The Marine Biological Laboratory

Ninety-Third Report for the Year 1990
One-Hundred and Third Year

Officers of the Corporation

Denis M. Robinson, Honorary Chairman of the Board of Trustees
Prosser Gifford, Chairman of the Board of Trustees
Harlyn O. Halvorson, President of the Corporation and Director
Robert D. Manz, Treasurer
Kathleen Dunlap, Clerk of the Corporation
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I began last year’s report by discussing the Laboratory’s needs and reminding the Corporation of the pressing need for a new Marine Resources Center capable of providing a reliable, healthy, and genetically defined supply of marine organisms. I closed that discussion of the long-awaited, many-times-planned MRC with the hope that this important facility would become a reality “before too many more director’s reports are filed.”

I begin this director’s report, my fourth, the Laboratory’s ninety-third (covering its one-hundred third year) with the very good news that the new MRC will indeed be a reality—very soon. As I write this report (in the spring of 1991), the building is going up outside my window. Where we used to have a carpenters’ shop and a parking lot, we now have pilings on top of which the walls of a state-of-the-art facility for holding marine animals are rising. The key step toward the MRC in 1990 was the passage, in October, of a Federal appropriation bill that included $4.75 million toward the MRC. Coupled with earlier Federal support, this brought funding for the MRC and related projects to a total of $8.95 million.

Part of the planning for the new MRC involved making alternate plans for parking and a re-location of the carpenters’ shop. The plan at the close of 1990 is to build a new carpenters’ shop on the MBL campus next to the Broderick House and to put a new, off-site parking lot in the MBL Woods off Oyster Pond Road near Memorial Circle. In the next director’s report, I fully expect to be able to report that these auxiliary projects are completed and that the new MRC is up and very close to going on-line.

While preparations for construction of the MRC occupied much of our attention in 1990, we simultaneously continued to plan for an Advanced Studies Laboratory (ASL), which together with the MRC will constitute the Marine Biomedical Institute for Advanced Studies. At the close of 1990, the new ASL was in the second of three design phases.

The construction of the new Marine Resources Center and the progress toward a new Advanced Studies Laboratory are important steps toward ensuring a bright future for the Laboratory, but other long-standing and well-documented needs remain. To address these additional needs, the Trustees at their June 22 meeting initiated a long-range development program. The Executive Committee approved the use of a development consultant to help us review our readiness for mounting a major fund raising campaign. The consultant, Browning Associates, presented a cogent analysis of the Laboratory, which will help us greatly expand our development operation in 1991 and beyond.

Research

At the urging of the External Scientific Advisory Committee, we established in 1990 a Scientific Council to function in an advisory capacity to the Executive Committee. The Council is charged with guiding the Laboratory in:

- the development of scientific and educational programs
- the use of scientific resources
- the evaluation and promotion of scientific staff
- the recruitment of new scientific positions
- the initiation of institutional grant proposals.

The council is to work in conjunction with existing committees, such as the Research Space Committee and the Instruction Committee.

Council members are appointed by the director, with the approval of the Executive Committee. The council is to include up to three members of the year-round
scientific community, up to three members of the summer community, two non-MBL scientists, the MBL director who serves *ex officio*, and an *ex officio* executive secretary. The first council is composed of: year-round MBL scientists Drs. John Hobbie (vice-chairman), Mitchell Sogin, and Felix Strumwasser; summer MBL scientists Drs. Barbara Ehrlich, Gerald Fischbach, and Joseph Sanger; Dr. Holger Jannasch, Woods Hole Oceanographic Institution, and Dr. Howard Hiatt, Brigham and Women’s Hospital. Dr. Leslie Garrick serves as *ex officio* executive secretary, and, as director of the MBL, I serve as *ex officio* chairman of the council.

The council met throughout 1990 to evaluate scientists for appointment and promotion and to set directions for future scientific development and expansion. They completed a draft of one position paper on Laboratory directions in cellular and developmental biology. The council plans to prepare additional position papers on environmental sciences/ecology, microbiology, molecular evolution, neurobiology, and plant sciences. These documents are targeted for completion in 1991 and 1992.

**Instruction**

The instruction program continued in 1990 with its unanimously acclaimed courses. One new short course was added: Pathogenesis of Neuroimmunologic Diseases, co-directed by J. Murdoch Ritchie, Yale University, and Byron H. Waksman, Harvard University and New York University.

At the urging of the External Scientific Advisory Committee, we have been taking a careful look at the cost of the courses. The Instruction Committee looked at cost containment in 1990, and, while there is as yet no consensus on how to proceed, it is clear that we will have to do something about spiraling cost increases in this age of decreasing federal support for advanced training.

New fellowships in 1990 included the Nikon Fellowship; a Bernard Davis Fellowship for studies in microbiology or molecular evolution; the Daniel S. Grosch Scholarship Fund for studies in environmental toxicology; and the Porter Fellowships for Minority Students/Investigators for work in physiology. A list of fellowship recipients appears later in this issue.

**Library**

The Library made continued progress toward applying computing technology to library services. As described in the Report of the Librarian, Jane Fessenden, the MBL Librarian of 29 years, retired in 1990. In December, Dr. David Stonehill accepted the position of Director of the MBL/WHOI Library and Scientific Information Research Center. Dr. Stonehill has been a national leader in the development of modern information services, having worked for
NASA, a number of leading universities, and—most recently—the President of the United States.

**Governance**

In August, Dr. Prosser Gifford announced his intention to step down from the chairmanship of the MBL Board of Trustees. Dr. Gifford led the MBL for 14 years, through a period of unprecedented change and growth. In a little short of a decade and a half, he worked with 4 of the 11 directors the Laboratory has had in its 103 year existence. Under his leadership, the Laboratory’s facilities were significantly upgraded, the year-round science program grew substantially, the educational program maintained its character, the library prospered and began an exciting modernization program, and the administrative and development staffs were strengthened.

