THE BIOLOGICAL BULLETIN

PUBLISHED BY THE MARINE BIOLOGICAL LABORATORY

THE MARINE BIOLOGICAL LABORATORY

FIFTY-THIRD REPORT, FOR THE YEAR 1950—SIXTY-THIRD YEAR

I. TRUSTEES AND EXECUTIVE COMMITTEE (AS OF AUGUST 8, 1950) 1

STANDING COMMITTEES

II. ACT OF INCORPORATION .................................. 4

III. BY-LAWS OF THE CORPORATION .......................... 4

IV. REPORT OF THE TREASURER ................................. 6

V. REPORT OF THE LIBRARIAN .................................. 9

VI. REPORT OF THE DIRECTOR .................................. 10

Statement .......................................................... 10

Addenda:
1. Memorial .......................................................... 13
2. The Staff ........................................................ 17
3. Investigators and Students .................................... 19
4. The Lalor Fellows ............................................. 27
5. Tabular View of Attendance, 1946–1950 ..................... 28
6. Subscribing and Cooperating Institutions .................. 28
7. Evening Lectures .............................................. 29
8. Shorter Scientific Papers (Seminars) ....................... 20
9. Members of the Corporation ................................. 21

I. TRUSTEES

EX OFFICIO

Lawrason Riggs, President of the Corporation, 120 Broadway, New York City
E. Newton Harvey, Vice President of the Corporation, Princeton University
Philip B. Armstrong, Director, State University of New York, Medical Center at Syracuse
Otto C. Glaser, Clerk of the Corporation, Amherst College
Donald M. Brodie, Treasurer, 322 Fifth Avenue, New York City

EMERITI

G. H. A. Clowes, Lilly Research Laboratory
E. G. Conklin, Princeton University
W. C. Curtis, University of Missouri
B. M. DUGGAR, University of Wisconsin
W. E. GARREY, Vanderbilt University
Ross G. HARRISON, Yale University
F. P. KNOWLTON, Syracuse University
R. S. LILLIE, The University of Chicago
A. P. MATHEWS, University of Cincinnati
W. J. V. OSTERHOUT, Rockefeller Institute
G. H. PARKER, Harvard University

TO SERVE UNTIL 1954

A. M. CHASE, Princeton University
D. P. COSTELLO, University of North Carolina
ETHEL B. HARVEY, Princeton University
D. A. MARSLAND, New York University
D. MAZIA, University of Missouri
C. PACKARD, Woods Hole
A. K. PARPART, Princeton University
H. B. STEINBACH, University of Minnesota

TO SERVE UNTIL 1953

W. R. AMBERSON, University of Maryland School of Medicine
E. G. BALL, Harvard University Medical School
F. A. BROWN, Jr., Northwestern University
ROBERT CHAMBERS, New York University
LEWIS KLEINHOLZ, Reed College
C. L. PROSSER, University of Illinois
A. C. REDFIELD, Harvard University and Woods Hole Oceanographic Institution
ALBERT TYLER, California Institute of Technology

TO SERVE UNTIL 1952

E. S. G. BARRON, The University of Chicago
D. W. BRONK, Johns Hopkins University
G. FAILLA, Columbia University
C. O'D. ISELIN, Woods Hole Oceanographic Institution
R. T. KEMPTON, Vassar College
C. W. METZ, University of Pennsylvania
W. R. TAYLOR, University of Michigan
GEORGE WALD, Harvard University

TO SERVE UNTIL 1951

W. C. ALLEE, The University of Chicago
C. L. CLAFF, Randolph, Mass.
K. S. COLE, Naval Medical Research Institute
P. S. GALTSOFF, U. S. Fish and Wild Life Service
L. V. HEILBRUNN, University of Pennsylvania
J. H. NORTHROP, University of California
H. H. PLOUGH, Amherst College
A. H. STURTEVANT, California Institute of Technology
TRUSTEES

EXECUTIVE COMMITTEE OF THE BOARD OF TRUSTEES

Lawrason Riggs, Ex Officio, Chairman
E. N. Harvey, Ex officio
D. M. Brodie, Ex officio
P. B. Armstrong, Ex officio
C. L. Claff, to serve until 1951
D. A. Marsland, to serve until 1951
Rudolf T. Kempton, to serve until 1952
H. H. Plough, to serve until 1952
F. A. Brown, Jr., to serve until 1953
D. P. Costello, to serve until 1953

THE LIBRARY COMMITTEE

W. R. Taylor, Chairman
H. W. Stunkard
Balduin Lucké
Mary Sears

THE APPARATUS COMMITTEE

C. L. Prosser, Chairman
Ivor Cornman
Harry Grundfest
O. H. Schmitt
F. J. M. Sichel

THE SUPPLY DEPARTMENT COMMITTEE

P. B. Armstrong, Chairman
C. L. Claff
P. S. Galtsoff
L. H. Kleinholz

THE EVENING LECTURE COMMITTEE

P. B. Armstrong, Chairman
E. S. G. Barron
E. G. Butler

THE INSTRUCTION COMMITTEE

A. K. Parpart, Chairman
Hope Hibbard
H. H. Plough
F. A. Brown, Jr.

THE BUILDINGS AND GROUNDS COMMITTEE

C. Lloyd Claff, Chairman
Ralph Wichterman
II. ACT OF INCORPORATION

COMMONWEALTH OF MASSACHUSETTS

Be It Known, That whereas Alpheus Hyatt, William Sanford Stevens, William T. Sedgwick, Edward G. Gardner, Susan Minns, Charles Sedgwick Minot, Samuel Wells, William G. Farlow, Anna D. Phillips, and B. H. Van Vleck have associated themselves with the intention of forming a Corporation under the name of the Marine Biological Laboratory, for the purpose of establishing and maintaining a laboratory or station for scientific study and investigation, and a school for instruction in biology and natural history, and have complied with the provisions of the statutes of this Commonwealth in such case made and provided, as appears from the certificate of the President, Treasurer, and Trustees of said Corporation, duly approved by the Commissioner of Corporations, and recorded in this office;

Now, therefore, I, HENRY B. PIERCE, Secretary of the Commonwealth of Massachusetts, do hereby certify that said A. Hyatt, W. S. Stevens, W. T. Sedgwick, E. G. Gardner, S. Minns, C. S. Minot, S. Wells, W. G. Farlow, A. D. Phillips, and B. H. Van Vleck, their associates and successors, are legally organized and established as, and are hereby made, an existing Corporation, under the name of the MARINE BIOLOGICAL LABORATORY, with the powers, rights, and privileges, and subject to the limitations, duties, and restrictions, which by law appertain thereto.

Witness my official signature hereunto subscribed, and the seal of the Commonwealth of Massachusetts hereunto affixed, this twentieth day of March, in the year of our Lord One Thousand Eight Hundred and Eighty-Eight.

[SEAL]

HENRY B. PIERCE,
Secretary of the Commonwealth.

III. BY-LAWS OF THE CORPORATION OF THE MARINE BIOLOGICAL LABORATORY

I. The members of the Corporation shall consist of persons elected by the Board of Trustees.

II. The officers of the Corporation shall consist of a President, Vice President, Director, Treasurer, and Clerk.

III. The Annual Meeting of the members shall be held on the second Tuesday in August in each year, at the Laboratory in Woods Hole, Massachusetts, at 11:00 A.M., and at such meeting the members shall choose by ballot a Treasurer and a Clerk to serve one year, and eight Trustees to serve four years, and shall transact such other business as may properly come before the meeting. Special meetings of the members may be called by the Trustees to be held at such time and place as may be designated.

IV. Twenty-five members shall constitute a quorum at any meeting.

V. Any member in good standing may vote at any meeting, either in person or by proxy duly executed.

VI. Inasmuch as the time and place of the Annual Meeting of members are fixed by these By-laws, no notice of the Annual Meeting need be given. Notice of any special meeting of members, however, shall be given by the Clerk by mailing notice of the time and place and purpose of such meeting, at least fifteen (15) days before such meeting, to each member at his or her address as shown on the records of the Corporation.
VII. The Annual Meeting of the Trustees shall be held on the second Tuesday in August in each year, at the Laboratory in Woods Hole, Mass., at 9:00 A.M. Special meetings of the Trustees shall be called by the President, or by any seven Trustees, to be held at such time and place as may be designated, and the Secretary shall give notice thereof by written or printed notice, mailed to each Trustee at his address as shown on the records of the Corporation, at least one (1) week before the meeting. At such special meeting only matters stated in the notice shall be considered. Seven Trustees of those eligible to vote shall constitute a quorum for the transaction of business at any meeting.

VIII. There shall be three groups of Trustees:

(A) Thirty-two Trustees chosen by the Corporation, divided into four classes, each to serve four years. After having served two terms of four years each, Trustees are ineligible for re-election until a year has elapsed. In addition, there shall be two groups of Trustees as follows:

(B) Trustees ex officio, who shall be the President and Vice President of the Corporation, the Director of the Laboratory, the Associate Director, the Treasurer, and the Clerk;

(C) Trustees Emeriti, who shall be elected from present or former Trustees by the Corporation. Any regular Trustee who has attained the age of seventy years shall continue to serve as Trustee until the next Annual Meeting of the Corporation, whereupon his office as regular Trustee shall become vacant and be filled by election by the Corporation and he shall become eligible for election as Trustee Emeritus for life. The Trustees ex officio and Emeriti shall have all the rights of the Trustees except that Trustees Emeriti shall not have the right to vote.

The Trustees and officers shall hold their respective offices until their successors are chosen and have qualified in their stead.

IX. The Trustees shall have the control and management of the affairs of the Corporation; they shall elect a President of the Corporation who shall also be Chairman of the Board of Trustees; and shall also elect a Vice President of the Corporation who shall also be the Vice Chairman of the Board of Trustees; they shall appoint a Director of the Laboratory; and they may choose such other officers and agents as they may think best; they may fix the compensation and define the duties of all the officers and agents; and may remove them, or any of them, except those chosen by the members, at any time; they may fill vacancies occurring in any manner in their own number or in any of the offices. The Board of Trustees shall have the power to choose an Executive Committee from their own number, and to delegate to such Committee such of their own powers as they may deem expedient. They shall from time to time elect members to the Corporation upon such terms and conditions as they may think best.

X. Any person interested in the Laboratory may be elected by the Trustees to a group to be known as Associates of the Marine Biological Laboratory.

XI. The consent of every Trustee shall be necessary to dissolution of the Marine Biological Laboratory. In case of dissolution, the property shall be disposed of in such manner and upon such terms as shall be determined by the affirmative vote of two-thirds of the Board of Trustees.

XII. The account of the Treasurer shall be audited annually by a certified public accountant.

XIII. These By-laws may be altered at any meeting of the Trustees, provided that the notice of such meeting shall state that an alteration of the By-laws will be acted upon.
IV. REPORT OF THE TREASURER

To the Trustees of the Marine Biological Laboratory:

Gentlemen:

The financial situation of the Laboratory at the end of 1950 was about the same as it was in December, 1949. Total cash receipts for the year amounted to $327,185.65 and expenditures, including $17,514.05 for capital assets, were $324,383.96. These totals were $19,550.51 and $14,283.03, respectively, in excess of the totals for 1949. The increases in charges for tuition, laboratory space and dormitory and Mess accommodations were just about sufficient to enable the Laboratory to meet increasing costs including a few very much needed salary and wage adjustments, but the margin is much too slim. Additional income for current operating expenses is still of the utmost urgency.

