DESCRIPTIVE PAMPHLET, 1946-1948

The Rockefeller University

Follow this and additional works at: http://digitalcommons.rockefeller.edu/rockefeller-institute-descriptive-pamphlet

Recommended Citation
The Rockefeller University, "DESCRIPTIVE PAMPHLET, 1946-1948" (1948). The Rockefeller Institute for Medical Research: Descriptive Pamphlet. 18.
http://digitalcommons.rockefeller.edu/rockefeller-institute-descriptive-pamphlet/18

This Book is brought to you for free and open access by the Campus Publications at Digital Commons @ RU. It has been accepted for inclusion in The Rockefeller Institute for Medical Research: Descriptive Pamphlet by an authorized administrator of Digital Commons @ RU. For more information, please contact mcsweej@mail.rockefeller.edu.
THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH

Descriptive Pamphlet

1946-1948

NEW YORK CITY
NEW YORK
This group of buildings, with community gardens in the foreground, faces York Avenue between 64th and 68th Streets, and is located on the cliff overlooking the East River. It is comprised of (left to right): North Laboratory, Middle Laboratory, Central Laboratory, Isolation Pavilion, Main Hospital, and Power House. To the rear and adjoining the Central Laboratory is the Library Building. Adjoining the North and Middle Laboratories to the rear are Animal Houses.
History
Organization
Present Scope of the Scientific Work
Buildings and Equipment
Publications

1946-1948

NEW YORK CITY
NEW YORK
# CONTENTS

<table>
<thead>
<tr>
<th>Corporation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board of Trustees</td>
<td>5</td>
</tr>
<tr>
<td>Board of Scientific Directors</td>
<td>5</td>
</tr>
<tr>
<td>Executive Officers</td>
<td>5</td>
</tr>
</tbody>
</table>

| Scientific Staff | 6 |

| Administrative and Other Appointments | 10 |

<table>
<thead>
<tr>
<th>History</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endowment</td>
<td>11</td>
</tr>
<tr>
<td>Bequests and Gifts</td>
<td>11</td>
</tr>
<tr>
<td>Purposes</td>
<td>11</td>
</tr>
<tr>
<td>Development</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organization</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>15</td>
</tr>
<tr>
<td>Departments of the Institute</td>
<td>16</td>
</tr>
<tr>
<td>The Department of the Laboratories</td>
<td>17</td>
</tr>
<tr>
<td>The Department of the Hospital</td>
<td>18</td>
</tr>
<tr>
<td>Admission of Patients</td>
<td>19</td>
</tr>
<tr>
<td>The Department of Animal and Plant Pathology</td>
<td>19</td>
</tr>
<tr>
<td>General Statement</td>
<td>20</td>
</tr>
<tr>
<td>Appointments to the Scientific Staff</td>
<td>21</td>
</tr>
<tr>
<td>Technical Employees</td>
<td>22</td>
</tr>
<tr>
<td>Services Auxiliary to Research</td>
<td>22</td>
</tr>
<tr>
<td>Discoveries and Inventions</td>
<td>23</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Present Scope of the Scientific Work</th>
<th>23</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Department of the Laboratories</td>
<td>23</td>
</tr>
<tr>
<td>The Department of the Hospital</td>
<td>35</td>
</tr>
<tr>
<td>The Department of Animal and Plant Pathology</td>
<td>39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Buildings and Equipment</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York City</td>
<td>42</td>
</tr>
<tr>
<td>Near Princeton, New Jersey</td>
<td>45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Publications</th>
<th>47</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Journal of Experimental Medicine</td>
<td>47</td>
</tr>
<tr>
<td>The Journal of General Physiology</td>
<td>47</td>
</tr>
<tr>
<td>Studies from The Rockefeller Institute for Medical Research</td>
<td>48</td>
</tr>
<tr>
<td>Monographs</td>
<td>48</td>
</tr>
<tr>
<td>Semiannual List</td>
<td>49</td>
</tr>
</tbody>
</table>

| Acknowledgments | 51 |
CORPORATION

Board of Trustees

BARKLIE HENRY, A.B.
GEORGE MURNANE, C.E.
JOHN DAVISON ROCKEFELLER, Jr., A.B., A.M., LL.D.; President of the Corporation and of the Board
TERM EXPIRES IN OCTOBER, 1949

LINDSLEY FISKE KIMBALL, A.B., Ph.D.
DAVID ROCKEFELLER, B.S., Ph.D.
GEORGE HOYT WHIPPLE, A.B., M.D., A.M. (Hon.), Sc.D., LL.D.; Vice-President of the Corporation and of the Board
TERM EXPIRES IN OCTOBER, 1950

HERBERT SPENCER GASSER, A.B., A.M., M.D., Sc.D., LL.D.
JOHN DAVISON ROCKEFELLER, 3rd, B.S.
JOHN C. TRAPHAGEN, LL.D.
TERM EXPIRES IN OCTOBER, 1951

Board of Scientific Directors

JAMES BRYANT CONANT, A.B., Ph.D., Sc.D., L.H.D., LL.D., D.C.L.
ALPHONSE RAYMOND DOCHEZ, A.B., M.D., Sc.D.; Secretary of the Board
WARFIELD THEOBALD LONGCOPE, A.B., M.D., Sc.D., LL.D., Dr., hon. causa; President of the Board
TERM EXPIRES IN OCTOBER, 1949

DETLEV WULF BRONK, A.B., M.S., Ph.D., Sc.D.
TERM EXPIRES IN OCTOBER, 1950

ROSS GRANVILLE HARRISON, A.B., Ph.D., M.D., A.M. (Hon.), Sc.D., Ph.D. (Hon.), M.D. (Hon.), LL.D.; Vice-President of the Board
GEORGE HOYT WHIPPLE, A.B., M.D., A.M. (Hon.), Sc.D., LL.D.
TERM EXPIRES IN OCTOBER, 1951

HERBERT SPENCER GASSER, A.B., A.M., M.D., Sc.D., LL.D.