Neurobiologist Dr. Jelle Atema assumed the directorship of the Boston University Marine Program in August. He replaces Dr. Rudi Strickler, who had directed BUMP since 1987. Dr. Atema has energetic plans for BUMP’s graduate and undergraduate programs, and his long acquaintance with the MBL bodes well for our partnership with Boston University.

In their February meeting, the Trustees approved a new Long Range Financial Planning Committee charged with reporting to the Trustees and/or the Executive Committee on the existence and appropriateness of long-range financial planning mechanisms of the laboratory. Responsibility for planning remains with the administration of the laboratory, while the new committee is to assure that the financial risks of growth have been properly anticipated and planned for. The committee is to include two at-large trustees, two corporate trustees, and the treasurer, ex officio. Treasurer Robert Manz chaired the new committee, which began by making a comprehensive review of the new MRC. In August, the Long Range Financial Planning Committee gave the Trustees a favorable report on the financial planning for the MRC. That favorable report was an important part of the briefing that led to the Trustees’ decision to proceed toward construction of the new MRC.

**Personnel**

A group of MBL employees, including service, maintenance, and clerical workers, voted in February to affiliate with the Hospital Workers Union, Local 767. Collective bargaining negotiations began almost immediately after the election, and with the union and management both negotiating in a spirit of cooperation and mutual respect, we were able to negotiate our first contract in an impressively short time. A fair, reasonable, and workable contract was signed in July, and the work of the Laboratory proceeded without disruption.

Long-time manager of marine resources John Valois retired in November after 40 years at the MBL. In addition to running the collecting operation, Mr. Valois has served for years as a spokesman for marine biology and has appeared regularly in newspapers and on television extolling the virtues of marine animals as models for research. On his departure, Edward Enos was promoted to Superintendent of Marine Resources. Mr. Enos has been a collector for many years and was eminently well-prepared to take the reins of the department.
The Biological Bulletin

Under the editorship of Michael J. Greenberg, The Biological Bulletin continued to publish well-presented reports of outstanding research that is of general interest to biologists throughout the world. In 1990, Dr. Greenberg announced that all page charges would be dropped, and that authors would be offered 100 free reprints for publishing in the journal. Most importantly, he noted in his 1990 report to the corporation, a carefully prepared manuscript can now appear in print as soon as 3.6 months after its submission. In fact, some manuscripts meeting the criteria of the new Research Notes section—which features brief communications of high quality and currency—may appear in print even sooner. All of these initiatives have been highlighted in the journal’s newsletter, The Biological Bulletin. The newsletter, which is published “occasionally” by the editorial staff, was created to highlight and promote the articles appearing in, and the policies of, the journal.

Dr. Greenberg has also been attempting to adjust the mix of papers appearing in the Bulletin so that the journal more closely reflects research here at the MBL. To assist in this effort, Dr. Greenberg has recruited three Associate Editors to aid in the review and solicitation of manuscripts. Drs. J. Malcolm Shick (University of Maine, Orono), Peter A. V. Anderson (The Whitney Laboratory), and David Epel (Hopkins Marine Station) will serve four-year terms as Associate Editors in their respective fields of physiology and metabolism, neurobiology, and developmental biology.

Science Writing Fellowships

In its fifth year, the MBL Science Writing Fellowships Program evolved a one-week, hands-on course in cellular and molecular biology for science writers. Co-directed by Dr. Robert Goldman, Northwestern University Medical School, and Boyce Rensberger, The Washington Post, the course began with an introduction to cells and a microscopy demonstration, and ended five days later with the writers cloning and sequencing DNA. The course, which will be expanded to include a neurobiology component in 1991, is open to all science writers and serves as an orientation for the MBL Science Writing Fellows.

Directorship of the Science Writing Program has passed from founding director James Shreve to Dr. Byron Waksman. Mr. Shreve will continue to serve on the program’s advisory board.

Public programs

We continued to offer a few modest programs for our non-scientist neighbors on the Upper Cape. In July we held a public symposium on Science and Public Policy. The keynote address was delivered by Massachusetts Senator John Kerry, who urged the science community to become more involved in the very political process of forging a coherent national science policy. The symposium was followed by the second annual MBL Chamber Music Concert, featuring the Tokyo String Quartet.

The first annual Falmouth Forum concluded in early 1990 with presentations by Dr. Allen Counter on Black Arctic explorer Matthew Henson, Anne Hawley on the government as patron of the arts, a musical portrait of Harry Truman by David McCullough, and a panel discussion on energy and the environment. The series was well enough received by local audiences that the MBL Associates brought it back for the winter of 1990–91. Marshall Goldman began the second Falmouth Forum series in November with a presentation on Perestroika, and in December actress Julie Harris read from Lucifer’s Child, her new one-woman play.

—Harlyn O. Halvorson
The year 1990 was one of building for the Laboratory. Total support and revenues increased from $16.2 to $17.1 million due primarily to the initiation of construction of the Marine Resources Center, supported by a grant from the federal government; $1.4 million was received and expended on this project in 1990. Gifts received decreased approximately $1.6 million; 1989 was the last year of the receipt of significant funds from the Howard Hughes Foundation multi-year grant for the Library and the Education programs. Dining hall revenues rose $170,000 due to increases in food service functions, attendees, and meal card prices. Investment income grew $200,000 from 1989 to 1990 due to increases of long- and short-term investments and the length of time that they were available to the Laboratory during the respective years. Recovery of indirect costs related to research and instruction grew by approximately $150,000, all of which was attributable to the growth of MBL sponsored research. Other operating revenues were essentially unchanged from 1989.