The statement of actual cash receipts and disbursements which has been given you in recent years is believed to be helpful in giving the overall picture, but in the case of some of the departments listed it may be misleading because of the fact that it does not include shares of the overhead cash expenses grouped under administration, buildings and grounds, etc. For instance, if overhead expense and depreciation are included, the Mess had a deficit of $2,145.52 and the dormitories a deficit of $1,258.68. Conversely, in the case of the Supply Department, when the cost of specimens furnished to Research and Instruction (estimated at $16,368.20) and other bookkeeping items are taken into account, there is a net income of $1,379.84 instead of the loss of $9,462.61 on a departmental cash basis.

Income from the Endowment Funds of the Laboratory increased $6,084.44 over last year to $46,431.59, due to larger common stock dividends. The average yield on securities was 4.8% on book value and 4.3% on market value. The investments and percentages in the Endowment Funds as of Jan. 1, 1951, were:

<table>
<thead>
<tr>
<th>Security</th>
<th>Book Value</th>
<th>%</th>
<th>Market Value</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U. S. Government</td>
<td>$367,997.66</td>
<td>38.31%</td>
<td>$361,447.87</td>
<td>33.90%</td>
</tr>
<tr>
<td>Railroad</td>
<td>54,613.02</td>
<td>5.65%</td>
<td>59,662.50</td>
<td>5.60%</td>
</tr>
<tr>
<td>Public Utility</td>
<td>90,192.50</td>
<td>9.34%</td>
<td>89,706.25</td>
<td>8.41%</td>
</tr>
<tr>
<td>Industrial</td>
<td>34,800.00</td>
<td>3.60%</td>
<td>34,283.75</td>
<td>3.21%</td>
</tr>
<tr>
<td>Total Bonds</td>
<td>$549,603.18</td>
<td>56.90%</td>
<td>$545,100.37</td>
<td>51.12%</td>
</tr>
<tr>
<td>Preferred Stocks</td>
<td>125,828.41</td>
<td>13.03%</td>
<td>123,877.25</td>
<td>11.62%</td>
</tr>
<tr>
<td>Common Stocks</td>
<td>290,371.21</td>
<td>30.07%</td>
<td>397,386.25</td>
<td>37.26%</td>
</tr>
<tr>
<td>Total Securities</td>
<td>$965,802.80</td>
<td>100.00%</td>
<td>$1,066,363.87</td>
<td>100.00%</td>
</tr>
<tr>
<td>Principal Cash</td>
<td>2,419.51</td>
<td></td>
<td>2,419.51</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>$968,222.31</td>
<td></td>
<td>$1,068,783.38</td>
<td></td>
</tr>
</tbody>
</table>

The Balance Sheet, Statement of Current Surplus, and Summary of Cash Transactions, as given in the report of the auditors, Seamans, Stetson and Tuttle of Boston, follow:
REPORT OF THE TREASURER

MARINE BIOLOGICAL LABORATORY BALANCE SHEET, Dec. 31, 1950

**Assets**

**Endowment Assets and Equities:**
- Securities and Cash in Hands of Central Hanover Bank and Trust Company, New York, Trustee .......................... $ 968,222.31
- Securities and Cash in Minor Funds ................................................. 18,998.47 $ 987,220.78

**Plant Assets:**
- Land ...................................................... $ 113,626.38
- Buildings ................................................. 1,490,666.08
- Equipment ............................................... 257,161.69
- Library .................................................... 403,433.74

Less Reserve for Depreciation ...................................................... $1,478,269.21

Book Fund Cash ...................................................... 2,939.75 $1,481,208.96

**Current Assets:**
- Cash .............................................................. $ 22,924.33
- Mortgage Note Receivable .................................................. 2,350.00
- Accounts Receivable .................................................. 19,874.97
- Inventories:
  - Supply Department .................................................. $ 53,670.83
  - "Biological Bulletin" ................................................... 16,191.21 69,862.04
- Investments:
  - Devil's Lane Property .................................................. 35,648.04
  - Stock in General Biological Supply House ........................... 12,700.00
  - Other Investment Securities ............................................. 46,109.29
  - Retirement Fund ....................................................... 20,244.36 114,701.69
- Prepaid Insurance ...................................................... 7,056.77
- Items in Suspense (Debits) ................................................ 1,161.41 $ 237,931.21

Liabilities

**Endowment Funds:**
- Endowment Funds ................................................... $ 966,445.89
- Reserve for Amortization .................................................. 1,776.42 968,222.31

Minor Funds ...................................................... 18,998.47 $ 987,220.78

**Plant Funds:**
- Mortgage Notes Payable .................................................. $ 11,000.00
- Donations and Gifts .................................................... 1,331,699.04
- Other Investments in Plant from Gifts and Current Funds ............. 138,509.92 1,470,208.96 $1,481,208.96

**Current Liabilities and Surplus:**
- Accounts Payable ....................................................... $ 5,361.61
- Items in Suspense (Credits) ................................................ 1,055.00 231,514.60 $ 237,931.21

$2,706,360.95
**Current Surplus Account**

**Balance, January 1, 1950** .................................................. $ 215,443.60

**Add:**
- Excess of Income over Expense for Year ......................... $ 4,685.77
- Reserve for Depreciation, 1950, Charged to Plant Funds .... 29,160.29

**Deduct:**
- Payments from Current Funds during year for Plant Assets:
  - Buildings ....................................................... $ 779.45
  - Equipment ..................................................... 5,773.72
  - Library ......................................................... 10,221.89
- Payment on Principal of Mortgage Note given in
  Partial Payment for "Dolphin" ................................ 1,000.00

**Balance December 31, 1950** ........................................... $ 231,514.60

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**Summary of Cash Transactions for Year ended December 31, 1950**

<table>
<thead>
<tr>
<th>Expenditures</th>
<th>Receipts</th>
<th>Current Additions to Capital Assets</th>
<th>Total Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Cash</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income from Endowment Funds</td>
<td>46,431.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income from Other Investments</td>
<td>22,502.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Estate Rentals</td>
<td>6,864.04</td>
<td>1,781.74</td>
<td>1,781.74</td>
</tr>
<tr>
<td>Donations</td>
<td>24,532.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Membership Dues</td>
<td>2,460.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction</td>
<td>16,811.15</td>
<td>10,073.86</td>
<td>10,073.86</td>
</tr>
<tr>
<td>Research (including Apparatus and Chemical Departments)</td>
<td>30,738.61</td>
<td>2,929.06</td>
<td>29,878.56</td>
</tr>
<tr>
<td>Supply Department</td>
<td>74,079.32</td>
<td>82,896.48</td>
<td>83,541.93</td>
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<tr>
<td>Mess</td>
<td>48,513.37</td>
<td>47,123.02</td>
<td>96.45</td>
</tr>
<tr>
<td>Dormitories</td>
<td>22,824.85</td>
<td>10,541.46</td>
<td>46.79</td>
</tr>
<tr>
<td>&quot;Biological Bulletin&quot;</td>
<td>7,551.71</td>
<td>14,253.77</td>
<td>14,253.77</td>
</tr>
<tr>
<td>Library</td>
<td>4,974.91</td>
<td>8,591.71</td>
<td>9,874.48</td>
</tr>
<tr>
<td>Frank R. Lillie Memorial Fund—Arbacia Survey</td>
<td>5,129.49</td>
<td>4,235.87</td>
<td>4,235.87</td>
</tr>
<tr>
<td>Office of Naval Research</td>
<td>3,522.50</td>
<td>3,440.16</td>
<td>3,440.16</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>4,576.07</td>
<td>755.73</td>
<td>755.73</td>
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<tr>
<td>Book Purchase Account, Woods Hole Oceanographic Institution</td>
<td>800.00</td>
<td>838.79</td>
<td>838.79</td>
</tr>
<tr>
<td>Real Estate Sales (on account)</td>
<td>4,872.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>24,718.91</td>
<td></td>
<td>24,718.91</td>
</tr>
<tr>
<td>Buildings and Grounds</td>
<td>51,010.98</td>
<td>1,632.60</td>
<td>52,643.58</td>
</tr>
<tr>
<td>Interest, Insurance and other Property Maintenance</td>
<td>10,769.50</td>
<td></td>
<td>10,769.50</td>
</tr>
<tr>
<td>Payments to Retirement Fund</td>
<td>8,888.43</td>
<td>8,888.43</td>
<td></td>
</tr>
<tr>
<td>Payment on Mortgage</td>
<td>1,000.00</td>
<td></td>
<td>1,000.00</td>
</tr>
</tbody>
</table>

$327,185.65 $306,869.91 $17,514.05 $324,383.96
REPORT OF THE LIBRARIAN

Cash Balance, January 1, 1950:

Central Hanover Bank and Trust Co. $ 8,159.11
Falmouth National Bank .......... 2,131.69 $ 10,290.80

Receipts .................................. 327,185.65

Payments ................................ 337,476.45

Cash Balance, December 31, 1950

Central Hanover Bank and Trust Co.... $ 11,003.27
Falmouth National Bank ............ 2,089.22 $13,092.49

Balance Balance
Other Cash Accounts Jan. 1, 1950 Received Paid Dec. 31, 1950

Allen R. Memhard Fund Cash ........... $ 58.05 $ 25.00 $ 83.05
Rev. Arsenious Boyer Burse Cash .... 561.33 125.00 $ 504.46 182.07
Lucretia Crocker Fund Cash ......... 1,747.88 440.43 1,513.39 674.92
Bathing Beach Fund Cash ............ 1,000.00 1,000.00
Dr. Frank R. Lillie Memorial Fund Cash 4,952.47 18,598.15 15,218.78 8,331.84
Old Main Building Fund Cash (Rockefeller) 30,720.64
Retirement Fund Cash ............. 4,555.05 11,082.29 14,637.99 999.35
Bio Club Scholarship Fund Cash ..... 130.03 62.50 120.00 72.53
Book Fund Cash ............ 838.93 5,056.25 2,601.70 3,293.48
Lalor Foundation Fellowships Cash ... 2,118.21 5,000.00 5,057.28 2,060.93

Respectfully submitted,

DONALD M. BRODIE,
Treasurer

V. REPORT OF THE LIBRARIAN

The sum of $12,544 was appropriated to the Library for the year 1950, plus $3000 from the Woods Hole Oceanographic Institution to be applied to staff salaries. This amount was expended as follows: serials, $4427.38; books, $565.17; binding, $2100.87; supplies and sundries, $843.37; insurance, $55.00; and salaries, $7768.89. The total expenditures amounted to $15,802.29.

In addition to the above, $800 (plus a balance of $63.89 from 1949) was received from the Woods Hole Oceanographic Institution for acquisitions covering the field of oceanography. Of this amount, $804.79 was spent, leaving a balance of $59.10 on Dec. 31, 1950.

From the Carnegie Corporation of New York Fund, 24 completed back sets and 37 partially completed back sets were purchased, at a cost of $3078.49. The balance of this fund will be used during the coming year and a final summary of acquisitions realized from the $25,000 will be given in the 1951 report.

During the year, 1478 (66 new) current journals were received. Of these, 480 (17 new) were Marine Biological Laboratory subscriptions, 587 (24 new) were exchanges and 158 (13 new) were gifts; 69 (3 new) were Woods Hole Oceanographic Institution subscriptions; 161 (3 new) were exchange and 23 (6 new) were gifts.
The Marine Biological Laboratory purchased 66 books, received 5 complimentary copies from authors, 85 titles from publishing firms and 21 miscellaneous donations. The Woods Hole Oceanographic Institution purchased 6 titles, making a total of 183 books added to the shelves.

There were 27 back sets completed: 26 by purchase (2, Woods Hole Oceanographic Institution), and 1 by exchange; 51 were partially completed: 42 by purchase (5, Woods Hole Oceanographic Institution), 1 by exchange and 8 by gift.

