947.

Subscriptions, and all inquiries relating to the publications of the Institute, should be addressed to the Publication Service, The Rockefeller Institute for Medical Research, York Avenue and 66th Street, New York 21, N. Y.

The Publication Service does not have reprints of the papers in the Semiannual List, but in some instances reprints can be obtained by addressing a request directly to the author.

SUBSCRIPTIONS

Subscriptions to the above publications may be obtained at the following rates:

The Journal of Experimental Medicine, $10.00 a year; $1.00 for single copies.

The Journal of General Physiology, $5.00 a year; $1.00 for single copies.

Studies from The Rockefeller Institute for Medical Research, $2.00 per volume. A special subscription rate of $1.00 per volume is made to those who subscribe to The Journal of Experimental Medicine or The Journal of General Physiology.

Monographs, usually $2.00 each. The price is determined at the time of publication.
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