Total expenses grew approximately $700,000, from $15 million in 1989 to $15.7 million in 1990. The most significant increases were in Research Services and Plant Operations; the former is due primarily to the expansion of the operations of the Mass Spectrometry Laboratory, the Instrument Development Laboratory, and the Protein and Nucleic Acid Chemistry Center operated jointly with the Woods Hole Oceanographic Institution; the latter is due primarily to increased utility, insurance, and labor costs, as well as significant expenses involving the removal of asbestos and other repairs and renovations of our housing. It is also worth noting that the Laboratory was able to offer approximately $100,000 more scholarships, fellowships, and stipends in 1990 than in 1989, a 35% increase. While our aim is to provide much more, the trend is very heartening, as we have almost doubled the amount of scholarships, fellowships, and stipends from 1988.

The Current Unrestricted Fund ended the year with an excess of support and revenues over expenses of $93,407. This combines the results of the Housing and Dining Auxiliary with all other Operations. The Housing and Dining Auxiliary had an excess of support and revenues over expenses of $267,761, of which $65,000 was used for scheduled repayment of debt owed on the Memorial Circle cottages and $199,863 was transferred to the Repairs and Replacements Reserve for housing. More sobering and troublesome, however, is that the operations of the Laboratory without the Housing and Dining operation experienced a deficiency of revenues to expenses of $174,354. The single greatest reason for this was our inability to meet budgeted goals for unrestricted current gifts.

The balance sheet shows that we ended 1990 with a significant degree of liquidity as cash and short-term investments accounted for approximately two-thirds of current assets. Investments at market grew by approximately $400,000. Essentially all of that was attributable to gifts for endowment, as the net impact of the market on the valuation of our investments was a decline of less than $100,000.

Land, buildings and equipment, net of accumulated depreciation, grew by almost $1 million due primarily to the beginning of construction of the Marine Resources Center. When completed, the cost of this project is expected to total $9 million.

The operating budget for 1991 reflects a determination to maintain the current level of services at the Laboratory in the most cost-effective manner possible, while we redouble our efforts to generate more funds to support operations.

Our greatest single challenge is still the need to find a cost-effective way to provide services that are primarily
used during the summer months. The strategy of the Laboratory for the last 20 years has been to increase the size of the year-round program to provide a more stable financial base for the Laboratory. The Ecosystems Center has been the most notable success to date, and we trust that this will be a model for other MBL sponsored programs. The principal financial benefit of this strategy is the potential to achieve efficiencies in the cost of administration and services by spreading them across a broader base. We recognize that these will only be achieved by focusing on ways to be as efficient as possible.

The principal financial cost of this strategy is the capital cost of the laboratory building and equipment to house the scientists and their science, as well as the reserve or endowment funds necessary to attract scientists. Through the federal funding to date of the MBIAS project, we are well on our way towards funding the necessary buildings. The next significant challenge will be generating the necessary program support funds.

This strategy presumes the continued excellence of the summer research and education programs. Our education program shows many signs of health and vitality. Courses are oversubscribed; we have had renewed success in obtaining grants, and funding remains in place to support the overhead costs of the program for the next few years. Our single greatest challenge at the moment is the renewal of this support either through endowment or renewed medium-term funding.

Our summer research program shows signs of financial stress. Applications, occupancy, and revenues have been flat to marginally declining for the last couple of years. It is clear that reductions in federal funding have placed a greater budgetary burden on scientists seeking to come to the MBL in the summer, and some have had to withdraw.

The Laboratory has long subsidized the cost of a summer stay for all scientists from its discretionary resources—the summer laboratory fee falls significantly short of the fully allocated cost of the space—but our ability to do so is limited. We can selectively support a few scientists, principally young investigators, and we have had some success recently with the establishment of two Nikon fellowships for young summer scientists, but we need to do much more.

It is clear that increased attention needs to be paid to the summer research program to continue its financial vitality. We need to attract more applicants; we need to find more funds to allow young scientists to become familiar with the MBL; and we need to be as efficient as possible in offering and delivering the services that make a stay at the MBL the most productive scientific experience possible.

Financially, your Laboratory lives on the edge. On the positive side, we have continued to demonstrate our ability to attract funds from the federal government, from foundations, and from individuals. We are in the process of significantly upgrading our physical plant, to make the Laboratory an even more attractive place to do science. Our housing budget is currently generating the funds necessary to assure that we will be able to continue to maintain and upgrade those facilities. Our endowment has continued to grow. On the negative side, our endowment is not large enough to provide a financial cushion for any of our major programs with the significant exception of the Ecosystems Center. We have limited funds to recruit scientists whether for summer or year-round programs. Our support services do not cover their costs through charges for their services, and operations aside from Housing and Dining are in deficit.

To move off the edge we will need to do three things:

- More clearly define, articulate, and communicate the MBL’s special contribution to science and society
- Significantly improve our generation of capital and operating support through fund raising
- Redefine for ourselves what constitutes the most effective delivery of services in the most efficient manner.

—Robert D. Manz
REPORT OF INDEPENDENT ACCOUNTANTS

To the Trustees of
Marine Biological Laboratory
Woods Hole, Massachusetts

We have audited the accompanying balance sheet of Marine Biological Laboratory as of December 31, 1990 and the related statement of support, revenues, expenses and changes in fund balances for the year then ended. We previously examined and reported upon the financial statements of the Laboratory for the year ended December 31, 1989, which condensed statements are presented for comparative purposes only. These financial statements are the responsibility of the Laboratory’s management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Marine Biological Laboratory at December 31, 1990, and its support, revenues, expenses and changes in fund balances for the year then ended in conformity with generally accepted accounting principles.

Our audit was conducted for the purpose of forming an opinion on the basic financial statements taken as a whole. The supplemental schedules of support, revenues, expense and changes in fund balances for current funds (Schedule I), endowment funds (Schedule II) and plant funds (Schedule III) as of December 31, 1990 are presented for purposes of additional analysis and are not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audit of the basic financial statements and, in our opinion, is fairly stated, in all material respects, in relation to the basic financial statements taken as a whole.