Executive Officers

EDWARD ROBINSON, A.B.; Treasurer of the Corporation
EDWARD EMERSON, A.B.; Assistant Treasurer of the Corporation
EDRIC BROOKS SMITH, B.S.; Secretary of the Corporation and of the Board of Trustees; Business Manager

Counsel

THOMAS McELRATH DEBEVOISE, A.B., LL.B.; Counsel
JOHN EDWARDS LOCKWOOD, A.B., LL.B.; Associate Counsel
SCIENTIFIC STAFF

Members of the Institute

HERBERT SPENCER GASSER, A.B., A.M., M.D., Sc.D., LL.D.; Physiology; Director of the Institute; Director of the Department of the Laboratories
THOMAS MILTON RIVERS, A.B., M.D., Sc.D.; Medicine; Director of the Department of the Hospital; Physician-in-Chief to the Hospital
CARL TENBROECK, A.B., M.D.; Animal Pathology; Director of the Department of Animal and Plant Pathology
REGINALD MACGREGOR ARCHIBALD, A.B., A.M., Ph.D., M.D.; Medicine; Physician to the Hospital
RENÉ JULES DUBOS, B.S., M.S., Ph.D., Sc.D., M.D.(Hon.); Pathology and Bacteriology
WALThER FREDERICK GOEBEL, A.B., A.M., Ph.D.; Pathology and Bacteriology
FRANK LAPPIN HORSFALL, Jr., A.B., M.D., C.M.; Medicine; Physician to the Hospital
WALTER ABRAHAM JACOBS, A.B., A.M., Ph.D.; Chemical Pharmacology
LOUIS OTTO KUNKEL, A.B., B.S., A.M., Ph.D.; Plant Pathology
RAFAEL LORENTE de NO, M.D.; Physiology
DUNCAN ARTHUR MACINNES, B.S., M.S., Ph.D.; Physical Chemistry
ALFRED EZRA MIRSKY, A.B., Ph.D.; General Physiology
JAMES BUMGARDNER MURPHY, B.S., M.D., M.D.(Hon.), Sc.D.; Pathology and Bacteriology
JOHN HOWARD NORTHROP, B.S., A.M., Ph.D., Sc.D., LL.D.; General Physiology
PETER KOSCIUSKO OLITSKY, M.D.; Pathology and Bacteriology
RICHARD EDWIN SHOPE, M.D., M.S.(Hon.); Animal Pathology
DILWORTH WAYNE WOOLLEY, B.S., M.S., Ph.D.; Physiology

Members Emeriti

OSWALD THEODORE AVERY, A.B., M.D., Sc.D., LL.D.; Medicine
ALFRED EINSTEIN COHN, A.B., M.D., Sc.D.; Medicine
RUFUS COLE, B.S., M.D., Sc.D.; Medicine
LEONOR MICHELIS, M.D., LL.D.; Physical Chemistry
WINTHROP JOHN VANLEUVEN OSTERHOUT, A.B., A.M., Ph.D., Sc.D.; General Physiology
PEYTON ROUS, A.B., M.D., Sc.D., M.D.(Hon.); Pathology and Bacteriology
FLORENCE RENA SABIN, B.S., M.D., Sc.D., LL.D.; Pathology and Bacteriology
HOMER FORDYCE SWIFT, Ph.B., M.D., Sc.D.; Medicine
DONALD DEXTER VAN SLYKE, A.B., Ph.D., M.D.(Hon.), Sc.D.; Chemistry

Guest of the Institute

EUGENE LINDSAY OPIE, A.B., M.D., Sc.D., LL.D.; Pathology and Bacteriology

Associate Members of the Institute

ALBERT CLAUDE, M.D.; Pathology and Bacteriology
THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

LYMAN CREIGHTON CRAIG, B.S., Ph.D.; Chemical Pharmacology
*RUDOLF WILLIAM GLASER, A.B., Sc.D.; Animal Pathology
FRANCIS OLIVER HOLMES, B.S., Sc.D.; Plant Pathology
MOSES KUNITZ, B.S., Ph.D.; General Physiology
REBECCA CRAIGHILL LANCEFIELD, A.B., A.M., Ph.D.; Bacteriology
DAVID PIERCE CARADOC LLOYD, A.B., B.S., Ph.D.; Physiology
LEWIS GIBSON LONGSWORTH, A.B., A.M., Ph.D.; Physical Chemistry
MACLYN McCARTY, A.B., M.D.; Medicine; Associate Physician to the Hospital
PHILIP DURYEÉ McMasters, B.S., M.D.; Pathology and Bacteriology
JOHN BROCKWAY NELSON, B.S., A.M., Ph.D.; Animal Pathology
LOUISE PEARCE, A.B., M.D., Sc.D.; Animal Pathology
ALEXANDRE ROTHEN, Ch.E., Sc.D.; Physical Chemistry
THEODORE SHEDLOVSKY, B.S., Ph.D.; Physical Chemistry
NORMAN RUDOLPH STOLL, B.S., M.S., Sc.D.; Animal Pathology

Associates

EDGAR EUGENE BAKER, A.B., A.M., Ph.D.; Pathology and Bacteriology
LILLIAN ELOISE BAKER, A.B., A.M., Ph.D.; Chemistry
ARMIN CHARLES BRAUN, B.S., Ph.D.; Plant Pathology
JORDI CASALS-ARIET, B.S., M.D.; Pathology and Bacteriology
MERRILL WALLACE CHASE, A.B., M.S., Ph.D.; Pathology and Bacteriology
VINCENT PAUL DOLE, JR., A.B., M.D.; Medicine; Associate Physician to the Hospital
DOMINIC DONALD DZIEWIATKOWSKI, A.B., M.S., Ph.D.; Chemistry
SAM GRANICK, B.S., M.S., Ph.D.; Physical Chemistry
ROLLIN DOUGLAS HOTCHKISS, B.S., Ph.D.; Pathology and Bacteriology
HENRY GEORGE KUNKEL, A.B., M.D.; Medicine; Associate Physician to the Hospital
HENRY DUMKE LAUSON, B.S., Ph.D., M.D.; Medicine; Associate Physician to the Hospital
RALPH BULKLEY LITTLE, V.M.D.; Animal Pathology
STANFORD MOORE, A.B., Ph.D.; Chemistry
KEITH ROBERTS PORTER, B.S., A.M., Ph.D.; Pathology and Bacteriology
HANS RIS, Ph.D.; General Physiology
HOWARD ALBERT SCHNEIDER, B.S., M.S., Ph.D.; Physiology
WILLIAM HOWARD STEIN, B.S., Ph.D.; Chemistry
ERNST GOLDRICH STILLMAN, A.B., M.D.; Medicine
WILLIAM TRAGER, B.S., A.M., Ph.D.; Animal Pathology