The reprint additions to the Library numbered 5146. Of these, 2009 were of current issue and 3137 of earlier dates. Acknowledgment is made to Dr. Dorothy Wrinch and to Dr. A. M. Pappenheimer for gifts of reprints totalling 4780. Of these, 1299 were not already contained in the Library’s collection.

Fifty volumes were borrowed on inter-library loan and 125 were sent to other institutions. Eighty-four microfilm orders were filled, amounting to $190.53.

The amount of $172.49 was realized from the sales room, and from this sum, new lights for the cataloguing room have been purchased.

There were two changes made in the staff during the year—Miss Benevides and Miss Hoffer joined the personnel, replacing Mrs. McInnes and Miss Goodfellow.

At the end of the year 1950, the Library contained 59,980 bound volumes and 174,081 reprints.

For the ever-willing help received from the Library Committee during 1950, the Librarian wishes to express her appreciation.

Respectfully submitted,
DEBORAH LAWRENCE HARLOW,
Librarian

VI. REPORT OF THE DIRECTOR

To the TRUSTEES OF THE MARINE BIOLOGICAL LABORATORY:

Gentlemen:

The sixty-third year of the Marine Biological Laboratory opened with a new administrative leadership and organizational set-up. The retirement of Dr. Charles Packard and of Mr. F. M. MacNaught, effective at the close of the preceding year, created serious gaps in the direction and management of the Laboratory. Fortunately we had available for the position of General Manager, Mr. Homer P. Smith who had had the valuable experience of serving as Assistant Business Manager with Mr. MacNaught.

Mr. Smith took over his duties as General Manager with energy and imagination. With the excellent cooperation of the Maintenance staff, he has continued the rehabilitation of the Laboratory plant initiated by Dr. Packard at the close of the war. Mr. Smith with the assistance of Mr. R. W. Kahler, has developed a long-range plan which, if it can be carried out in the present emergency and in the future, will result in the maintenance of our plant in first-rate condition.

The reorganization of the Laboratory administrative set-up, developed by a committee under the chairmanship of Dr. Eric G. Ball, has worked most satisfactorily. The lines of authority and responsibility are well defined, resulting in excellent cooperation and performance by the members of the permanent staff.
Mess Hall Management

During the winter Mr. Smith explored the possibilities of employing a new steward for the Mess Hall. Miss Belle Downing completed this season fifty years of summer service in the Mess Hall, the past several years in direct charge. These duties, combined with the supervision of the dormitory maid service, were too heavy for one person and Mr. Robert T. Martin, Manager of the dining hall at Harvard University's Adams House, took over as steward. He proved a most fortunate choice as Mr. Martin, assisted by Mr. John De Petris, has done an outstanding job. Increased cost of food and help necessitated an increase in Mess rates which was more than compensated by the improvement in the food and service.

Contributions and Gifts

Contributions to the Frank R. Lillie Memorial Fund during the year totaled $25,860.12. The Laboratory is much indebted to the contributors which included the Eli Lilly Company, $15,000; Dr. G. H. A. Clowes, $5,000; the Kettering Foundation, $2500; and the General Biological Supply House, $1000. A number of the Corporation members also contributed and it is hoped that other members will also give to the fund.

Contributions from the Associates totaled $1465, and, in addition, there was an anonymous contribution from one of the associates who donated $1000 to the Laboratory to be used as was deemed most advisable. With the Associates' contribution, the Laboratory has purchased a steam generator which has been urgently needed by the Laboratory for the past several years.

Dr. William Curtis, as has been his custom in the past, made a special donation to the Laboratory: this year, a handsome compass and an automatic heater for the Dolphin.

Grants

The American Philosophical Society has instituted a program through which they support three research rooms annually for the next five years. This grant amounts to $1800 each year and covers the total maintenance costs of these rooms. Already this has proved a real asset, providing space for visiting foreign investigators who frequently do not have funds available to cover the Laboratory charges.

The American Cancer Society continued its support of the "hot lab" by a grant which will provide experienced technical assistance so necessary in the handling of radioactive materials.

The Laboratory continues to receive support from the Rockefeller Foundation from a grant which has three more years to run. These funds supplement the regular Laboratory income for general operations and are very important in helping the Laboratory operate with reasonable effectiveness. This past summer we enjoyed a visit from President Chester I. Barnard of the Rockefeller Foundation and Dr. Warren Weaver, Director of the Natural Science Division. They spent two days surveying the research and teaching activities and facilities of the Laboratory. They were impressed by the need of the Laboratory for certain new items of equipment and apparatus.
Lalor Fellowship Program

Dr. C. Lalor Burdick visited the Laboratory in August, talked with the Lalor Fellows and met with the Fellowship Committee. Dr. Burdick encouraged the Committee to apply for a renewal of the fellowship grant and this was done. Notice has been received from the Foundation that the fellowship grant has been renewed for five years and increased to $6000 annually. The outstanding success of this program should encourage the Laboratory to seek additional funds for fellowships in fields not covered by the Lalor Grant.

Office of Naval Research Contract

A contract with the O. N. R. provided funds in the amount of $5000 for the collection, transportation, and distribution of squid for research purposes. A truck was especially equipped with a cooled, aerated, salt water tank. With this equipment, it has been possible to transport squid from the north side of the Cape to Woods Hole, the animals arriving at the Laboratory in excellent condition. The funds also provided a new engine for the *Tern*, which brings in squid from the Martha's Vineyard Sound fish traps.

Arbacia Program

There was a serious shortage of Arbacia for research purposes during the 1949 season. With funds from the Frank R. Lillie Memorial Fund, an Arbacia scouting project was developed in 1950, to locate new collecting beds. Dr. John S. Rankin spent the major part of the summer dredging likely areas and located a long, narrow bed off the northwest shore of Martha's Vineyard between Gay Head and Menimsha Bight. It is hoped that in the near future an ecological program may be developed for the investigation of Arbacia. Through the cooperative use of the Arbacia collected from the old beds, most investigators obtained adequate materials. Some investigators substituted for their research other forms which, in some cases, were more satisfactory than Arbacia.

Ecology Program

Early in the year a committee was set up under the Chairmanship of Dr. W. C. Allee to develop an ecological program. Such a program appeared desirable, particularly in view of our difficulty in obtaining some forms in adequate numbers for research and, still more, to broaden the base of operation of the Laboratory. As a first step the Committee recommended the establishment of a course in ecology at the graduate level for a limited number of students. This was approved by the Board of Trustees, provided funds could be obtained to support the course. The problem was discussed with Mr. Fairfield Osborn, President of the New York Zoological Society. This Society very generously has made a grant of $4000 a year for three years to assist us in getting this program under way.

Oceanographic Institution Expansion

There is urgent need for expansion of the Oceanographic Institution plant to take care of Navy contract research resulting from the present emergency. The most favorable site for this expansion is on the Bar Neck Property adjacent to the Oceanographic Institution. This property is owned by the Marine Biological
Laboratory. A majority of the M. B. L. Trustees oppose the sale of this unique piece of property, although there was considerable support for leasing the property. It should be possible to solve this problem to the mutual satisfaction of both institutions, permitting effective expansion of the Oceanographic Institution but, at the same time, protecting the interests of the Marine Biological Laboratory.

**Biological Bulletin**

At the termination of this year, Dr. Donald P. Costello became editor of the "Biological Bulletin," succeeding Dr. H. Burr Steinbach.

**Housing**

Housing continues to be a vexing problem though it has been eased somewhat by the building of several houses in the Devil's Lane Tract, during the past two years. The roads in this tract have been accepted by the town and power lines and water mains have been installed.

*There are appended as parts of this report:*

1. Memorial
2. The Staff
3. Investigators and Students
4. The Lalor Fellows
5. Tabular View of Attendance
6. Subscribing and Cooperating Institutions
7. Evening Lectures
8. Shorter Scientific Papers Presented at the Seminar
9. Members of the Corporation

Respectfully submitted,

PHILIP B. ARMSTRONG,

Director

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**1. Memorial**

Leonor Michaelis

By

E. S. G. Barron

The Marine Biological Laboratory mourns the death of Professor Michaelis. The loss is more deeply felt, as his death came just two months after the Department of Physiology had decided to celebrate his 75th birthday by dedicating to him the Physiology Course of 1950. He was very touched by this tribute and had accepted our invitation to spend the summer with us. Students and staff expected to profit from his genius and his wisdom. A member of the Corporation since 1928, Professor Michaelis was an instructor of the Physiology Course for ten years.

Born in Berlin, Germany, on January 16, 1875, Leonor Michaelis graduated from the Medical School in Berlin in 1897. That his life was to be devoted to the pursuit of knowledge was demonstrated early. While still a student he published a paper on the histology of milk secretion which was rewarded with a prize from the Medical School,
the only recognition that was to be awarded to him in time. In Professor Hertwig's
laboratory young Michaelis worked on embryological problems; his paper on the cytology
of the fertilization of the ovum of the amphibian *Triton taeniatus*, as well as his doctor's
thesis on the determination of the direction of the first cleavage in the frog's egg, reveals
rare insight and clarity of conception.

It was natural that Michaelis' early scientific steps were directed toward microscopic
anatomy, since medical thinking at that time was strongly influenced by the rapid advances
made with the aid of the microscope. Perhaps he would have directed himself toward
pathology if, "by some strange coincidence" as he says it, he had not met Paul Ehrlich,
who at that time was looking for a young histologist. Ehrlich offered him a one-year
position as his private assistant in the State Institute for Serological Testing and Re
search. It was here that Michaelis studied the chemistry of staining, and it was here
that the vital staining of mitochondria with Janus Green originated. There is no doubt
that this one year at Ehrlich's laboratory exerted a decisive influence on the direction of
his investigations. The whole field of physico-chemical sciences as applied to biology and
medicine was here opened to him. With his powerful and quick intellect he visualized
the unlimited applications of physics and chemistry to biological phenomena. The sci-
ence of Biochemistry at the start of the century, when Michaelis entered Ehrlich's labo-
ratory, was still in its infancy, mostly sheltered in physiological and pathological labo-
ratories; and the *Journal of Biological Chemistry, Biochemical Journal* and *Biochem.
ische Zeitschrift* did not appear until six years later. Here, in front of him, was a field of
vast possibilities, and he with no financial facilities, and no formal, classical training to
enter it. Indeed Ehrlich himself had advised him to enter clinical medicine, which he
had to do, becoming an assistant to Professor Litten in a department of one of the mu-
nicipal hospitals in Berlin from 1900 to 1904. A herculean task was this, taking care of
the sick and at the same time preparing himself with the solid foundations required for
fundamental research in quantitative biology. With no teachers to guide him, armed
only with his genius and his tenacious perseverance, he studied chemistry, as he once told
me, in a dictionary, and mastered the branches of mathematics necessary to become fa-
miliar with the solution of physicochemical problems. And while thus schooling himself
for the task ahead, he still found time to continue his investigations in histology and
staining.

In 1903 he was made a Privadozent at the University of Berlin with a thesis on im-
munological protein precipitins. By combining enzyme techniques he observed that short
digestion of serum albumin with pepsin changed profoundly the immunological proper-
ties. He was also the first to show that aqueous extracts of normal livers could be used
for the Wassermann test, and that the complement fixation test in the Wassermann re-
action could be replaced by a direct precipitation test by using extracts of syphilitic foetus
of high potency.

In 1904, a paper about some iron-containing inclusions in tumors of the urinary
bladder aroused the interest of Professor v. Leyden who appointed him research assistant
for the newly created Institute for Cancer Research at the University Clinic. He worked
here on experimental cancer, and once was sent to Jena to bring the ultramicroscope newly
built by Siedenhopf and Zsigmondy at the Zeiss optical works. With this instrument
v. Leyden had great hopes of finding the cause of cancer; Michaelis had great hopes of
utilizing the instrument for studies of colloidal chemistry (which he indeed succeeded
in doing).