Boston, Massachusetts
April 19, 1991
### Marine Biological Laboratory

**Balance Sheets**

December 31, 1990  
(with comparative totals for 1989)

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<tr>
<td>Cash and savings deposits</td>
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<td>$496,014</td>
<td>Current portion of long-term debt</td>
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<td>Restricted cash</td>
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<td>Accounts payable and accrued expenses</td>
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<td>Short-term investments (Notes B and H)</td>
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<td>Deferred income</td>
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<td>120,137</td>
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<td>Accounts receivable, net of allowance for uncollectible accounts</td>
<td>540,983</td>
<td>500,644</td>
<td>Total current liabilities</td>
<td>1,518,988</td>
<td>1,313,081</td>
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<td>Receivables due for costs incurred on grants and contracts</td>
<td>581,880</td>
<td>1,200,558</td>
<td>Mortgage and notes payable (Note G)</td>
<td>1,200,000</td>
<td>1,265,000</td>
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<td>Other assets</td>
<td>35,679</td>
<td>35,098</td>
<td>Deferred support (Note K)</td>
<td>4,774,618</td>
<td>4,450,222</td>
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<td><strong>Total current assets</strong></td>
<td>3,663,362</td>
<td>3,197,314</td>
<td>Annuities payable (Note B)</td>
<td>117,381</td>
<td>105,355</td>
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<td>Investments, at market (Notes B and H)</td>
<td>16,395,852</td>
<td>15,971,459</td>
<td><strong>Total long-term liabilities</strong></td>
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<td>Deposits with trustees (Note G)</td>
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<td><strong>Total liabilities</strong></td>
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<td>7,133,658</td>
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<td>Land, buildings and equipment (Notes B and C)</td>
<td>22,433,390</td>
<td>20,869,811</td>
<td>Current unrestricted fund balances</td>
<td>19,518</td>
<td>21,030</td>
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<td>Less accumulated depreciation</td>
<td>(9,459,548)</td>
<td>(8,858,047)</td>
<td><strong>Endowment funds:</strong></td>
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<td><strong>Total assets</strong></td>
<td>$33,176,262</td>
<td>$31,313,537</td>
<td>Quasi-endowment unrestricted</td>
<td>237,279</td>
<td>426,982</td>
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<td>Endowment, income for unrestricted purposes</td>
<td>3,291,503</td>
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<td>Endowment, income for restricted purposes</td>
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<td>Quasi-endowment restricted</td>
<td>4,565,674</td>
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<td><strong>Total plant funds</strong></td>
<td>12,238,853</td>
<td>11,212,096</td>
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<td><strong>Total liabilities and fund balances</strong></td>
<td>$33,176,262</td>
<td>$31,313,537</td>
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The accompanying notes are an integral part of the financial statements.


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<th>SUPPORT AND REVENUES:</th>
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<th>Endowment Funds</th>
<th>Plant Funds</th>
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<td>Grant reimbursement of direct cost</td>
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<td>$4,872,529</td>
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<td>Grant for capital additions</td>
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<td>Recovery of indirect costs related to research and instruction programs</td>
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<td>484,749</td>
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<td>Tuition</td>
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<td>484,749</td>
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<td>Support activities:</td>
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<td>Dormitories</td>
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<td>Dining hall</td>
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<td>Library</td>
<td>273,475</td>
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<td><strong>Biological Bulletin</strong></td>
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<td>Research services</td>
<td>491,642</td>
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<td>728,008</td>
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<td>Marine resources</td>
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<td>149,555</td>
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<td>Investment income</td>
<td>466,931</td>
<td>674,423</td>
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<td>1,141,354</td>
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<td><strong>Total</strong></td>
<td><strong>6,398,667</strong></td>
<td><strong>6,268,067</strong></td>
<td></td>
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<td><strong>1,429,322</strong></td>
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<td>Gifts (Note I)</td>
<td>634,428</td>
<td>1,979,547</td>
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<td>314,972</td>
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<tr>
<td>Change in deferred support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Note K)</td>
<td>634,428</td>
<td>1,655,151</td>
<td></td>
<td></td>
<td>314,972</td>
</tr>
<tr>
<td>Miscellaneous revenue</td>
<td>114,516</td>
<td>224,740</td>
<td></td>
<td></td>
<td>239,256</td>
</tr>
<tr>
<td>Total support and revenues</td>
<td>7,147,611</td>
<td>8,147,958</td>
<td></td>
<td></td>
<td>314,972</td>
</tr>
</tbody>
</table>
### Statement of Support, Revenues, Expenses and Changes in Fund Balances

for the year ended December 31, 1990
(with comparative totals for 1989)

(continued)