Assistants

EDWARD HAMBLIN AHRENS, Jr., B.S., M.D.; Medicine; Assistant Physician to the Hospital
HAROLD CLIFFORD ANDERSON, A.B., B.S., M.B., M.D.; Medicine; Senior Assistant Physician

*Deceased September 4, 1947
SVEN ERIK FREDRIK BJÖRKMAN, M.D.; Medicine; Assistant Physician to the Hospital (July, 1947-July, 1948)*
FRANCIS PIERRE CHINARD, A.B., M.D.; Medicine; Assistant Physician to the Hospital
GEORGE CONSTANTIN COTZIAS, M.D.; Medicine; Assistant Physician to the Hospital
LEWIS KITCHENER DAHL, B.S., M.D.; Medicine; Assistant Physician to the Hospital
MARGARET OAKLEY DAYHOFF, A.B., A.M., Ph.D.; Physical Chemistry
PAUL GERARD ECKER, B.S., M.D.; Physical Chemistry (Jan., 1947–July, 1948)*
WILLIAM JOSEPH EISENMENGER, B.S., M.D.; Medicine; Assistant Physician to the Hospital
JACQUES GENEST, A.B., M.D.; Medicine; Assistant Physician to the Hospital
JOHN DELAFIELD GREGORY, B.S., Ph.D.; Chemical Pharmacology
ROGER LOUIS GREIF, B.S., M.D.; Medicine; Assistant Physician to the Hospital
HERBERT JAFFE, B.S., Ph.D.; Chemistry
EDWIN DENNIS KILBOURNE, A.B., M.D.; Medicine; Assistant Physician to the Hospital
GEORGE ISRAEL LAVIN, B.S., Ph.D.; in charge of Spectroscopic Laboratory
ROBERT BARCLAY McGHEE, A.B., M.S., Ph.D.; Animal Pathology
GARDNER MIDDLEBROOK, A.B., M.D.; Pathology and Bacteriology
GEORGE EMIL PALADE, M.D.; Pathology and Bacteriology
GERTRUDE ERIKA PERLMANN, Ph.D.; Physical Chemistry
CYNTHIA HAMBURY PIERCE, A.B., Ph.D.; Pathology and Bacteriology
ANNA LUDUTSKY PRINGLE, B.S., A.M., Ph.D.; Physiology
EDGAR STANFIELD ROGERS, B.S., M.D.; Pathology and Bacteriology
YOSHIO SATO, A.B., M.S., Ph.D.; Chemical Pharmacology
MARGARET HAMILTON DONALD SMITH, B. Én L., M.D.; Animal Pathology (Sept., 1947–Aug., 1948)*
CHANDLER ALTON STETSON, JR., B.S., M.D.; Medicine; Assistant Physician to the Hospital
ERNEST STURM; Pathology and Bacteriology
JAMES RICHARD WEISIGER, A.B., A.M., Ph.D.; Chemistry
HARRISON FREDERICK WOOD, A.B., M.D.; Medicine; Assistant Physician to the Hospital

Fellows
HOWARD ABRAM EDER, A.B., M.P.H., M.D.; Medicine; Assistant Physician to the Hospital
ARTHUR KENNETH SAZ, B.S., A.M., Ph.D.; Pathology and Bacteriology (July, 1947–Oct., 1948)*

*Dates of an appointment not previously mentioned but now terminated
THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

Special Investigator
WINSTON HARVEY PRICE, A.B.; General Physiology

Visiting Investigators

GUY THOMAS BARRY, B.S., Ph.D.; Pathology and Bacteriology
*JAMES HERBERT BAXTER, Jr., B.S., M.D.; Medicine
MARTHA BARNES BAYLOR, A.B., M.S., Ph.D.; General Physiology
*HANS BERNKOPF, M.D.; Animal Pathology
*HUBERT BLOCH, M.D.; Pathology and Bacteriology
*CARLO LORENZO CAZZULLO, M.D.; Physiology
*HSIANG-TUNG CHANG, B.S., Ph.D.; Physiology
MARIE MAYNARD DALY, B.S., M.S., Ph.D.; General Physiology
FRED MARSHALL DAVENPORT, A.B., M.D.; Medicine
*HECTOR ACHILLE DIEU, Ph.D.; General Physiology
FRANK JOHN FENNER, M.B., B.S., M.D., D.T.M.; Pathology and Bacteriology
LOUIS JOSEPH GOSTING, A.B., Ph.D.; Physical Chemistry
*HALLDOR GRIMSSON, B.S.; Plant Pathology
CASPAR WISTAR HIATT, 3RD, B.S., Ph.D.; Physical Chemistry
*CECIL FELIX JACOBSEN, Ph.D.; Physical Chemistry
JOHN ALFRED JACQUEZ, M.D.; Pathology and Bacteriology
*WILLIAM M. M. KIRBY, M.D.; Pathology and Bacteriology
RICHARD BURTON KRAKAUR, A.B., M.D.; General Physiology
*NATHANIEL BERTRAND KURNICK, A.B., M.D.; Physiology
OSKAR HENRY LALHELLE, M.D.; Medicine
*SAUL MALKIEL, A.B., A.M., Ph.D., M.D.; Plant Pathology
DONALD DAVID MARK, A.B., M.D.; Pathology and Bacteriology
SAMUEL PRESTON MARTIN, M.D.; Pathology and Bacteriology
*FRED D. MAURER, B.S., B.S.V.M., V.M.D.; Physiology
GEORGE EDWARD MURPHY, A.B., M.D.; Medicine; Assistant Physician to the Hospital
*BO MAGNUS FREDERIK NORBERG, M.D.; General Physiology
SANFORD L. PALAY, A.B., M.D.; Pathology and Bacteriology
ROSS BARTON PRINGLE, B.S., M.S., Ph.D.; Physiology
*KANJYO SAKIMURA; Plant Pathology
ELLIOTT NATHAN SHAW, B.S., Ph.D.; Physiology
SVANTE HARRY SVENSSON, B.S., M.S., Ph.D.; Physical Chemistry
CHLOE TAL, M.S., Ph.D.; Pathology and Bacteriology
DERMOT BROWN RIGG TAYLOR, A.B., M.B., B.Ch., B.A.O.; General Physiology
HELEN POucher THOMPSON, B.S., M.D.; Pathology and Bacteriology
PARKER VANAMEE, B.S., M.D.; Pathology and Bacteriology
DUARD LEE WALKER, A.B., M.S., M.D.; Medicine
SEYMOUR HORACE WOLLMAN, B.S., M.S., Ph.D.; Physical Chemistry
ROBERT HENRY YAGER, V.M.D.; Pathology and Bacteriology