In 1905, Michaelis received the title of Professor. What could a Professor do with
no salary, no laboratory, no funds to support his work? Fully realizing the hopelessness
of this situation, he accepted the position of bacteriologist at the municipal hospital "am
Urban" in Berlin, which brought him in contact with Peter Rona, the chemist of the
hospital. The close friendship and association with Rona lasted throughout his seventeen-
year stay at the hospital. It was here that the full powers of Michaelis came to glorious
ecllosion. In his humble research room, with barely space enough—as Albert Szent-
Györgyi has said to me—for one man to walk through, and with scarce equipment,
Michaelis accomplished, either alone or in collaboration with his friend Peter Rona and
a number of young scientists from abroad and from Germany, the series of remarkable
investigations on the ionic environment, on weak electrolytes, on adsorption, on proteins,
on enzymes—chapters which are now the secure foundation of quantitative biology.

Simultaneously with Sørensen, Michaelis foresaw the influence of the hydrogen ion
concentration on biological phenomena and proceeded to develop the theory and practice
of hydrogen ions. The hydrogen electrode he built for exact measurements. The theory
of buffers, or, as he called them, “hydrogen ion regulators,” was lucidly presented. The
theories of the dissociation of amphotheric electrolytes, and of the iso-electric points of
amino acids and proteins were developed quantitatively, after Hardy had introduced in
a qualitative way the concept of the isoelectric point. He developed the method of elec-
trophoresis in such a way as to keep the pH constant during the flow of current. The
isoelectric points of casein, hemoglobin, serum albumin, serum globulin, native and de-
natured globin, gelatine, and edestin were thus determined. He was the first to show that
the charge of a colloid, enzyme, or even of whole bacteria was not a property inherent
in the substance alone but was dependent upon the pH and that there is an isoelectric
point characteristic of the substance.

He was devoting his attention at the same time to the field of enzymes. Mindful of
the influence of ionic environment, he studied the effect of the hydrogen ion concentration
on enzyme activity, and although Sørensen published first similar studies, Michaelis pro-
cceeded to extend Sørensen’s observations by showing that the dependence of enzy-
me activity on pH was of the same nature as the dependence of the dissociation of a weak
acid on pH. By comparing the enzymatic activity at constant pH but varied concentra-
tions of substrate he presented lucidly and quantitatively the concept of affinity constant.
And thus the theory of enzyme-substrate combination, postulated by Henry in 1903, was
established on a firm basis ten years later, in 1913. At a time when the protein nature
of enzymes was as yet unknown, Michaelis guided by his genius foresaw it, and with
daring and his elegant simplicity put forth the theory of enzyme-substrate complex for-
mation. Now the Michaelis enzyme-substrate complex is one of the solid foundations
of enzymology.

In a study of the effect of adsorption on enzyme activity he gave evidence of site
specificity on the enzyme surface. And in his studies on the nature of enzyme inhibitors
he distinguished the competitive inhibitors from those which influence the rate of splitting
of the enzyme-substrate into the split products and free enzyme.

Studies on adsorption, on bacterial agglutination, on blood sugar, on buffers, and on
pH indicators crowded those years of intense production.

The international reputation of Michaelis was widespread. In 1921 he received the
title of professor extraordinarius of physical chemistry applied to medicine and biology
at the University of Berlin. Again a professorship with no salary, no laboratory, no
budget. Grim irony this “appointment” must have seemed to him! Hence, he accepted
in 1921 the position of consultant in an industrial concern for scientific apparatus where
he was provided with laboratory facilities. Less than one year later, however, he was
invited to the chair of biochemistry at the re-organized medical school of Nagoya. Three
pleasant and fruitful years were spent in Japan, where he initiated, in collaboration with
Fujita, his studies on membrane permeability. Struck by the selective permeability
of cell membranes, he strove to construct a model which would show similar properties,
and thus he made his dried collodium membranes permeable only to cations. Here again he
gave proof of his rare insight, for he terminated these studies upon recognizing that his
models did not reproduce the properties of cellular membranes.
During his stay in Japan, Michaelis received an invitation from Jacques Loeb for a lecture tour in the United States, to be given in the summer of 1924. On the very day of his departure from Japan he received the tragic news of Jacques Loeb's sudden death. The lectures, however, had all been properly arranged, and on that occasion Michaelis was asked to come to Johns Hopkins as a resident lecturer for three years, beginning in the Spring of 1926 at the termination of his contract in Japan.

And thus, at Hopkins, started the third cycle of Michaelis' achievements. The field of oxidation-reduction processes and of heavy metal catalysis now received most of his attention. Here, as in the field of enzymes, his genius brought forth theories of fundamental importance for the understanding of the kinetics of biological oxidations. The simultaneous discovery with Elema, from Holland, of the two-step reduction of pyocyanine in acid solutions was the starting point of Michaelis' principle of monovalent oxidation-reductions and the intermediary formation of free radicals during the oxidation process of systems which perform the reaction by transfer of two electrons. The presence of such free radicals, existing in equilibrium with their "parent substances" even in aqueous solutions, was a daring concept which appeared absurd to conservative chemists. Like his theory of enzyme-substrate formation, it was more the foresight of a genius than a methodical and secure approach. The first papers on the theory of two-step oxidations were rejected by both the Journal of Biological Chemistry and the Journal of the American Chemical Society. So indignant was one referee of the latter journal that in horror he wrote, "In short, a principle of modern scientific philosophy is violated." The paper was published in Biochemische Zeitschrift. Michaelis felt deeply this attack. To answer the criticisms of lack of conclusive evidence and of too much reliance on potentiometric data, he diligently started the study of quantum mechanics and of magnetochemistry, attacking them with the same enthusiasm as when thirty years previously he had prepared himself in organic chemistry and mathematics. He simplified the method of the magnetic balance for the measurement of the paramagnetism of these intermediate compounds and left no room for doubt about the existence of free radicals. Thus, the name of Michaelis was incorporated in every modern text book on organic chemistry.

Yet official recognition came always late. He became a member of the National Academy of Science five years after his retirement as active member of the Rockefeller Institute, where he spent the last years of his life—from the end of his lectureship at Johns Hopkins until his death in October of 1949.

With the death of Michaelis we lose a man of an intellectual stature that is more and more rare in this age of narrow specialization. He had the priceless gift of transforming the most abstruse and complex concepts into simple and clear ideas; the books he wrote were models of clarity and conciseness. His textbook on embryology reached nine editions. Hydrogen Ion Concentrations, Manual of Physical Chemistry, Introduction to Mathematics for Biologists and Chemists and Oxidation-reduction Potentials were all translated into various languages. His brilliant genius allowed him to perceive immediately the important points in any discussion, and his wide knowledge in the fields of biology, medicine, chemistry, physics, and mathematics, was always at the service of those who went to him for advice.

The humanistic type of Gymnasium where Michaelis received his secondary education broadened his intellectual training and interests. With no difficulties in Latin or Greek he tackled the Japanese language when in Japan and became quite a connoisseur of the old Oriental civilizations. Music attracted him greatly. In his first semester at the University he even took a course in counterpoint with Professor Bellerman. His improvisations at the piano were always a delight to his listeners.

The Marine Biological Laboratory mourns deeply the loss of a great man of science and a scholar of broad interests, as well as a friend of many years' standing.
2. The Staff, 1950

Philip B. Armstrong, Director, State University of New York, Medical Center at Syracuse.

Senior Staff of Investigation

E. G. Conklin, Professor of Zoology, Emeritus, Princeton University.
W. E. Garrey, Professor of Physiology, Emeritus, Vanderbilt University Medical School.
R. S. Lillie, Professor of General Physiology, Emeritus, The University of Chicago.
A. P. Mathews, Professor of Biochemistry, Emeritus, University of Cincinnati.
G. H. Parker, Professor of Zoology, Emeritus, Harvard University.

Zoology

I. Consultants

F. A. Brown, Jr., Professor of Zoology, Northwestern University.
Libbie H. Hyman, American Museum of Natural History.
A. C. Redfield, Woods Hole Oceanographic Institution.

II. Instructors

L. H. Kleinholz, Associate Professor of Biology, Reed College, in charge of course.
W. D. Burbank, Professor of Biology, Drury College.
C. G. Goodchild, Professor of Biology, S. W. Missouri State College.
John H. Lochhead, Assistant Professor of Zoology, University of Vermont.
Madeleine E. Pierce, Associate Professor of Zoology, Vassar College.
W. M. Reid, Professor of Biology, Monmouth College.
T. H. Waterman, Assistant Professor in Biology, Yale University.
Marion H. Pettibone, Arctic Research Laboratory, U. S. National Museum.

III. Laboratory Assistants

Robert S. Howard, Northwestern University.
Muriel Sandeen, Northwestern University.

Embryology

I. Instructors

Donald P. Costello, Kenan Professor of Zoology, University of North Carolina, in charge of course.
Arthur L. Colwin, Assistant Professor of Zoology, Queens College.
Charles B. Metz, Assistant Professor of Zoology, Yale University.
James A. Miller, Professor of Anatomy, Emory University.
S. Meryl Rose, Associate Professor of Zoology, University of Illinois.
Albert Tyler, Associate Professor of Embryology, California Institute of Technology.

II. Research Assistant

Margaret E. Davidson, McGill University.

III. Laboratory Assistants

J. Bruce Guysselman, Northwestern University.
Donald E. Kent, University of North Carolina.
PHYSIOLOGY

I. CONSULTANTS

ERIC G. BALL, Professor of Biochemistry, Harvard University Medical School.
MERKEL H. JACOBS, Professor of Physiology, University of Pennsylvania.
OTTO LOEWI, Professor of Pharmacology, New York University, School of Medicine.
ARTHUR K. PARPART, Professor of Biology, Princeton University.

II. INSTRUCTORS

E. S. GUZMAN BARRON, Associate Professor of Biochemistry, University of Chicago, in charge of course.
DANIEL MAZIA, Professor of Zoology, University of Missouri.
HANS NEURATH, Professor of Biochemistry, Duke University Medical School.
JOHN RUNNSTRÖM, Director of the Wenner Grens Institute, Stockholm.
H. BURR STEINBACH, Professor of Zoology, University of Minnesota.
GEORGE WALD, Professor of Biology, Harvard University.

III. LABORATORY ASSISTANT

PATRICIA McINTYRE, Johns Hopkins Medical School.

BOTANY

I. CONSULTANTS

BOSTWICK H. KETCHUM, Woods Hole Oceanographic Institution.
WM. RANDOLPH TAYLOR, Professor of Botany, University of Michigan.

II. INSTRUCTORS

MAXWELL S. DOTY, Assistant Professor of Biology, Northwestern University, in charge of course.
GEORGE J. HOLLENBERG, Professor of Biology, University of Redlands.
R. D. WOOD, Assistant Professor of Botany, Rhode Island State College.

III. LABORATORY ASSISTANTS

RALPH A. LEWIN, Yale University.
CECILIA RIEGER, Vassar College.

IV. COLLECTOR

HANNAH T. CROASDALE, Research Associate, Dartmouth College.

V. LECTURERS

J. B. LACKEY, Medical and Scientific Editor, The Blakiston Company.
RUTH PATRICK, Curator of Limnology, Academy of Natural Sciences of Philadelphia.