<table>
<thead>
<tr>
<th></th>
<th>Current Funds</th>
<th>Endowment Funds</th>
<th>Plant Funds</th>
<th>1990 Total</th>
<th>1989 Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unrestricted</td>
<td>Restricted</td>
<td>Unrestricted</td>
<td>Restricted</td>
<td>Unrestricted</td>
</tr>
<tr>
<td>EXPENSES:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction</td>
<td>1,370,282</td>
<td></td>
<td>1,370,282</td>
<td>1,328,404</td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td>5,228,030</td>
<td></td>
<td>5,228,030</td>
<td>5,070,730</td>
<td></td>
</tr>
<tr>
<td>Scholarships, fellowships, and stipends</td>
<td>356,253</td>
<td></td>
<td>356,253</td>
<td>264,699</td>
<td></td>
</tr>
<tr>
<td>Support activities:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dormitories</td>
<td>638,531</td>
<td></td>
<td>638,531</td>
<td>736,372</td>
<td></td>
</tr>
<tr>
<td>Dining hall</td>
<td>690,644</td>
<td></td>
<td>690,644</td>
<td>543,797</td>
<td></td>
</tr>
<tr>
<td>Library</td>
<td>579,898</td>
<td>172,398</td>
<td>752,296</td>
<td>761,654</td>
<td></td>
</tr>
<tr>
<td>Biological Bulletin</td>
<td>141,118</td>
<td></td>
<td>141,118</td>
<td>192,741</td>
<td></td>
</tr>
<tr>
<td>Research services</td>
<td>658,115</td>
<td>347,996</td>
<td>1,006,111</td>
<td>843,511</td>
<td></td>
</tr>
<tr>
<td>Marine resources</td>
<td>443,676</td>
<td>6,791</td>
<td>450,467</td>
<td>373,571</td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>1,979,541</td>
<td>35,014</td>
<td>2,014,555</td>
<td>1,897,994</td>
<td></td>
</tr>
<tr>
<td>Sponsored projects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>278,221</td>
<td></td>
<td>278,221</td>
<td>316,501</td>
<td></td>
</tr>
<tr>
<td>Plant operations</td>
<td>1,644,460</td>
<td>1,009</td>
<td>$111,922</td>
<td>$1,757,391</td>
<td>$1,481,382</td>
</tr>
<tr>
<td>Depreciation</td>
<td></td>
<td></td>
<td>601,501</td>
<td>601,501</td>
<td>589,120</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>432,408</td>
<td>8,500</td>
<td>440,908</td>
<td>574,696</td>
</tr>
<tr>
<td>Total expenses</td>
<td>7,054,204</td>
<td>7,950,181</td>
<td>721,923</td>
<td>15,726,308</td>
<td>14,975,072</td>
</tr>
<tr>
<td>Excess (deficit) of support and revenues over expenses</td>
<td>93,407</td>
<td>197,777</td>
<td>314,972</td>
<td>(721,923)</td>
<td>1,429,322</td>
</tr>
<tr>
<td>Realized gain on investments</td>
<td>1,649</td>
<td>$9,488</td>
<td>481,361</td>
<td></td>
<td>492,498</td>
</tr>
<tr>
<td>Unrealized gain (loss) on investments</td>
<td>19,868</td>
<td>(11,451)</td>
<td>(429,074)</td>
<td></td>
<td>(420,657)</td>
</tr>
<tr>
<td>Total gain (loss) on investments</td>
<td>-</td>
<td>21,517</td>
<td>(1,963)</td>
<td>52,287</td>
<td></td>
</tr>
<tr>
<td>Transfers</td>
<td>(94,919)</td>
<td>(219,294)</td>
<td>(187,740)</td>
<td>92,595</td>
<td>(249,931)</td>
</tr>
<tr>
<td>Net change in fund balances</td>
<td>-1,512</td>
<td>-</td>
<td>(189,703)</td>
<td>459,854</td>
<td>(62,634)</td>
</tr>
<tr>
<td>Fund balances, beginning of year</td>
<td>21,030</td>
<td>-</td>
<td>426,982</td>
<td>12,519,771</td>
<td>10,421,774</td>
</tr>
<tr>
<td>Fund balances, end of year</td>
<td>$19,518</td>
<td>-</td>
<td>$237,279</td>
<td>$12,979,625</td>
<td>$10,359,140</td>
</tr>
</tbody>
</table>

The accompanying notes are an integral part of the financial statements.


Marine Biological Laboratory

Notes to Financial Statements

A. Purpose of the Laboratory:

The purpose of Marine Biological Laboratory (the "Laboratory") is to establish and maintain a laboratory or station for scientific study and investigations, and a school for instruction in biology and natural history.

B. Significant accounting policies:

Basis of presentation—fund accounting

In order to ensure observance of limitations and restrictions placed on the use of resources available to the Laboratory, the accounts of the Laboratory are maintained in accordance with the principles of fund accounting. This is the procedure by which resources are classified into separate funds in accordance with specified activities or objectives. Separate accounts are maintained for each fund; however, in the accompanying financial statements, funds that have similar characteristics have been combined into fund groups. Accordingly, all financial transactions have been recorded and reported by fund group.

Externally restricted funds may only be utilized in accordance with the purposes established by the donor or grantor of such funds. However, the Laboratory retains full control over the utilization of unrestricted funds. Restricted gifts, grants, and other restricted resources are accounted for in the appropriate restricted funds. Restricted current funds are reported as revenue as the related costs are incurred (see Note K).

Endowment funds are subject to restrictions requiring that the principal be invested in perpetuity with income available for use for restricted or unrestricted purposes by the Laboratory. Quasi-endowment funds have been established by the Laboratory for the same purposes as endowment funds; however, the principal of these funds may be expended for various restricted and unrestricted purposes.

Fixed assets

Fixed assets are recorded at cost. Depreciation is computed using the straight-line method over estimated useful lives of fixed assets.

Contracts and grants

Revenues associated with contracts and grants are recognized in the statement of support, revenues, expenses and changes in fund balances as the related costs are incurred (see Note K). The Laboratory reimbursement of indirect costs relating to government contracts and grants is based on negotiated indirect cost rates with adjustments for actual indirect costs in future years. Any over or under recovery of indirect costs is recognized through future adjustments of indirect cost rates.

Investments

Investments purchased by the Laboratory are carried at market value. Money market securities are carried at cost which approximates market value. Investments donated to the Laboratory are carried at fair market value at the date of the gift. For determination of gain or loss upon disposal of investments, cost is determined based on the average cost method.

The Laboratory is the beneficiary of certain endowment investments reported in the financial statements which are held in trust by others. Every ten years the Laboratory's status as beneficiary of these funds is reviewed to determine that the Laboratory's use of these funds is in accordance with the intent of the funds. The market values of these investments are $4,125,093 and $4,039,803 at December 31, 1990, and 1989, respectively.

Investment income and distribution

The Laboratory follows the accrual basis of accounting except that investment income is recorded on a cash basis. The difference between such basis and the accrual basis does not have a material effect on the determination of investment income earned on a year-to-year basis.

Investment income includes income from the investments of specific funds and from the pooled investment account. Income from the pooled investment account is distributed to the participating funds on the market value unit basis (Note L).