*Visit not previously mentioned, but now terminated
THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

ADMINISTRATIVE AND OTHER APPOINTMENTS

EDRIC BROOKS SMITH, B.S.; Business Manager
WALDO RAYMOND FLINN, A.B., M.B.A.; Assistant Business Manager
CHARLES PETRZELKA; Bursar
ERNEST WILLIAM SMILLIE, V.M.D.; Superintendent of the Department of Animal and Plant Pathology
ALICE NORINE LOCKIE, R.N.; Superintendent of the Hospital
GEORGINA MAY DREW, R.N.; Assistant Superintendent of the Hospital
BERNARD LUPINEK; Superintendent of Maintenance
WILLETS HAVILAND SHOTWELL, Jr., A.B., M.B.A.; Administrative Assistant
ANTHONY JOHN CAMPO, Ph.G.; Purchasing Agent
FLORENCE MARIAN STEWART, A.B.; in charge of Publications
ESTHER JUDKINS, A.B., B.S.; Librarian
JULIAN ALEXANDER CARLILE; in charge of Illustration
CHRISTINE McDONALD, R.N., B.S.; in charge of X-Ray Photography
DOROTHY SLOAN McCLINTOCK, A.B.; in charge of Media Preparation
STELLA ROSE HOFFMANN, R.N.; Supervisor of Nurses
EDMUND JAN BENTKOWSKI, Ph.G., PHAR.D.; Pharmacist
MARGUERITE VAN OSTRAND PATMORE, R.N.; Medical Social Worker
VIRGINIA MINOT FOWLER, A.B., A.M.; Secretary to the Director of the Institute
FLORENCE CLARA OTT, A.B.; Secretary to the Director of the Hospital
MABEL DENNIS REED; Secretary to the Director of the Department of Animal and Plant Pathology
HAZEL REED OLMSTEAD; Secretary to the Business Manager
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. It
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 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-eight 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 Department 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. 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 provided in one organization for the study of disease as it occurs in all the main orders of living things.

While experience has fully justified the program for the comparative study of disease, the advantages to be gained by daily association of the investigators in the closely related parts, and the growing need in all sectors of investigation for the ready availability of elaborate specialized techniques, have made it desirable in the interest both of effectiveness and economy of research, to integrate the parts of the Institute. At the present time steps are being taken to establish the Department of Animal and Plant Pathology alongside of the other Departments on the grounds in New York City.

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, Physiology, and General 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, Gregory, and Sato.

Laboratories of Physical Chemistry are conducted by Dr. MacInnes, in association with Drs. Longsworth, Shedlovsky, Dayhoff, and Perlmann; and by Dr. Rothen.

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, Porter, and Palade, and Mr. Sturm.

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

**Physiology**

Laboratories of Physiology are conducted by Dr. Gasser, in association with Dr. Lloyd; by Dr. Lorente de Nó; by Dr. Woolley, in association with Dr. A. L. Pringle; and by Dr. Schneider.
General Physiology

Laboratories of General Physiology are conducted in Princeton by Dr. Northrop, in association with Dr. Kunitz and Mr. Price; and in New York by Dr. Mirsky, in association with Dr. Ris; and 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 interest and training of the scientific staff. 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 requires the employment of the methods of the basic sciences. The interests of a member of a particular group are not necessarily confined to the disease being studied by his group. For example, 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 and Viral Diseases
       Drs. Horsfall, Stillman, Ginsberg, and Kilbourne.
   (b) Rheumatic Fever
       Drs. McCarty, Lancefield, Anderson, G. E. Murphy, Stetson, and Wood, and Dr. Swift, Member Emeritus.

2. Metabolic Diseases
   (a) Nephritis and Nephrosis
       Drs. Lauson, Chinard, Weisiger, and Eder, and Dr. Van Slyke, Member Emeritus.
(b) Hypertensive Diseases
Drs. Dole, Cotzias, and Dahl.
(c) Endocrine Disorders, Excluding Diabetes Mellitus
Drs. Archibald, Dziewiatkowski, Genest, Greif, and Jaffe.
(d) Acute and Chronic Diseases of the Liver
Drs. H. G. Kunkel, Ahrens, and Eisenmenger.

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 modern and approved methods of treatment can be adequately employed. Each physician has but 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 graduated 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 or another of these diseases are admitted for treatment. They are admitted 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, Little, Trager, and McGhee; by Dr. Shope; by Dr. Pearce; and by Dr. Stoll.

Plant Pathology

A laboratory of Plant Pathology is conducted by Dr. L. O. Kunkel, in association with Drs. Holmes and Braun.

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.
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**

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 of the Institute, 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 out-
side 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 investi-
gators 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. 
dergree, 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, Physiology, and General Physiology.

**Chemistry**

In the Laboratory of Chemistry, Drs. Moore and Stein are engaged in studies on the biochemistry of proteins, peptides, and amino acids. Recent work has led to the development of improved chromatographic methods for the separation of amino acids from hydrolysates of proteins. The techniques are being applied to investigations on the composition of a variety of products of protein nature. In research aimed at further elucidation of the structural pattern of protein molecules, the methods are being extended to permit the separation and characterization of peptides occurring in partial hydrolysates of proteins. Studies are also being made to facilitate the isolation of amino acids and peptides from biological systems. This phase of the work is directed toward the provision of additional tools for the investigation of the metabolic rôle of amino acids and peptides.