EXPERIMENTAL RADIOLOGY

G. FAILLA, College of Physicians and Surgeons, Columbia University.
L. ROBINSON HYDE, Phillips Exeter Academy, Exeter, N. H.
REPORT OF THE DIRECTOR

LIBRARY

MRS. DEBORAH LAWRENCE HARLOW, Librarian
MARY A. ROHAN  LORETTA J. BENEVIDES  JOAN M. HOFFER

APPARATUS DEPARTMENT

ROBERT MILLS, Manager
JAMES D. GRAHAM  ELIZABETH J. KEELER
JAMES D. GRAHAM, JR.  SEAVE R. HARLOW

CHEMICAL DEPARTMENT

GAIL M. CAVANAUGH, Chemical Supplies Manager

SUPPLY DEPARTMENT

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JOHN S. RANKIN, Naturalist
RUTH CROWELL  JANICE MCLAUGHLIN
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A. M. HILTON  CARL O. SCHWEIDENBACK  H. S. WAGSTAFF
W. E. KAHLER  R. O. LEHY  ROBERT PERRY

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ROBERT GUNNING  ALTON J. PIERCE
JOHN H. HEAD  T. E. TAWELL

GEORGE A. KAHLER

3. INVESTIGATORS AND STUDENTS

Independent Investigators, 1950

ABRAMS, RICHARD, Assistant Professor, Inst. Radiobiology and Biophysics, University of Chicago.
ALLEN, M. JEAN, Assistant Professor of Zoology, University of New Hampshire.
ALSCHER, RUTH P., Assistant Professor, Manhattanville College of the Sacred Heart.
ARMSTRONG, PHILIP B., Professor of Anatomy, State College of New York, Medical Center, Syracuse, N. Y.
ATWOOD, KIMBALL C., Visiting Professor of Zoology, Columbia University.
BAILY, NORMAN A., Research Scientist, Columbia University.
BALL, ERIC G., Professor of Biological Chemistry, Harvard Medical School.
BARNETT, ROBERT B., Graduate Student in Physiology, University of Chicago.
BARRON, E. S. GUZMAN, Professor of Biochemistry, University of Chicago.
BELFORD, JULIUS, Assistant Professor of Pharmacology, Brooklyn 2, New York.
BERGER, CHARLES A., Director, Biological Laboratory, Fordham University.
BERNSTEIN, MAURICE H., Graduate Assistant, Washington University.
BLISS, ALFRED F., Associate Professor of Physiology, Tufts College Medical School.
BLUM, HAROLD F., Physiologist, Princeton University.
BOETTIGER, EDWARD C., Assistant Professor of Zoology, University of Connecticut.
BONNER, JOHN TYLER, Assistant Professor, Princeton University.
VON BORSTEL, ROBERT C., Assistant Instructor, University of Pennsylvania.
BRIDGMAN, ANNA JOSEPHINE, Associate Professor of Biology, Agnes Scott College.
BROOKS, MATILDA M., Research Associate in Physiology, University of California.
BROWN, FRANK A., JR., Professor and Chairman Biological Sciences, Northwestern University.
BROWN, FRANK A., JR., Professor and Chairman Biological Sciences, Northwestern University.
BRUNST, V. V., Research Associate, University of Maryland Medical School.
BRUST, MANFRED, Research Assistant in Physiology, University of Chicago.
BUBIENIEC, ERNEST J., Graduate Student, University of Wisconsin.
BURBANCK, W. D., Chairman, Department of Biology, Drury College.
CAMBER, BERNARD, Fellow of the Rockefeller Institute for Medical Research.
CHAMBERS, EDWARD S., New York University, Washington Square College.
CHAMBERS, ROBERT, Professor Emeritus, New York University, Washington Square College.
CHAREST, DONALD R., Chairman, Division of Biological Sciences, University of Rochester.
CHASE, AURINE M., Associate Professor of Biology, Princeton University.
CHENAY, RALPH HOLT, Professor of Biology, Brooklyn College.
CLAFF, C. LLOYD, Research Associate in Surgery, Harvard Medical School.
CLARK, ARNOLD M., Assistant Professor of Biology, University of Delaware.
CLEMBA, A. C., Associate Professor of Biology, Emory University.
CLOWES, G. H. A., Research Director, Emeritus, Eli Lilly and Company.
COHEN, SEYMOUR STANLEY, Associate Professor of Physiological Chemistry, University of Pennsylvania.
COLEWIN, ARTHUR L., Assistant Professor of Biology, Queens College.
COLEWIN, LAURA N., Queens College.
CONKLIN, EDWIN G., Professor of Biology Emeritus, Princeton University.
COOPERSTEIN, SHERWIN J., Instructor of Anatomy, Western Reserve University.
COPELAND, D. EUGENE, Assistant Professor of Biology, Brown University.
CORNMAN, IVOR, Assistant Research Professor, George Washington University.
COSTELLO, DONALD PAUL, Kenan Professor of Zoology, University of North Carolina.
COYLE, ELIZABETH E., Associate Professor of Biology, College of Wooster.
CROWELL, SEARS, Assistant Professor of Zoology, Indiana University.
CURTIS, HOWARD J., Professor of Physiology, Vanderbilt University School of Medicine.
CURTIS, W. C., Professor of Zoology Emeritus, University of Missouri.
DE FALCO, RALPH, Associate Professor of Zoology, Rutgers University.
DOTY, MAXWELL S., Associate Professor of Biology, Northwestern University.
ELLIOTT, ALFRED M., Assistant Professor of Zoology, University of Michigan.
FAURÉ-FREMiet, EMMANUEL, Professor, Collège de France.
FINKESTEIN, PAUL, AEC Postdoctoral Fellow, University of Chicago.
FOSTER, RICHARD W., Assistant Curator of Mollusks, Museum of Comparative Zoology, Harvard University.
GAFFRON, HANS, Associate Professor of Biochemistry, University of Chicago.
GARREY, WALTER EUGENE, Professor of Physiology Emeritus, Vanderbilt University School of Medicine.
GASVA, BETTY, Junior Biochemist, Argonne National Laboratory.
GILMAN, LAUREN C., Associate Professor of Zoology, University of Miami.
GLASER, OTTO, E. S. Harkness Professor Emeritus, Amherst College.
GOODCHILD, C. G., Professor of Zoology, Southwest Missouri State College.
GRAY, I. E., Professor of Zoology, Duke University.
GREEN, THOMAS W., Assistant Professor of Physiology, Rutgers University.
GROSCH, DANIEL S., Assistant Professor of Zoology, North Carolina State College.
GRUNDfest, HARRY, Associate Professor of Neurology, Columbia University.
HAYS, STEPHEN, Associate Professor, Institute for Muscle Research.
HARIDING, CLIFFORD V., Research Fellow, University of Pennsylvania.
REPORT OF THE DIRECTOR

Harvey, Ethel Browne, Independent Investigator of Biology, Princeton University.
Harvey, E. Newton, Professor of Physiology, Princeton University.
Haywood, Charlotte, Professor of Physiology, Mount Holyoke College.
Heilbrunn, L. V., Professor of Zoology, University of Pennsylvania.
Henley, Catherine, Research Associate, University of North Carolina.
Hodes, Robert, Professor of Neurophysiology, Tulane University.
Holtfreter, Johannes, Professor of Zoology, University of Rochester.
Inoué, Shinya, Graduate Student, Princeton University.
Jacobs, M. H., Professor of General Physiology, University of Pennsylvania.
Jacobs, William P., Assistant Professor of Biology, Princeton University.
Jenkins, George B., Professor of Anatomy Emeritus, George Washington University.
Karush, Fred, Visiting Scholar, Columbia University.
Keeffe, Mary M., Assistant Professor of Biology, College of St. Thomas.
Kelly, Sally M., Assistant Professor of Plant Science, Vassar College.
Kempton, Rudolf T., Professor of Zoology, Vassar College.
Kiss, Kisho, Professor of Chemistry, Yeshiva University.
Kleinholz, Lewis H., Associate Professor of Biology, Reed College.
Klotz, Irving M., Associate Professor of Chemistry and Biology, Northwestern University.
Krahl, Maurice E., Associate Professor of Biological Chemistry, Washington University, School of Medicine.
Kreeger, George L., Associate Professor, Washington University.
Kuffler, Stephen W., Associate Professor, Wilmer Institute.
Kuntz, Eloise, Instructor, Vassar College.
LaJtha, Abel, Assistant Professor, Institute for Muscle Research.
Lanc, Charles E., Research Associate, University of Miami.
Lazarow, Arnold, Associate Professor of Anatomy, Western Reserve University.
Levy, Milton, Associate Professor of Chemistry, New York University College of Medicine.
Lillie, Ralph S., Professor of Physiology Emeritus, University of Chicago.
Lochhead, John H., Associate Professor of Zoology, University of Vermont.
Loveless, Roberta, Adjunct Professor in Biology, University of South Carolina.
Lucké, Baldwin, Professor of Pathology, University of Pennsylvania.
Marshak, Alfred, Adjunct Associate Professor, New York University College of Medicine.
Marsland, Douglas, Professor of Biology, New York University, Washington Square College.
Marmont, George, Assistant Professor of Physiology, University of Chicago.
Mazia, Daniel, Professor of Zoology, University of Missouri.
Mehler, Alan H., Research Associate, University of Chicago.
Metz, Charles B., Assistant Professor of Zoology, Yale University.
Metz, Charles W., Chairman, Department of Zoology, University of Pennsylvania.
Mihályi, Elemér, Research Assistant, Institute for Muscle Research.
Miller, James A., Professor of Anatomy, Emory University.
Millett, Norman, Professor of Zoology, University College of West Indies.
Monroy, Alberto, Visiting Investigator, Zoological Station, Naples, Italy.
Moore, George M., Chairman, Department of Zoology, University of New Hampshire.
Nachmansohn, David, Assistant Professor of Neurology, Columbia University.
Nelson, Leonard, Instructor in Zoology, University of Nebraska.
Neuberg, Carl, Visiting Professor, Polytechnic Institute of Brooklyn.
Neburath, Hans, Professor of Physical Biochemistry, Duke University.
Nicoll, Paul Andrew, Associate Professor of Physiology, Indiana University.
Palay, Sanford L., Instructor in Anatomy, Yale University, School of Medicine.
Parmenter, C. L., Professor of Zoology, University of Pennsylvania.
Parpart, Arthur K., Chairman, Department of Biology, Princeton University.
Petitbone, Marian H., Researcher, Arctic Research Laboratory, U. S. National Museum, Washington, D. C.
Pierce, Madeleine E., Associate Professor of Zoology, Vassar College.
Plough, H. H., Professor of Biology, Amherst College.
Prosser, C. Ladd, Professor of Physiology, University of Illinois.
Redfield, Robert R., AEC Post-Doctorate Fellow, University of Chicago.
Reid, W. Malcolm, Head of Department of Biology, Monmouth College.
REISCHER, HELEN S., Research Associate, Haskins Laboratories.
RICCA, RENATO A., Clinical Assistant, Hartford Hospital.
RICH, ALEXANDER, Research Fellow in Chemistry, California Institute of Technology.
RISER, PETER, Instructor in Physiology, Fordham University.
RONKIN, R. R., Assistant Professor of Physiology, University of Delaware.
ROSSI, HAROLD H., Assistant Professor of Radiology, Columbia University.
ROTH, JAY S., Assistant Professor of Biochemistry, Rutgers University.
RUDENBERG, M. A., Research Associate, University of Chicago.
RUNNSTRÖM, J., Director, Wenner-Grens Institut, Stockholm, Sweden.
RUTSTEIN, DAVID D., Professor of Preventive Medicine, Harvard Medical School.
SANDOW, ALEXANDER, Associate Professor of Biology, Washington Square College.
SARKAR, NIRMAL K., Research Assistant, Institute for Muscle Research.
SCHAEFFER, ASA A., Professor of Biology, Temple University.
SCHMITT, FRANCIS O., Head, Department of Biology, Massachusetts Institute of Technology.
SCOTT, ALLAN C., Associate Professor of Biology, Union College.
SCOTT, SISTER FLORENCE MARIE, Professor of Biology, Seton Hill College.
SHEA, ERIC R., Associate Professor of Zoology, Oberlin College.
STAIN, GERALD R., Instructor in Biological Chemistry, School of Medicine, Creighton University.
STANKAR, ALBERT, Institute for Advanced Studies, Princeton.
SZENT-GYöRGYI, ALBERT, Institute for Advanced Studies, Princeton.
SZENT-GYöRGYI, ANDREW, Institute for Muscle Research.
TAYLOR, WILLIAM RANDOLPH, Professor of Botany, University of Michigan.
TOBIAS, JULIAN M., Associate Professor of Anatomy, Johns Hopkins University School of Medicine.
TRUNKS, HORACE W., Professor of Biology, New York University.
VARGA, LASZLO, Institute for Muscle Research.
REPORT OF THE DIRECTOR