Annuities payable

Amounts due to donors in connection with gift annuities is determined based on remainder value calculations which generally assure a rate of return at 10%, maximum payout terms of eighteen years, and interest payout rate of 8%.

C. Land, buildings and equipment:

The following is a summary of the unrestricted plant fund assets:

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>$689,660</td>
<td>$689,660</td>
</tr>
<tr>
<td>Buildings</td>
<td>16,955,015</td>
<td>16,926,715</td>
</tr>
<tr>
<td>Equipment</td>
<td>2,819,202</td>
<td>2,672,838</td>
</tr>
<tr>
<td>Construction in progress</td>
<td>1,969,713</td>
<td>580,598</td>
</tr>
<tr>
<td></td>
<td>22,433,590</td>
<td>20,869,811</td>
</tr>
<tr>
<td>Less accumulated depreciation</td>
<td>(9,459,548)</td>
<td>(8,858,047)</td>
</tr>
<tr>
<td></td>
<td>$12,974,042</td>
<td>$12,011,764</td>
</tr>
</tbody>
</table>
D. Retirement plan:
The Laboratory participates in the defined contribution pension program of the Teachers Insurance and Annuity Association College Retirement Equities Fund. Contributions amounted to $451,665 in 1990 and $393,422 in 1989.

E. Restricted pledges and grants:
As of December 31, 1990, the Laboratory reported active pledge and grant commitments outstanding of $492,939 (unaudited) to be received. The restricted pledges are not included in the financial statements since it is not practicable to estimate the net realizable value of such pledges. Restricted pledges of $467,337 and $14,151 and $11,451 are scheduled to be paid in 1991, 1992, and 1993, respectively.

F. Interfund borrowings:
Current fund interfund balances at December 31 are as follows:

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due to restricted endowment fund</td>
<td>$(4,750)</td>
<td>$(2,190)</td>
</tr>
<tr>
<td>Due to restricted quasi-endowment funds</td>
<td>(1,650)</td>
<td>(200)</td>
</tr>
<tr>
<td>Total</td>
<td>$(6,400)</td>
<td>$(2,390)</td>
</tr>
</tbody>
</table>

G. Mortgage and notes payable:
Long-term debt at December 31, 1990 amounted to $1,265,000. The aggregate amount of redemption due for each of the next five fiscal years is as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>$65,000</td>
<td>60,000</td>
<td>60,000</td>
<td>60,000</td>
<td>60,000</td>
<td>960,000</td>
</tr>
<tr>
<td>Less current portion</td>
<td>1,265,000</td>
<td>65,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In 1989, the Laboratory issued $1,330,000 Massachusetts Industrial Finance Authority (MIFA) Series 1989 Bonds, which pay varying annual interest rates and mature on October 31, 2011. The Series 1989 bonds are collateralized by a first mortgage on certain Laboratory property.

The interest rate is adjustable and was 7.25% and 6.5% at December 31, 1990 and 1989. In compliance with the Laboratory’s MIFA bond indenture, deposits with Shawmut Bank N.A., as trustee, represent investments in the debt service reserve fund of $143,006 in 1990 and $133,000 in 1989.

H. Investments:
The following is a summary of the cost and market value of investments at December 31, 1990 and 1989 and the related investment income and distribution of investment income for the years ended December 31, 1990 and 1989.

<table>
<thead>
<tr>
<th></th>
<th>Cost</th>
<th>Market</th>
<th>Investment Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endowment and Quasi-Endowment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Government securities</td>
<td>$1,934,834</td>
<td>$2,595,407</td>
<td>$1,957,512</td>
</tr>
<tr>
<td>Corporate fixed income</td>
<td>6,663,376</td>
<td>5,900,736</td>
<td>6,809,264</td>
</tr>
<tr>
<td>Common stocks</td>
<td>4,284,165</td>
<td>3,392,001</td>
<td>6,346,778</td>
</tr>
<tr>
<td>Money market securities</td>
<td>590,735</td>
<td>595,467</td>
<td>590,735</td>
</tr>
<tr>
<td>Real estate</td>
<td>343,247</td>
<td>345,749</td>
<td>343,247</td>
</tr>
<tr>
<td>Total</td>
<td>13,816,357</td>
<td>12,829,360</td>
<td>16,047,536</td>
</tr>
<tr>
<td>Less custodian and management fees</td>
<td></td>
<td></td>
<td>(55,592)</td>
</tr>
<tr>
<td>Total</td>
<td>13,816,357</td>
<td>12,829,360</td>
<td>16,047,536</td>
</tr>
<tr>
<td>Restricted Current Fund</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificates of deposits</td>
<td>502,360</td>
<td>490,263</td>
<td>502,360</td>
</tr>
<tr>
<td>Money market securities</td>
<td>1,500,000</td>
<td>965,000</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Total</td>
<td>2,002,360</td>
<td>1,455,263</td>
<td>2,002,360</td>
</tr>
<tr>
<td>Total investments</td>
<td>$15,818,717</td>
<td>$14,284,623</td>
<td>$18,049,896</td>
</tr>
</tbody>
</table>
I. Gift support for instruction:
Current year unrestricted gifts includes $500,000 of gifts for the support of the Laboratory's instruction program available for indirect costs attributable to the instruction program.

J. Tax-exempt status:
The Laboratory is exempt from federal income tax under Section 501(c)3 of the Internal Revenue Code.