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 pharmacological significance. In this connection special attention is being given to certain groups of alkaloids the chemistry of which has been little understood. Following the 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 object 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 connection with 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 Dr. MacInnes and his associates are studying the physical chemistry of salt and protein solutions mainly by the application of methods involving electrophoresis and centrifugal force.

The use of the ultracentrifuge for obtaining molecular weights of proteins is being investigated with the idea of improving precision of the results. The chief variables involved are the speed control, the temperature of the rotor, and the optical equipment. Also involved are determinations of diffusion constants and partial molal volumes of the proteins. For the diffusion measurements a new interferometric method is yielding excellent data. The partial molal volume values depend upon accurate density measurements of the solutions, and a magnetic float method of very high sensitivity is being developed for the purpose.

A study is being made of the effect of centrifugal force on the potentials of simple galvanic cells. The method is providing data which, with the aid of density determinations, can be interpreted to yield transference numbers and ionic mobilities. The importance of the method lies in its application to non-aqueous solutions, for which the other available methods are not applicable. Other physical-chemical methods are also being used to study non-aqueous solutions of biological interest, particularly with reference to cell permeability and bioelectric potentials.

Theoretical and experimental studies are being made concerning the
interpretation of the electrophoretic patterns obtained for mixtures of proteins, in order to obtain more precise values of the concentrations, electric mobilities, and electric charges of the separate components. These investigations involve precision measurements of refractive indices.

The electrophoretic method and the ultracentrifuge are being used as analytical and preparative tools in the study of problems connected with proteins. One line of research is the effect on proteins of enzymes which attack the weaker chemical bonds. Other researches involve collaboration with investigators, both inside and outside the Institute, 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 *conditio 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.

The study of porphyrin compounds has been extended to chlorophyll also. Some mutants of the green alga, *Chlorella*, produced by x-ray radiation, have been used to demonstrate the metabolic precursors of chlorophyll. As a first result of these studies it has been shown that a porphyrin, the same one as occurs in animal blood pigment, is a precursor of chlorophyll. In this way a comparative study of the phylogenetic and ontogenetic developments and the functions of the porphyrin compounds in the animal and vegetable kingdoms, as well as in microorganisms, is being pursued.

Dr. Rothen is studying specific long range action between biologically important macromolecules. He has shown that multilayers of antigen deposited on metal slides can adsorb homologous antibodies in spite of a
thin blanket of inert material covering the antigen. The thickness of the
adsorbed layers is measured optically to within a fraction of one Ångström
unit. Interactions have also been observed through thin blankets be­
tween substrates and enzymes. The mechanism of this phenomenon is
being investigated.

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 associates are studying neurotropic viruses and the
diseases induced by them, especially the so called encephalitis viruses and
the viral encephalitides of man. Their chief interests are the mechanism
of immunity in these infections, diagnostic methods, the practice and the
principles underlying such laboratory procedures as virus neutralization
and complement fixation, and the differences between non-specific re­
sistance and true immunity as is characterized by the presence of specific
antibody. In the latter relation, the problem is being investigated from
the angle of the immune responses as they develop with age, the resistance
induced by the non-specific interference by one virus with the action of
another, and the correlation of virus-neutralizing antibody to immunity
to active virus introduced by various routes. The prevention of infec­
tion by certain neurotropic viruses as well as treatment of the recognizable
experimental diseases is thus being studied by use of specific and non­
specific methods. The viruses of equine encephalomyelitis, Russian Far
East encephalitis, and Japanese B encephalitis lend themselves con­
veniently to these experiments and are therefore mainly employed. In
addition, the classification, or taxonomy, of the different encephalitis
viruses is receiving attention. A laboratory model for the study of
poliomyelitis is available in the readily obtainable virus of spontaneous
mouse encephalomyelitis, the TO strain, which is similar in many char­
acteristics to the virus of poliomyelitis. Moreover, a rodent-adapted
strain of the latter (MEF1) has been isolated in this laboratory. This strain aids in experimental studies since it can replace for certain purposes strains that are only adaptable to monkeys, which are not easily available and are difficult to use.

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 was hoped that, in this case again, more accurate knowledge of the structure and behavior of the causative microorganism would permit the development of better diagnostic methods and of more effective therapeutic procedures for the control of tuberculosis. In fact, the data obtained during the past three years have led to the formulation of entirely new methods for bacteriological diagnosis of the disease. Moreover, there has been discovered a new serological reaction which permits a laboratory detection of the activity of the tuberculous process by the use of small amounts of the patient's blood. Finally, much progress has been made toward identification of the cellular component of virulent tubercle bacilli to which they owe their pathogenic behavior; isolation of this substance and
determination of its properties will undoubtedly give a more rational basis to the development of prophylactic and therapeutic measures.

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 are being pursued on the mechanism of the inhibition of virus multiplication, both animal and bacterial, by polysaccharides derived from certain pathogenic microorganisms.

Dr. McMaster is conducting experiments directed toward an understanding of two opposed functions of the lymphatic system, one of which apparently favors the spread of infection in the body, by the transport of foreign materials in the lymph, while the other checks infectious processes by the phagocytic activity of the lymph nodes and by the formation, in lymphoid tissue itself, of antibodies to both bacteria and viruses. Highly antigenic, deep blue azo-proteins, which can be seen in lymph and blood vessels and within the cells of lymphoid and other tissues, are being employed to trace the spread of antigenic material in the lymphatics, to determine its subsequent distribution in the body, and to learn more about the sites of antibody formation. The blue azo-proteins are also demonstrating their usefulness in an investigation of the mechanisms of anaphylactic shock and local hypersensitivity, and in physiological studies on the exchange of materials from the blood to the tissues and lymph.

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 spon-
taneous 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.