Beginning Investigators, 1950

AARONSON, SHELDON, Research Associate, Haskins Laboratories.
ALLEN, ROBERT DAY, Assistant Instructor in Zoology, University of Pennsylvania.
BREEN, MOIRA, Assistant in Physiology, Vassar College.
BRUMMETT, ANNA RUTH, Fellow in Biology, Bryn Mawr College.
CANTOR, NANCY JOAN, University of Vermont, College of Medicine.
CLARK, MARQUERITE R., Graduate Fellow, St. Louis University.
COLON, DORIS E., Graduate Student, University of Pennsylvania.
EDGECOMBE, CAROLYN A., Student, University of Connecticut.
ESSNER, EDWARD S., Assistant Instructor, University of Pennsylvania.
GAGNON, ANDRE, Assistant Instructor, University of Pennsylvania.
GOLDSTEIN, LESTER, Graduate Student, University of Pennsylvania.
GRIFFIN, MADELYN R., Graduate Student in Botany, Cornell University.
GROSS, PAUL RANDOLPH, Graduate Student, University of Pennsylvania.
HABARAN, ATIDA, Graduate Student, University of Pennsylvania.
HALABAN, DRUSILLA, Research Assistant, University of Pennsylvania.
HASTINGS, JOHN WOODLAND, Graduate Student, Princeton University.
HAY, ELIZABETH D., Medical Student, Johns Hopkins Medical School.
HILL, RUTH F., AEC Fellow in Biophysics, Columbia University.
HODGE, ALAN JOHN, Research Assistant, Massachusetts Institute of Technology.
JAMES, THOMAS W., University of Missouri.
KATZ, MICHAEL, Graduate Student, University of Pennsylvania.
KELLY, JOHN W., Graduate Student, University of Pennsylvania.
KRAUSE, LEONARDO A., Student Investigator, University of Connecticut.
MALAMED, SASHA, Assistant Instructor, University of Pennsylvania.
McCULLOCH, DAVID, AEC Fellow in Biology, Massachusetts Institute of Technology.
McINTYRE, PATRICIA A., Johns Hopkins Medical School.
MEYER, HERTHA, Head of Tissue Culture Lab., Institute of Biophysics of University of Brazil.
MICHELINI, FRANCIS J., Research Fellow, University of Delaware.
MITCHELL, CONSTANCE JANE, University of Delaware.
NEILL, WILLIAM A., Student, Amherst College.
PASSANO, LEONARD MACBRIDE, Laboratory Assistant, Yale University.
PROCTOR, NATHANIEL K., Student, University of Pennsylvania.
RUSK, MALCOLM L., Graduate Student in Zoology, Indiana University.
SAN PIERO, ANTHONY, Graduate Student, Columbia University.
SCLUFER, EVELYN, Graduate Student, Bryn Mawr College.
SLANE, GERTRUDE M., Graduate Student, St. Louis University.
STEWART, PETER A., Teaching Assistant, University of Minnesota.
STIEGLITZ, ALICE ANNE, Student, University of Pennsylvania.
SULLIVAN, ROBERT JAMES, Instructor, Fordham University.
TWEDELL, KENYON S., Teaching Assistant, University of Illinois.
WEBER, PATRICIA R., Graduate Fellow, St. Louis University.

Research Assistants, 1950

ALLEN, FRANK L., University of Chicago.
ALLAMAN, LOREN E., Northwestern University.
ANDERSON, NORMAN G., Duke University.
BRAGANCA, BEATRICE M., McGill University.
BRYAN, ELIZABETH R., Columbia University.
BRYAN, GEORGE C., Columbia University.
CHATTERJEE, J., Washington University Medical School.
CURRIER, JEANNE, Vassar College.
CURTIS, PAUL, Oberlin College.
DAVIDSON, MARGARET ELIZABETH M., McGill University.
DEKORNFIELD, THOMAS J., Georgetown Medical School.
FASS, JEROME S., Rockefeller Institute for Medical Research.
FINGERMAN, MILTON, Northwestern University.
FITCH, FRANK W., University of Chicago.
FLESHER, JAMES W., University of Chicago.
FOLEY, MARY T., Yale University.
GELEWITZ, EDMUND W., Northwestern University.
GLASS, RICHARD, Princeton University.
GROSS, SAMSON R., Columbia University.
GUYYELMAN, J. BRUCE, Northwestern University.
HALL, ROBERT STEARNS, Northwestern University.
HULFISH, BARBARA, University of Rochester.
JACOB, MIRIAM L., Rockefeller Institute.
JOSEPH, ROSALIE, Columbia University.
KAPLAN, ANN ESTHER, University of Pennsylvania.
LANDAU, JOSEPH VICTOR, New York University, Washington Square College.
LEBARON, GEORGE L., Jr., Union College.
LEONARD, LAWRENCE M., Haverford College.
LICHTENSTEIN, ROBERT, Harvard Medical School.
LITT, MORTIMER, University of Rochester Medical School.
MCINTYRE, JANE H., Bryn Mawr College.
MITCHELL, RUTH, Columbia University.
MOE, ROBERT, Fordham University.
NATHANSON, NEAL, Harvard Medical School.
ORSKI, BARBARA M., Harvard Medical School.
PADAWER, JACQUES, New York University.
PRESCOTT, DAVID M., Yale University.
ROSEN, SAUL W., Northwestern University.
SANDERN, MURIEL, Northwestern University.
SCHNEIDER, LILLIAN K., Columbia University.
STEINBERG, MAURICE, Polytechnic Institute of Brooklyn.
STAPP, ROBERT, Yale University.
SWAIN, ROBERT, Harvard Medical School.
TAMM, OLGA, American Geographical Society of New York.
TAVENBAUM, STUART, Columbia University.
TIEF, ARTHUR, Duke University.
WEBB, H. MARGUERITE, Northwestern University.
WILSON, IRWIN B., Columbia University.
WYCICK, EDNA, Peter Bent Brigham Hospital.

Library Readers, 1950

BARTLETT, JAMES H., Professor of Physics, University of Illinois.
BEVERLANDER, GERRIT, Professor of Histology, New York University.
BOGDANSKY, OSAR, Head, Clinical Biochemistry, Memorial Hospital.
BURIAN, RICHARD, Retired Professor of Physiology, 262 Kent Street, Brookline, Mass.
CANTONI, G. L., Associate Professor in Pharmacology, Western Reserve University.
CASE, JAMES F., Graduate Student, Johns Hopkins University.
CAVALLARI, LIEBE F., Research Associate, Sloan-Kettering Institute.
CLARK, ELIOT R., Professor of Anatomy Emeritus, University of Pennsylvania.
CSEPEL, MARTHA DE, Laboratory Technician, Rockefeller Institute for Medical Research.
DE LAMATER, EDWARD D., Associate Research Professor, University of Pennsylvania.
EICHEL, BERTRAM, Assistant Research Specialist, Rutgers University.
EICHEL, HERBERT J., Teaching Assistant in Physiology, Rutgers University.
FRIES, E. F. B., Assistant Professor, The City College of New York.
FRIEDLER, GLADYS, Graduate Student, University of Pennsylvania.
FROELICH, ALFRED, Associate, May Institute for Medical Research.
FRENCH, JULES, Public Health Research Institute of the City of New York.
GABRIEL, MORDECAI, Assistant Professor of Biology, Brooklyn College.
REPORT OF THE DIRECTOR

GOFF, RICHARD A., Assistant Professor of Zoology, University of Oklahoma.
Gould, Harley N., Professor of Biology, Newcomb College of Tulane University.
GUBERNATSCHE, FREDERICK, 41 Fifth Avenue, New York 3, New York.
Gurewich, Vladimir, Assistant Visiting Physician, Bellevue Hospital.
HREOUX, OLYVIER, Graduate Student, Laval University.
Hughes, Arthur, Research Fellow, Strangways Research Laboratory, Cambridge, England.
Kaan, Helen W., Research Associate, National Research Council.
Kabat, Elvin A., Associate Professor of Bacteriology, Columbia University.
Keosian, John, Professor of Biology, Rutgers University.
Krasnow, Frances, Head, Department of Research, The Guggenheim Dental Foundation.
Kunitz, Moses, Member, Rockefeller Institute for Medical Research.
Lansing, Albert I., Washington University, School of Medicine.
Levine, Celia, Graduate Student, Columbia University.
Ling, Gilbert, Instructor, Johns Hopkins Medical School.
Lorfi, Otto, Research Professor, New York University College of Medicine.
McCabe, Marcia, Mount Holyoke College.
McDonald, Sister Elizabeth Seton, College of Mount St. Joseph, Ohio.
Nadeau, L. V., Graduate Student in Philosophy, College of St. Thomas Aquinas.
Person, Philip, Research Associate, Rutgers University.
Quastel, J. H., Professor of Biochemistry, McGill University.
Reiner, John R., Senior Enzyme Chemist, Columbia University.
Rosenthal, Theodore B., Research Associate, Washington University.
Rowell, L. S., Associate Professor in Zoology, University of Vermont.
Roys, Chester, University of Iowa.
Schaller, William B., Hoffmann-LaRoche, Inc.
Sulkin, S. Edward, Southwestern Medical School, University of Texas.
Taussky, H. H., Research Fellow, Cornell Medical College.
Wainio, Walter W., Associate Research Specialist, Rutgers University.
Weinstein, Marvin J., Research Assistant, Squibb Institute for Medical Research.
Wood, Darwin L., AEC Fellow, Ohio State University.

Students, 1950

BOTANY

Barnes, Albert M., Bowdoin College.
Davis, Loretta, Student, Harvard-Radcliffe.
Federbush, Sylvia, The City College of New York.
Hansen, Jørgen B., University of Copenhagen.
James, Jacqueline, Student, Vassar College.
Johnson, Nancy G., Teaching Assistant, University of Wisconsin.
Keyes, Carolyn, Wheaton College.
Krauss, Robert W., Graduate Assistant, University of Maryland.
LaMesurier, Margaret G., Student, McGill University.
Milbrey, Roger A., Drew University.
Niederseem, Ethel, Graduate Student, Brooklyn College.
Powers, Ann W., Wellesley College.
Ross, Elizabeth G., Elmira College.
Silberger, Julius, Student, Harvard College.
Strout, Phyllis M., Student, Goucher College.