K. Restricted current funds deferred support:
The Laboratory defers recognition of revenue on current restricted funds until the related costs are incurred. Amounts received in excess of expenses are recorded as deferred support. The following summarizes the activity in the deferred support account for 1990 and 1989, respectively:

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance at beginning of year</td>
<td>$4,450,222</td>
<td>$2,951,662</td>
</tr>
<tr>
<td>Additions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gifts, endowment income and grants received</td>
<td>8,499,360</td>
<td>9,382,212</td>
</tr>
<tr>
<td>Unrealized gains</td>
<td>19,868</td>
<td>30,672</td>
</tr>
<tr>
<td>Realized gain</td>
<td>1,649</td>
<td></td>
</tr>
<tr>
<td>Deductions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Funds expended under gifts and grants</td>
<td>7,977,187</td>
<td>7,542,909</td>
</tr>
<tr>
<td>Transfers</td>
<td>219,294</td>
<td>374,415</td>
</tr>
<tr>
<td>Balance at end of year</td>
<td>$4,774,618</td>
<td>$4,450,222</td>
</tr>
</tbody>
</table>

L. Accounting for pooled investments:
The major portion of investment assets is pooled for investment purposes with each participating fund subscribing to, or disposing of, units at market value at the beginning of the current quarter. The unit participation of the funds at December 31, 1990 and 1989, respectively, is as follows:

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endowment and similar funds:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quasi-unrestricted</td>
<td>3,909</td>
<td>3,887</td>
</tr>
<tr>
<td>Quasi-restricted</td>
<td>7,436</td>
<td>7,416</td>
</tr>
<tr>
<td>Restricted endowment</td>
<td>39,401</td>
<td>36,488</td>
</tr>
<tr>
<td></td>
<td>50,746</td>
<td>47,791</td>
</tr>
</tbody>
</table>

Pooled investment activity on a per-unit basis was as follows:

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit value at beginning of year</td>
<td>$109.57</td>
<td>$100.00</td>
</tr>
<tr>
<td>Unit value at end of year</td>
<td>108.90</td>
<td>109.57</td>
</tr>
<tr>
<td>Increase (decrease) in realized and unrealized appreciation</td>
<td>(.67)</td>
<td>9.57</td>
</tr>
<tr>
<td>Net income earned on pooled investments</td>
<td>5.99</td>
<td>5.73</td>
</tr>
<tr>
<td>Total return on pooled investments</td>
<td>$5.32</td>
<td>$15.30</td>
</tr>
</tbody>
</table>

Investment income is distributed to individual funds as earned.
## Schedule I

**Marine Biological Laboratory**

**Statement of Support, Revenues, Expenses and Changes in Fund Balances**

**Current Funds**

For the year ended December 31, 1990

<table>
<thead>
<tr>
<th>Operating Fund</th>
<th>Auxiliary Enterprises Fund</th>
<th>Total Current Unrestricted Fund</th>
<th>Current Restricted Fund</th>
<th>Total</th>
</tr>
</thead>
</table>

### SUPPORT AND REVENUES:

- **Grant reimbursement of direct costs**
- **Recovery of indirect costs related to research and instruction programs** $3,136,240
- **Tuition** $4,872,529

#### Support activities:

- **Dormitories** $906,292
- **Dining hall** $802,447
- **Library** $273,475
- **Biological Bulletin** $172,085
- **Research services** $491,642
- **Marine resources** $149,555
- **Investment income** $466,931

#### Gifts

- $634,428

#### Change in deferred support

- $(324,396)

#### Miscellaneous revenue

- $114,516

#### Total support and revenues

- $5,438,872

### EXPENSES:

- **Instruction** $1,370,282
- **Research** $5,228,030
- **Scholarships, fellowships, and stipends** $356,253

#### Support activities:

- **Dormitories** $638,531
- **Dining hall** $690,644
- **Library** $579,898
- **Biological Bulletin** $141,118
- **Research services** $658,115
- **Marine resources** $443,676
- **Administration** $1,867,738
- **Sponsored projects administration** $278,221
- **Plant operations** $1,644,460

#### Other

- $(432,408)

#### Total expenses

- $5,613,226

#### Excess (deficit) of support and revenues over expenses

- $(174,354)

#### Unrealized gain on investments

- $19,868

#### Realized gain on investments

- $1,649

#### Total gain on investments

- $21,517

### Transfers Among Funds:

- **Debt service** $(65,000)
- **Acquisition of fixed assets** $(65,000)
- **To unrestricted plant fund** $(144,881)
- **Housing transfer** $(199,863)
- **To support operations** $(196,965)
- **Instruction** $(5,045)

#### Other

- $(314,213)

#### Total transfers among funds

- $(172,842)

#### Net change in fund balance

- $(1,512)

#### Fund balances, beginning of year

- $21,030

#### Fund balances, end of year

- $19,518

- $19,518

- $19,518
## Marine Biological Laboratory

**Statement of Support, Revenues, Expenses and Changes in Fund Balances**

**Endowment Funds**

for the year ended December 31, 1990

<table>
<thead>
<tr>
<th>Restricted</th>
<th>Unrestricted</th>
<th>Quasi-Endowment</th>
<th>Endowment, Income for Unrestricted Purposes</th>
<th>Endowment, Income for Restricted Purposes</th>
<th>Quasi-Endowment</th>
<th>Total Restricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUPPORT AND REVENUES:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gifts</td>
<td>$312,522</td>
<td>$2,450</td>
<td>$314,972</td>
<td>$314,972</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total support and revenues</td>
<td>312,522</td>
<td>2,450</td>
<td>314,972</td>
<td>314,972</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess of support and revenues over expenses</td>
<td>312,522</td>
<td>2,450</td>
<td>314,972</td>
<td>314,972</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Realized gains on investments</td>
<td>$9,488</td>
<td>$165,441</td>
<td>$121,543</td>
<td>$194,377</td>
<td>$481,361</td>
<td>$490,849</td>
<td></td>
</tr>
<tr>
<td>Unrealized gain (loss) on investments</td>
<td>$(11,451)</td>
<td>$(110,737)</td>
<td>$(113,465)</td>
<td>$(204,872)</td>
<td>$(429,074)</td>
<td>$(440,525)</td>
<td></td>
</tr>
<tr>
<td>Total gain (loss) on investments</td>
<td>$(1,963)</td>
<td>54,704</td>
<td>8,078</td>
<td>$(10,495)</td>
<td>52,287</td>
<td>50,324</td>
<td></td>
</tr>
<tr>
<td><strong>TRANSFERS AMONG FUNDS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capitalize ecosystems income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endowment transfers</td>
<td>$(190,000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other transfers</td>
<td>2,260</td>
<td>1,921</td>
<td>(2,158)</td>
<td>12,277</td>
<td>12,040</td>
<td>14,300</td>
<td></td>
</tr>
<tr>
<td>Total transfers among funds</td>
<td>$(187,740)</td>
<td>1,921</td>
<td>(2,158)</td>
<td>92,832</td>
<td>92,595</td>
<td>(95,145)</td>
<td></td>
</tr>
<tr>
<td>Net change in fund balances</td>
<td>$(189,703)</td>
<td>56,625</td>
<td>318,442</td>
<td>84,787</td>
<td>459,854</td>
<td>270,151</td>
<td></td>
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<tr>
<td>Fund balances, beginning of year</td>
<td>$426,982</td>
<td>3,234,878</td>
<td>4,804,006</td>
<td>4,480,887</td>
<td>12,519,771</td>
<td>12,946,753</td>
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<tr>
<td>Fund balances, end of year</td>
<td>$237,279</td>
<td>$3,291,503</td>
<td>$5,122,448</td>
<td>$4,565,674</td>
<td>$12,979,625</td>
<td>$13,216,904</td>
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</tbody>
</table>