A detailed study of the difference between malignant and normal cells is in progress, with emphasis on the nature and function of the formed elements of the cell cytoplasm. Certain enzyme systems have been shown to be associated with the mitochondria. New information on the structure of the cytoplasm has been developed by means of the electron microscope. The filtrable agents of the fowl tumors and what appears to be the milk agent are clearly defined. A cytoplasmic body rarely seen in normal cells is found in great abundance in malignant cells. The nature of this complex spiral structure is being investigated.

Dr. Rous, Member Emeritus, and an associate are at work with two aims in mind, to study further the successive cellular alterations which result in cancer, and to learn more of the share of viruses and virus-like agents in the causation of tumors in general.

Experiments of past years have made clear that the conversion of a normal cell into a neoplastic cell and the multiplication of the latter into a perceptible mass are processes determined and conditioned by very different influences. Often cells become neoplastic without any tumor arising. The work has shown further that many of the cancers which emerge to view are the end-result of step-like cellular changes which, though essentially neoplastic, are largely subthreshold in character. Experimental methods have now been devised for the disclosure of some of these hidden, forerunning changes, and study of them is under way. A recent finding, that mice injected with urethane during late pregnancy give birth to young having pulmonary tumors practically at once, has made plain that the search for the beginnings of cancer must be pushed into prenatal life in some instances.

Carcinomas in considerable variety arise secondarily from the cells of the virus-induced papillomas of domestic rabbits, and many facts have appeared to indicate that they are actuated by variants of the virus responsible for these growths. But to make direct tests in the matter has proved well-nigh impossible, so great have been the difficulties of transplanting the cancers for use. Now it has been found that they will flourish in newborn rabbits and that these provide notably favorable
conditions for the tests. Active virus has been recovered from several of the cancers thus far propagated in the baby animals, but it produced only papillomas of the sort from which the malignant tumors derived and probably existed in the latter merely as a rider. There is the more reason to think so because it has lately disappeared from a carcinoma which had previously harbored it. Studies have been begun to learn whether the various cancers maintained in baby rabbits contain any immunizing material distinctive of them.

**Physiology**

Dr. Lloyd (in Dr. Gasser's laboratory) is conducting studies on the physiology of the spinal cord, with particular reference to the elementary properties of synaptic transmission in monosynaptic reflex arcs, and to 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. Within the functional unit afferent fibers from one muscle are excitatory to the motoneurons of synergists and inhibitory to motoneurons of antagonists. This knowledge of the distribution, in monosynaptic pathways, of excitation and inhibition has made it possible to study the processes independently, and so to reveal their time course, which proves to be similar to that of the action currents about afferent collaterals as demonstrated by another experimental approach.

Myotatic afferent fibers dichotomize to supply not only direct connections to motoneurons for transmission of the myotatic reflex, but also to certain afferent tracts. At the present time attention is being directed to the analysis of impulse conduction in these afferent fibers, of the manner in which impulses in terminal collaterals differ from those in the parent fibers, and to a comparison of synaptic activity at the junctions of these fibers with motoneurons and with neurons of the ascending afferent tracts.

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 ten 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.

At present work is being done along two different lines of research. The discovery of the fact that tetraethylammonium is able to substitute for sodium in certain aspects of nerve physiology has led to a systematic analysis of the effect upon nerve deprived of sodium of several series of quaternary ammonium ions, some of which have been prepared from naturally occurring substances (niacinamide, lysine, histamine), and to a search for hitherto undescribed quaternary ammonium bases in nervous tissue. On the other hand, 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. Woolley and his associates are studying the nature and modes of action of some of the vitamins and allied compounds of metabolic importance. To investigate the nature of some of the previously unknown vitamins work is being conducted towards the isolation and determination of the structure of strepogenin. This is a substance which is necessary for normal growth of several kinds of microorganisms and of animals. It is a constituent of some pure proteins and is probably a peptide containing glutamic acid as well as several other amino acids. Crystalline insulin, the richest known source, is being degraded and from among the fragments the vitamin is being concentrated. In addition to information about strepogenin these studies are giving an insight into some of the
features of the exact chemical structure of insulin and several other proteins.

Much of the work dealing with the mode of action of the vitamins is being done through the development of antimetabolites. These are substances closely related in chemical structure to various vitamins, hormones, and other metabolites, but having the property of producing in living things the signs of deficiency of these metabolites. Such antagonists have been produced for each of the several water-soluble vitamins, for some of the fat-soluble ones, for hormones such as thyroxine, and for metabolites such as purines and amino acids. By use of these agents it has been found possible to produce specifically in many kinds of living matter the signs of deficiency of the metabolites. By using such antagonistic compounds the roles in metabolism of some vitamins are being studied. Furthermore, these agents represent new series of drugs or pharmacological agents and as such they are being investigated in efforts to learn something of theoretical and possibly practical importance in pharmacology. For example, the application of the basic principles which have been discovered about the phenomenon of antagonism between structurally related compounds has made possible the discovery of substances which will protect experimental animals and other kinds of living things against influenza virus and certain other viral infections. In order to learn what kinds of alteration in structure should be made so that metabolites may be converted into these specific pharmacological agents, an extended series of investigations is being made in which many kinds of compounds related in various ways to individual vitamins and hormones are prepared and studied for effects on diverse living organisms.

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. Vitamin-like compounds are being isolated from natural foodstuffs which can improve resistance.

General Physiology

In the Laboratory of General Physiology at Princeton, Dr. Northrop
and his associates are engaged in the study of physiologically active pro-
teins, 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 sub-
stance 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 by decomposing the compound into smaller
and less complicated fragments whose structure can be established.

The mechanism of the formation of these active substances is also
under investigation. Several of the enzymes are formed from inactive
precursors by catalytic or anticatalytic reactions and analogies exist
between these reactions and the formation of bacterial viruses. The
conditions controlling the formation of virus by a strain of staphylococcus
are being studied in detail. It has been found that the formation of
virus as well as the effect of the virus on the host cell can be controlled
at will through the culture medium by the addition or removal of certain
specific substances. One of the substances which is present in the ribose
nucleic acid fraction obtained from yeast stimulates virus formation and
also, according to Reiner and his collaborators, stimulates the formation
of adaptive enzymes in yeast.