EMBRYOLOGY

Andersen, Irene L., Graduate Student, Brown University.
Babbott, Elizabeth, Student, Connecticut College.
Bernstein, Paul W., Instructor of Biology, Wesleyan University.
Carpe, Lestra M., Sarah Lawrence College.
Dunnebaker, Thelma H., Instructor, Smith College.
Freightner, Lawrence E., University of Illinois.
FOWLER, IRA, Student, Louisiana State University.
GAMERO-REYES, ALONSO, Instructor of Zoology, Instituto Pedagogico, Venezuela.
GRAVETT, HOWARD L., Associate Professor, Texas A. and M.
GREENGARD, PAUL, Student, Johns Hopkins University.
JACOBSON, EUGENE D., Undergraduate, Wesleyan University.
KONIGSBERG, IRWIN R., Junior Instructor, Johns Hopkins University.
LANSCHER, JAMES M., Student, Washington University.
LEAVITT, EARLE E., Instructor, Norwich University.
LINDBERG, ROBERT G., Teaching Assistant, University of California, Los Angeles.
MABEL, JUDITH, Goucher College.
MAGNER, ARDYS, Duke University.
MCCULLOUGH, KIRK W., Instructor, Washington and Jefferson College.
MCKIBBEN, JULIET, Assistant Professor of Biology, Carnegie Institute of Technology.
NEFF, RUTH H., Instructor, University of Missouri.
PEPPER, MAX F., Amherst College.
RENZI, ALFRED A., Research Assistant, Syracuse University.
SEXTON, OWEN J., Oberlin College.
SMALL, JEAN ELIZABETH, Student, University of Massachusetts.
SMITHBERG, MORRIS, Graduate Student, University of Rochester.
SPIROFF, BORIS E. N., Graduate Teaching Assistant, Northwestern University.
VAN BREEMEN, VERNE L., Research Assistant, State University of Iowa.
VOLZ, PHILIP H., Graduate Student, Loyola University.

PHYSIOLOGY

BAIRD, JOAN AUDREY, Graduate Assistant, Syracuse University.
BURLINGTON, HAROLD, Graduate Assistant, Syracuse University.
CHIN, MARY B., Teaching Fellow, University of Michigan.
EHRMANN, ROBERT L., Johns Hopkins University Medical School.
FRIEDMAN, STANLEY, Graduate Student, Johns Hopkins University.
GLADNER, JULIUS, Research Assistant, Duke University School of Medicine.
HEBBERT, EDWARD, Student, University of Pennsylvania.
KARPLUS, MARTIN, Student, Harvard College.
KELLER, JOHN G. J., Graduate Fellow, St. Louis University.
KOMINZ, DAVID R., Post-doctoral Fellow, Harvard University.
LILLEN, OTTO M., Jefferson Medical College.
MARSHALL, GERALD W., University of California, Los Angeles.
MEDILL, MARY A., University of Pennsylvania.
MCMASTER, RACHEL D., Graduate Student, Columbia University.
MILLER, DANIEL G., Rockefeller Institute.
MILLER, TILFORD D., Amherst College.
NEFF, ROBERT J., Research Associate, University of Missouri.
NEUKOM, BETTY JANE, Chemical Technician, University of Colorado Medical Center.
PRAGLIN, JULIUS, Assistant, University of Illinois.
REICHERT, ERIBA R., Johns Hopkins Medical School.
ROBINSON, CHARLES V., Research Associate, Harvard Medical School.
SCHNEIDER, ROSE MARY, Graduate Student, New York University.
SHAW, EVELYN S., Instructor, American Museum of Natural History.
STALLWORTHY, WILSON B., Instructor in Zoology, University of Maine.
STROMINGER, JACK L., Washington Medical School.
TOWNE, PHILIP L., Graduate Student, University of Rochester.
DEVILLA FRANCA, GEORGE W., Student, Yale University.

INVERTEBRATE ZOOLOGY

ANDERSON, EVERETT, Graduate Student, Fisk University.
ANDERSON, JANET L., Teaching Assistant, University of Michigan.
BELMONTE, REV. ROCH G., Instructor in Biology, Fordham University.
BENNE, BERNARD, Assistant Instructor, University of Illinois.
BERNHARDT, EVA G., Associate Professor of Biology, Huntington College.
REPORT OF THE DIRECTOR

BIRKNER, MARION L., University of Illinois.
BOWMAN, MARJORIE C., Graduate Student, University of Toronto.
CAMPBELL, MILDRED A., Smith College.
CONOVER, ROBERT J., Oberlin College.
CORY, B. LAWRENCE, Graduate Student, Notre Dame University.
COTTER, WILLIAM B., JR., Graduate Student, Wesleyan University.
DOSSEL, WILLIAM E., Graduate Assistant, Marquette University.
EDE, DONALD A., Assistant, Northwestern University.
ERK, FRANK C., Johns Hopkins University.
ETGES, FRANK J., Graduate Assistant, New York University.
FORSTHOEFEL, REV. PAULINUS F., Graduate Student, Ohio State University.
GUSTAFSON, JOHN A., Assistant, Cornell University.
HADDOW, SUZANNE, Student, Skidmore College.
HODGE, MARY H., Wilson College.
HUGHINS, ERNEST J., Teaching Assistant, University of Illinois.
HUNTER, ROBERT L., University of Michigan.
HYLAND, KERWIN E., JR., Graduate Student, Duke University.
IMBIE, JOHN, Graduate Student, Yale University.
JENERICK, HOWARD P., Public Health Service Fellow, University of Chicago.
JOHNSON, HARRY M., Student, Cornell University.
KAYE, ALVIN M., Senior at Columbia College, Columbia University.
KELEY, JOAN M., Vassar College.
KRAUSE, LEONARD A., Student, University of Connecticut.
LATHROP, MURIEL H., Instructor, Smith College.
LEVIN, NORMAN L., Student, University of Illinois.
LIEB, REV. JOEL R., Graduate Student, St. Louis University.
LIPPITT, RUTH H., Student, Wellesley College.
LYON, JOHN B., JR., Hamilton College.
MACMILLAN, SHIRLEY A., Student, Oberlin College.
MANN, DAVID E., JR., Purdue University.
MAYNARD, DONALD M., Student, Harvard University.
MCCASHLAND, BENJAMIN W., Instructor of Physiology, University of Nebraska.
MCDERMOTT, WILLIAM M., Tufts College.
NEWMAN, ELLEN, Radcliffe College.
ROLLE, GLORIA K., Laboratory Technician, New York University.
SAUNDERS, RICHARD L., University of Massachusetts.
SCHELTEMA, RUDOLF S., George Washington University.
SEALE, JOANNE K., Pennsylvania College for Women.
SHAW, EDWARD I., Graduate Assistant in Zoology, University of Missouri.
STAHL, WALTER, Massachusetts Institute of Technology.
TAMAR, HENRY, Graduate Student, New York University.
TASSONI, JOSEPH P., Assistant in Biology, New York University.
TIMM, REV. RICHARD W., Graduate Student, Catholic University.
TREFZ, SHIRLEY, Temple University.
URSO, PAUL, JR., Student, St. Francis College.
VAN AKEN, MARY C., Graduate Student, Yale University.
VERBENG, FRANK J., Graduate Student, Purdue University.
VERBENG, WINONA M., Graduate Student, Purdue University.
WALSH, WINIFRED, Student, Hunter College.
WEINERT, SANFORD D., Graduate Student, Harvard University.

4. THE LALOR FELLOWS, 1950

SEYMOUR S. COHEN, University of Pennsylvania.
WILLIAM P. JACOB, Princeton University.
SALLY M. KELLY, Vassar College.
ALAN H. MEHLER, University of Chicago.
STUART SMITH, University of Colorado Medical School.
5. **Tabular View of Attendance, 1946–1950**

<table>
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<th>1946</th>
<th>1947</th>
<th>1948</th>
<th>1949</th>
<th>1950</th>
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<td><strong>Investigators—Total</strong></td>
<td>267</td>
<td>299</td>
<td>326</td>
<td>344</td>
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<tr>
<td>Independent</td>
<td>175</td>
<td>182</td>
<td>183</td>
<td>193</td>
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<tr>
<td>Under instruction</td>
<td>29</td>
<td>36</td>
<td>42</td>
<td>52</td>
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<td>Library Readers</td>
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<td>36</td>
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<tr>
<td>Research Assistants</td>
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<td><strong>Students—Total</strong></td>
<td>122</td>
<td>131</td>
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<td>Zoology</td>
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<td>Physiology</td>
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<tr>
<td>Botany</td>
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<td><strong>Total Attendance</strong></td>
<td>389</td>
<td>430</td>
<td>449</td>
<td>472</td>
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<td>Less persons registered as both students and investigators</td>
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<td>6</td>
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<tr>
<td><strong>Institutions Represented—Total</strong></td>
<td>141</td>
<td>148</td>
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<tr>
<td>By Investigators</td>
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<tr>
<td>By Students</td>
<td>56</td>
<td>56</td>
<td>68</td>
<td>68</td>
<td>67</td>
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<tr>
<td><strong>Schools and Academies Represented</strong></td>
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<tr>
<td>By Students</td>
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<td><strong>Foreign Institutions Represented</strong></td>
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<tr>
<td>By Students</td>
<td>5</td>
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6. **Subscribing and Cooperating Institutions, 1950**

**Subscribing Institutions**

- Children's Hospital of Philadelphia
- Elmira College
- Georgetown University Medical School
- Hahnemann Medical School
- Haskins Laboratories
- Indiana University
- Marquette University
- Morgan State College
- National Research Council
- Pennsylvania College for Women
- Public Health Research Institute of New York City
- Radcliffe College
- Rutgers University
- St. Francis College
- Southwestern Medical College
- Tulane University School of Medicine
- University of Miami
- University of New Hampshire
- University of Rochester
- University of Wisconsin
- Vanderbilt University School of Medicine
- Wellesley College
- Wheaton College
- Wilson College

**Cooperating Institutions**

- Amherst College
- Argonne National Laboratory
- Brooklyn College
- Brown University
- Bryn Mawr College
- College of Mt. St. Joseph-on-the-Ohio
- College of Physicians and Surgeons
- Columbia University
- Cornell University
- Duke University
- Emory University
- Fordham University
- Goucher College
- Harvard University
- Harvard University Medical School
- Hunter College
- Institute for Muscle Research
- Johns Hopkins University
- Johns Hopkins University Medical School
- Eli Lilly and Company
REPORT OF THE DIRECTOR

Madison Foundation
Massachusetts Institute of Technology
Mount Sinai Hospital
National Cancer Institute
New York University College of Medicine
New York University, Heights
New York University, Washington Square College
North Carolina State College
Northwestern University
Oberlin College
Princeton University
Rockefeller Institute for Medical Research
St. Louis University
Sloan-Kettering Institute
State University of Iowa
Temple University
Tufts College Medical School
Union College
University of Chicago
University of Delaware
University of Illinois
University of Kansas
University of Massachusetts
University of Maryland School of Medicine
University of Michigan
University of Minnesota
University of Missouri
University of Oklahoma
University of Pennsylvania Medical School
University of Pennsylvania
University of Vermont Medical School
University of Virginia
Vassar College
Washington University
Wesleyan University
Western Reserve University
Yale University

7. EVENING LECTURES

The Friday Evening Lectures, 1950

**Friday, June 30**
Dr. A. E. Szent-Györgyi .......... "Life and Muscle."

**Friday, July 7**
Dr. Arthur W. Pollister .......... "Studies in Cytology."

**Friday, July 14**
Dr. Carroll M. Williams .......... "A Hormonal-Enzymatic Mechanism for the Control of Growth and Differentiation in the Cecropia Silkworm."

**Friday, July 21**
Dr. James Danielli ............... "The Phosphatase of Cell Nuclei."

**Friday, July 28**
Dr. H. H. Plough ................ "Radiation Induced Mutations in Salmonella typhimurium and Their Genetic Implications."

**Friday, August 4**
Dr. John Runnström ............... "Some Aspects of the Developmental Physiology of the Sea Urchin."

**Friday, August 11**
Dr. Chester L. Yntema ........... "Induction and Differentiation of the Ear."

**Friday, August 18**
Dr. Robert F. Pitts ............... "Renal Control of Acid Base Balance."

**Friday, August 25**
Dr. Clarence Cottam ............... "Wildlife Management in Relation to America's River Development Program."