In Dr. Mirsky's laboratory in New York the chemical composition of
chromosomes is under investigation. Methods for the isolation of chro-
mosomes have been developed. From some tissues it is now possible
to prepare isolated chromosomes in such quantities that the com-
position of these bodies can be investigated by direct chemical procedures
which would be inapplicable to chromosomes lying inside cells.

Isolated chromosomes contain desoxyribonucleic acid and histone, as
would be expected from previous work on the chemistry of chromosomes.
They also contain some ribonucleic acid and a protein which, since it
remains in chromosomes after extraction of both desoxyribonucleic acid
and histone, is referred to as the "residual protein" of the chromosome.
The structure of a chromosome, as seen under the microscope, is in large
measure due to its residual protein.

A comparison of chromosomes isolated from different types of cells
shows that the residual protein also plays a part in interactions between
nucleus and cytoplasm. The composition of chromosomes varies in dif-
ferent cells of the same organism. A cell with an abundant, metabolically

[ 33 ]
active cytoplasm has chromosomes containing a relatively large quantity of residual protein, while a cell with scanty or inactive cytoplasm has chromosomes with relatively little residual protein; and when, under certain conditions, the level of activity in a cell changes, there is also a change in the quantity of residual protein present in its chromosomes.

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 chromosomes still located within the cell.

Work on the chemistry of chromosomes is directed toward an understanding of their structure, their role in cell physiology, and their genetic activity.

Dr. Osterhout, Member Emeritus, also in New York, is continuing 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. 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.

Electrical measurements on these cells make possible the detection of small and rapid alterations in the protoplasm without injuring the cell. Changes due to injury can be followed step by step. These and other studies indicate that as soon as the non-aqueous protoplasmic surface layer becomes completely and irreversibly permeable to solutes in water the cell is dead and this appears to constitute the best test of death we possess.

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 this 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. Positive as well as negative action currents can be obtained. 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.
These cells facilitate a study of the rôle of water not only in normal and abnormal growth but also in the interplay of sol and gel in the cell; this is of fundamental importance but is little understood. The rate at which water enters and leaves the cell under various conditions can be measured in these cells and changes produced by loss of water can be followed.

A further understanding of the behavior of the cell is gained by the setting up of physicochemical models. For example, when two aqueous solutions in a model are separated by a non-aqueous layer such a layer may show considerable resemblance to the non-aqueous layer at the surface of the protoplasm since it may be permeable to water and more permeable to weak electrolytes than to strong electrolytes as well as more permeable to potassium compounds than to corresponding compounds of sodium. It may also act like the living cell in showing a relatively large electric potential between a spot in contact with potassium chloride and one in contact with sodium chloride. If a similar model is arranged so that one aqueous solution represents the sap of the living cell and the other represents the external solution it is found in some cases that when 0.1 m compounds of potassium and of sodium simultaneously are present in the external solution and carbon dioxide is bubbled through the artificial sap the solutes pass from the external solution into the artificial sap where the concentrations of potassium ions and of sodium ions become much higher than in the external solution; furthermore the concentration of potassium ions becomes higher than that of sodium ions, as happens in most living cells. An outwardly directed electric potential is developed as in the living cell.

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 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 sciences of physics, chemistry, physiology, microbiology, and immunology. Moreover, it is considered 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 and Viral Diseases. Various forms of acute infection of the respiratory tract are being investigated; these include the syndromes which 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 respiratory infections and about the nature of the infectious agents associated with these diseases.

Certain groups of viruses as well as a wide variety of bacterial species appear to be intimately associated with the pathogenesis of respiratory infections. However, the causal factors responsible for many respiratory diseases have not yet been established. 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 respiratory diseases in experimental animals have been developed. In certain 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 components 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 organization of pneumococci and, indeed, that certain nucleic acid polymers of the desoxyribose type possess the capacity, under appropriate conditions, 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.

Viral diseases in addition to those which chiefly cause respiratory symptoms are also under study. These include mumps, measles, chickenpox, herpes zoster, and infectious mononucleosis. At the present time major emphasis is directed towards gaining additional information about the infectious agents.

(b) Rheumatic Fever. It is now recognized that this disease occurs as a sequela of hemolytic streptococcal infection. However, little is known of the mechanism by which the streptococcal infection gives rise to a disease with the varied clinical manifestations and protracted course of rheumatic fever. In order to obtain an understanding of this mechanism, additional information of a fundamental nature is being sought in two broad fields of study: (1) the biology of the streptococcus and (2) the host reaction to infection. Studies on the antigenic structure of group A hemolytic streptococci are being continued, including attempts to isolate and characterize certain of the major antigenic components of the cell. In addition, some of the numerous biologically active, extracellular products of these cells are under investigation, since it is probable that these substances are released in host tissues which may be injured by them. Patients with streptococcal infections and rheumatic fever are admitted to the Hospital for treatment and for study of the host reaction to infection; serological and biochemical techniques are being used in these investigations. Finally, because of the great opportunity for further study of the disease that would result if the syndrome of rheumatic fever were reproducible in laboratory animals, attempts to achieve this are still in progress.
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) Hypertensive Diseases. For investigative purposes it is possible experimentally to induce hypertension in lower animals. This provides the opportunity to trace the changes in cellular metabolism that are associated with so serious a circulatory disturbance. Metabolic changes found in animals can thus be sought for in patients by methods appropriately modified so as to be without hazard. Based on these general considerations, efforts are being made in the laboratory to develop new methods for recognition of chemical derangements in diseased tissue, i.e., the chemical pathology which exists even when classical methods of examination show no change. Correlated with laboratory studies, clinical activities are directed toward application of new concepts and tests. In particular, it is considered of immediate interest to seek improved diagnostic methods directed toward separation of the various conditions now grouped in the category of hypertension, so that new means of treatment can, in the future, be more effectively studied.