**Other Lectures**

**Wednesday, August 23**
Dr. D. O. Jordan ............... "Recent Studies on Desoxyribosenucleic Acid."

Dr. A. G. Ogston ............... "Experiments on Hyaluronic Acid."
8. Seminars, 1950

July 5

Anita Zorzoli ........................................... "Alkaline Phosphatase Activity in Normal and Scorbatic Bones."

S. J. Cooperstein ........................................ "The Reduction of Janus Green by Isolated Enzyme Systems."

Arnold Lazarow .......................................... "The Reduction of Janus Green by Liver Cell Constituents and the Mechanism of Janus Green Staining of Mitochondria."

July 11

Claude A. Villee ......................................... "The Enzymatic Conversion of Ovalbumin to Plakalbumin."

Milton Levy ............................................... "Denaturation of Ricin as Affected by pH and Temperature."


July 18

Charles B. Metz ......................................... "Amino Acids and Peptides as Adjuvants in Agglutination of Starfish Sperm by Fertilizin."

Albert Tyler ............................................. "Extension of Functional Life Span of Spermatozoa by Amino Acids and Peptides."

J. Runnström .............................................. "The Effect of Ca and Jelly Coat Substance on the Agglutination and Respiration of Sea Urchin Spermatozoa."

July 25

J. W. Green and A. K. Parpart ......................... "The Effect of Metabolic Poisons on Potassium Loss from Rabbit Red Cells."

B. Lucké, R. Ricca and A. K. Parpart .................. "The Effect of X-rays on Permeability to Water and to Glycols of Arbacia Eggs."

M. H. Jacobs and H. N. Glassman ....................... "Permeability of the Erythrocyte at Different Temperatures."

August 1

John Tyler Bonner ...................................... "Orientation to Heat and Light during Morphogenesis in the Amoeboid Slime Molds."

Donald R. Griffin ....................................... "Polarized Light and the Orientation of Bees."

Aurin M. Chase .......................................... "On the Nature of Luciferin."

Alan H. Mehler ......................................... "Reactions Catalyzed by Isolated Chloroplasts."

August 3

C. C. Speidel ............................................ "Cell Adjustments in Frog Tadpoles Following Implant of Foreign Substances."

Emmanuel Fauré-Fremiet ................................. "Feeding Reactions of Some Predator Ciliates."

REPORT OF THE DIRECTOR

August 8

Abraham M. Shanes and
Thomas DeKornfeld

Some Spectrophotometric Observations on Invertebrate Nerve and Its Extracts.

Wolf Vishniac

Ionic Balance Required by Some Marine Microorganisms and the Effect of Quaternary Ammonium Ions.

Ivor Cornman

Selective Destruction of Fibroblasts by Desoxycorticosterone in Cultures of Mixed Tissues.

William P. Jacobs

Polarity of Hormone-Movement as the Indirect Limiting Factor for Seedling Growth.

August 15

Norman Millott

The Reactions to Shade and the Pigmentation of the Sea Urchin Diadema antillarum.

Harold F. Blum and
Margie R. Mathews

Photorecovery after Ultraviolet Radiation, in Amphibian Larvae.

Alfred F. Bliss

Action of Alcohol Dehydrogenase on Vitamin A.

August 22

Lillian K. Schneider

Population Dynamics in Escherichia coli.

Samson R. Gross

Heterocaryosis Between Opposite Mating Types in Neurospora crassa.

K. C. Atwood

The Homology Pattern of Induced Lethal Mutations in Neurospora crassa.

Alfred Marshak

Comparison of the Base Composition of Nucleic Acids of Nuclei and Cytoplasm of Different Mammalian Tissues.

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ROSSI, Dr. HAROLD H., Department of Radiology, Columbia University, New York 32, New York.
ROTHENBERG, Dr. M. A., Institute of Radiobiology and Biophysics, University of Chicago, Chicago, Illinois.
RUEBUSH, Dr. T. K., 9712 Elrod Road, Kensington, Maryland.
RUGH, Dr. ROBERTS, Radiological Research Laboratory, College of Physicians and Surgeons, New York, N. Y.
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SCHCHECHTER, Dr. VICTOR, College of the City of New York, New York City, New York.
SCHMITT, Dr. L. H., Christ Hospital, Cincinnati, Ohio.
SCHMITT, Prof. F. O., Department of Biology, Massachusetts Institute of Technology, Cambridge, Massachusetts.
SCHMITT, Dr. O. H., Department of Physics, University of Minnesota, Minneapolis 14, Minnesota.
SCHOLANDER, Dr. P. F., Harvard Medical School, Department of Biochemistry, Boston, Massachusetts.
SCHOTTÉ, Dr. OSCAR E., Department of Biology, Amherst College, Amherst, Massachusetts.
SCHRADER, Dr. FRANZ, Department of Zoology, Columbia University, New York City, New York.
SCHRADER, Dr. SALLY HUGHES, Department of Zoology, Columbia University, New York City, New York.
SCOTT, Dr. ALLAN C., Union College, Schenectady, New York.
SCOTT, SISTER FLORENCE MARIE, Professor of Biology, Seton Hill College, Greensburg, Pennsylvania.
SCOTT, Dr. GEORGE T., Oberlin College, Oberlin, Ohio.
SEMPLE, Dr. R. BOWLING, 140 Columbia Heights, Brooklyn, New York.
SEVERINGHAUS, DR. AURA E., Department of Anatomy, College of Physicians and Surgeons, New York City, New York.
SHANES, DR. ABRAHAM M., Experimental Biology and Medicine Institute, National Institutes of Health, Bethesda 14, Maryland.
SHAPIRO, DR. HERBERT, 4539 Warwick Street, Philadelphia 40, Pennsylvania.
SHULL, PROF. A. FRANKLIN, University of Michigan, Ann Arbor, Michigan.
SHUMWAY, DR. WALDO, Stevens Institute of Technology, Hoboken, New Jersey.
SICHEL, DR. FERDINAND J. M., University of Vermont, Burlington, Vermont.
SICHEL, MRS. F. J. M., 35 Henderson Terrace, Burlington, Vermont.
SINNOTT, DR. E. W., Osborn Botanical Laboratory, Yale University, New Haven, Connecticut.
SLIFER, DR. ELEANOR H., Department of Zoology, State University of Iowa, Iowa City, Iowa.
SMITH, DR. DIETRICH CONRAD, Department of Physiology, University of Maryland School of Medicine, Baltimore, Maryland.
SONNEBORN, DR. T. M., Department of Zoology, Indiana University, Bloomington, Indiana.
SPIEDEL, DR. CARL C., University of Virginia, University, Virginia.
SPRATT, DR. NELSON T., Department of Zoology, University of Minnesota, Minneapolis 14, Minnesota.
STEINBACH, DR. HENRY BURR, University of Minnesota, Minneapolis, Minnesota.
STERN, DR. KURT G., Polytechnic Institute, Department of Chemistry, Brooklyn New York.
STEWART, DR. DOBORHY, Rockford College, Rockford, Illinois.
STOKEY, DR. ALMA G., Department of Botany, Mount Holyoke College, South Hadley, Massachusetts.
STRAUS, DR. W. L., Johns Hopkins Medical School, Baltimore, Maryland.
STUNKARD, DR. HORACE W., New York University, University Heights, New York City, New York.
STURTEVANT, DR. ALFRED H., California Institute of Technology Pasadena, California.
SZENT-GYÖRGYI, DR. A. E., Marine Biological Laboratory, Woods Hole, Massachusetts.
TASHIRO, DR. SHIRO, Medical College, University of Cincinnati, Cincinnati, Ohio.
TAYLOR, DR. WILLIAM R., University of Michigan, Ann Arbor, Michigan.
TEWINKEL, DR. L. E., Department of Zoology, Smith College, Northampton, Massachusetts.
TRACY, DR. HENRY C., University of Kansas, Lawrence, Kansas.
TREGER, DR. WILLIAM, Rockefeller Institute, Princeton, New Jersey.
TRINKAUS, DR. J. PHILIP, Department of Zoology, Osborn Zoological Laboratory, New Haven, Connecticut.
TURNER, DR. ABBY H., Mt. Holyoke College, South Hadley, Massachusetts.
TURNER, PROF. C. L., Northwestern University, Evanston, Illinois.
TYLER, DR. ALBERT, California Institute of Technology, Pasadena, California.
UHLENHUTH, DR. EDUARD, University of Maryland, School of Medicine, Baltimore, Maryland.
VILLEE, DR. CLAUDE A., JR., Harvard Medical School, Boston, Massachusetts.
Visscher, Dr. J. Paul, University of Minnesota, School of Medicine, Minneapolis, Minnesota.
Wainio, Dr. W. W., Bureau Biological Research, Rutgers University, New Brunswick, New Jersey.
Wald, Dr. George, Biological Laboratories, Harvard University, Cambridge, Massachusetts.
Warbasse, Dr. James P., Woods Hole, Massachusetts.
Warner, Dr. Robert C., Department of Chemistry, New York University College of Medicine, New York 16, New York.
Warren, Dr. Herbert S., 1405 Greywall Lane, Overbrook Hills, Philadelphia 31, Pennsylvania.
Waterman, Dr. T. H., Osborn Zoological Laboratory, Yale University, New Haven, Connecticut.
Weiss, Dr. Paul A., Department of Zoology, University of Chicago, Chicago, Illinois.
Whedon, Dr. A. D., North Dakota Agricultural College, Fargo, North Dakota.
Whitaker, Dr. Douglas M., Stanford University, California.
White, Dr. E. Grace, Wilson College, Chambersburg, Pennsylvania.
Whiting, Dr. Anna R., University of Pennsylvania, Philadelphia, Pennsylvania.
Whiting, Dr. Phineas W., Zoological Laboratory, University of Pennsylvania, Philadelphia, Pennsylvania.
Wichterman, Dr. Ralph, Biology Department, Temple University, Philadelphia, Pennsylvania.
Wieman, Prof. H. L., University of Cincinnati, Cincinnati, Ohio.
Wilber, Dr. C. G., St. Louis University, Department of Biology, St. Louis 4, Missouri.
Willier, Dr. B. H., Department of Biology, Johns Hopkins University, Baltimore 18, Maryland.
Wilson, Dr. J. W., Brown University, Providence, Rhode Island.
Wilson, Dr. Walter L., Department of Physiology, University of Vermont, College of Medicine, Burlington, Vermont.
Witschi, Prof. Emil, Department of Zoology, State University of Iowa, Iowa City, Iowa.
Wolf, Dr. Earnst, Pendleton Hall, Wellesley College, Wellesley, Massachusetts.
Wood, Dr. Richard D., Department of Botany, Rhode Island State College, Kingston, Rhode Island.
Woodward, Dr. Alvalyn E., Zoology Department, University of Michigan, Ann Arbor, Michigan.
Woodward, Dr. Arthur A., Department of Zoology, Washington University, St. Louis 5, Missouri.
Wrinch, Dr. Dorothy, Smith College, Northampton, Massachusetts.
Yntema, Dr. C. L., Department of Anatomy, State College of New York Medical Center, Syracuse, New York.
Young, Dr. B. P., Cornell University, Ithaca, New York.
Young, Dr. D. B., 7128 Hampden Lane, Bethesda, Maryland.
REPORT OF THE DIRECTOR

YUDKIN, Dr. Warren H., Department of Chemistry, Northwestern University, Evanston, Illinois.
ZINN, Dr. Donald J., Box 66, State College, Kingston, Rhode Island.
ZORZOLI, Dr. Anita, Department of Physiology, Washington University School of Dentistry, St. Louis 10, Missouri.
ZWILLING, Dr. E., Department of Genetics, University of Connecticut, Storrs, Connecticut.

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