(c) Endocrine Disorders, Excluding Diabetes Mellitus. Hormones exert a profound influence on metabolic processes in the human body, and, in some manner as yet not understood, these substances regulate enzyme
activity either directly or indirectly. Laboratory investigations associated with clinical studies may give clues as to the mechanisms by which the hormones exert their influence on enzymatic systems involved in the metabolic processes already shown to be affected by hormones. Before laboratory investigations of these problems can be conducted to best advantage it is necessary, first, to develop improved methods for the fractionation and the quantitative detection of various hormones or their metabolic products. Such methods are being developed, and children having abnormalities of growth or maturation are being studied clinically. Attempts are made to ascertain which biochemical processes involved in their growth and development deviate from normal to an appreciable extent, and which of these processes are limiting factors in growth or maturation. Investigations are being conducted also on the effect on those reactions of administration of (a) supplementary hormone to persons with hypofunction and (b) certain drugs which decrease hormone production to persons with hyperfunction.

(d) Acute and Chronic Diseases of the Liver. Diseases of the liver, although caused by widely diversified mechanisms, present a similar pattern of complex alterations in numerous metabolic processes mediated through the liver. Because of the complexity of these alterations, progress in therapy is chiefly dependent on further knowledge of the vitamins, hormones, and enzymes involved in each of the many processes. In investigations of liver diseases, an unusual opportunity, therefore, is provided for the direct application of advances in the field of biochemistry to medical problems. Since inadequate synthesis of metabolites essential to the body causes most of the clinical manifestations of liver insufficiency, the picture is essentially one of a multiple deficiency disease. At the present time studies have been directed toward discovering the more important intrinsic deficiencies involved and correcting them by direct administration of the materials which the liver fails to synthesize in adequate amounts. For this purpose patients have been chosen with advanced non-malignant diseases of the liver, such as chronic hepatitis and cirrhosis.

The Department of Animal and Plant Pathology

The Department 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 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. Drs. Stoll and Trager 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 studying 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

Plant pathology laboratories were added to the Department of Animal Pathology at Princeton in 1931. Since that time plant and animal pathologists probably have worked in closer contact here than anywhere else in the world. The science of disease and the practice of control in the two great categories of living things have been studied side by side. It was hoped that through this intimate association plant pathology with its natural objectivity and animal pathology with its emphasis on serology and other special fields little known to plant pathologists might be mutually helpful in providing new points of view, new methods, and new hypotheses. Most of the researches carried out up to the present time have been concerned with diseases caused by bacteria and viruses. Some of the subjects investigated recently or currently under study are described briefly below.

Dr. L. O. Kunkel and associates have attempted to cure plant virus diseases by prolonged heat treatments. No mosaic disease has been cured but the method has been successful with all yellows diseases that have been available for testing. Fifteen different diseases in this group have yielded to treatments. Peach yellows was cured by temperatures as low as 32°C; blueberry stunt required a minimum of about 40°C. These temperatures did not seriously injure affected plants. Heat treatments apparently cure by inactivating all the virus in the diseased tissues. The inability of certain viruses to endure high temperatures accounts for the geographical distribution of the diseases they cause; for example, peach yellows virus flourishes in the vicinity of Washington, D. C., and northward but cannot endure the summer temperatures of Georgia.

Breeding experiments have resulted in the development of lines of tobacco and garden peppers that are resistant to tobacco mosaic disease. Similar experiments with tomato have given tomato varieties that are resistant to spotted wilt disease. Attempts to produce a tomato variety resistant to tobacco mosaic have thus far been unsuccessful but are being continued. Mutant forms of host plants occurring in nature possess genic mechanisms controlling various types of response to infection. In some cases single genes have been found to control these responses, but in other instances more complicated genic mechanisms are involved. Plant breeding seems to offer one of the best means of controlling plant virus diseases.

When crown-gall bacteria are inoculated into wounds they cause the
host tissues in the wounded areas to produce overgrowths, the cells of which continue to proliferate at a rapid rate indefinitely if supplied with food either from the plant to which the overgrowths are attached or from a suitable culture medium. How the bacteria bring about this change in the behavior of plant cells is one of the unsolved mysteries of plant pathology. Early workers believed that the bacteria lived and multiplied within the changed cells. Subsequent work has failed to confirm this view. It is now thought that the change results from something the bacteria transfer, but what the nature of this agent may be is unknown. Intensive but fruitless efforts have been made to find a bacterial product that will change normal cells to tumor cells. The change seems to result only from the action of living bacteria applied to freshly wounded tissues. If the wound is 5 or more days old or if the wounded plant is held at a temperature of 30°C. or higher, no change takes place and no overgrowth is produced. Secondary overgrowths occasionally occur at a considerable distance from primary overgrowths in sunflower and Paris daisy plants. It recently has been shown that these are usually sterile and hence must be produced not by bacteria but by something refractory to cultivation that moves from the wounded area to the site of the secondary overgrowth. It also has been shown by suitable experiments that the change to tumor cells brought about by crown-gall bacteria does not occur in the first 24 hours after the bacteria are applied but does occur in the next 10 hours and is completed in the next 3 days. Attenuated strains of crown-gall bacteria occur in nature and may be derived from virulent strains by growth on appropriate culture media. The attenuated strains are incapable of causing overgrowths, or cause exceedingly small, slow growing overgrowths. It recently has been shown that inoculation with attenuated strains will cause large, fast growing overgrowths if certain growth-promoting substances are applied to the tissues near the wounds. The crown-gall problem remains unsolved but the findings described here seem to be steps that eventually may aid in bringing a solution.

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 isolation units 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 can 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 occu-
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.

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 waterfront 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.

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 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. In preparation for the moving of Plant Pathology to New York, equivalent greenhouse facilities are now being erected on the New York grounds.

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, 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 October, 1948, the one hundred and thirty-sixth 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 1948. The Monographs that have been published are 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 the volumes as they appear may also 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. 64 was published in June, 1948.

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, payable in advance:

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.
ACKNOWLEDGMENTS

Bequests and gifts for the promotion of medical research which have been received from others than Mr. John D. Rockefeller and Mr. John D. Rockefeller, Jr., are as follows:

For General Purposes
  Legacy from John M. Van Heusen
  Gift from Mr. James B. Stokes
  Legacy from Anthony Gross

For the Promotion of Cancer Research
  Legacy from Henry Rutherford
  Legacy from Viola Gray Egley

For the Study of Leukemia
  An anonymous gift

For the Study of Metabolic Diseases
  Gift in memory of Dr. Leslie T. Webster