15
**SCHEDULE III**

**MARINE BIOLOGICAL LABORATORY**

**STATEMENT OF SUPPORT, REVENUES, EXPENSES AND CHANGES IN FUND BALANCES**

**PLANT FUNDS**

for the year ended December 31, 1990

<table>
<thead>
<tr>
<th>Unrestricted</th>
<th>Repairs and Replacement Reserve</th>
<th>Total Unrestricted</th>
<th>Restricted</th>
<th>Total</th>
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<tr>
<td><strong>SUPPORT AND REVENUES:</strong></td>
<td></td>
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<tr>
<td>Grant for capital additions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total support and revenues</td>
<td>$1,429,322</td>
<td>$1,429,322</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EXPENSES:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>$601,501</td>
<td>$601,501</td>
<td>601,501</td>
<td></td>
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<tr>
<td>Plant operations</td>
<td>$111,922</td>
<td>$111,922</td>
<td>111,922</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>8,500</td>
<td>8,500</td>
<td>8,500</td>
<td></td>
</tr>
<tr>
<td>Total expenses</td>
<td>610,001</td>
<td>111,922</td>
<td>721,923</td>
<td>721,923</td>
</tr>
<tr>
<td>Excess (deficit) of support and revenues over expenses</td>
<td>(610,001)</td>
<td>(111,922)</td>
<td>(721,923)</td>
<td>$1,429,322</td>
</tr>
<tr>
<td><strong>TRANSFERS AMONG FUNDS:</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Debt service</td>
<td>65,000</td>
<td>65,000</td>
<td>65,000</td>
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<tr>
<td>Acquisition of fixed assets</td>
<td>180,662</td>
<td>180,662</td>
<td>180,662</td>
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<tr>
<td>Transfers to unrestricted plant fund</td>
<td>(14,128)</td>
<td>(14,128)</td>
<td>(14,128)</td>
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<tr>
<td>Housing transfers</td>
<td>199,863</td>
<td>199,863</td>
<td>199,863</td>
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<tr>
<td>Other transfers</td>
<td>227,892</td>
<td>227,892</td>
<td>(249,931)</td>
<td>(22,039)</td>
</tr>
<tr>
<td>Total transfers among funds</td>
<td>245,662</td>
<td>413,627</td>
<td>659,289</td>
<td>(249,931)</td>
</tr>
<tr>
<td>Net change in fund balances</td>
<td>(364,339)</td>
<td>301,705</td>
<td>(62,634)</td>
<td>1,179,391</td>
</tr>
<tr>
<td>Fund balances, beginning of year</td>
<td>10,272,954</td>
<td>148,820</td>
<td>10,421,774</td>
<td>790,322</td>
</tr>
<tr>
<td>Fund balances, end of year</td>
<td>$9,908,615</td>
<td>$450,525</td>
<td>$10,359,140</td>
<td>$1,969,713</td>
</tr>
</tbody>
</table>


Report of the Librarian

Library directors

In 1990, Jane Fessenden, who had been the librarian and worked at the MBL for 29 years, retired. Jane made the Library a productive home for its users, improved the collection whenever financially possible, and lead the Library through innumerable changes. During her tenure, the Library was converted from the Dewey Decimal System to Library of Congress, the first “stack move” took place (after three years of planning), the reading rooms were redone, the Rare Books Room was created, the Copy Service Center was developed in its present location, staff was increased, and new technology was initiated. She will be best remembered, however, for her unique ability to provide the services and support most desired by our users.

In December, Dr. David Stonehill accepted the position of Director of the MBL/WHOI Library and Scientific Information Research Center. Dr. Stonehill managed computer facilities on various NASA projects and directed computing services at academic institutions. From 1988 until his move to MBL, he was Director of Information Resources Management for the Executive offices of the President of the United States. Under Dr. Stonehill, the Library plans to launch a Scientific Information Research Center, and we look forward to his leadership as we meld the traditional with the new methods of scientific information management.

New age information delivery

Using the report created by the Hughes Committee, the Library immediately began to implement some of its recommendations. A network manager was hired, and the network design was completed. What followed was a frenzy of equipment ordering and the installation of cable and wires to extend the network out of the library and into classrooms and labs in the Lillie and Loeb buildings and the Ecosystems Center. Because of the ease of communicating over the network, some of the traditional methods of the reference librarians moved into a new era during 1990. One advance, Current Contents loaded onto the librarians’ computers, allowed us to send weekly up-dated bibliographies to requesters over the MBLnet.

The Library’s catalog has been converted to electronic records, and all the books in the library were barcoded as part of the automation of library systems. The CLAMS network of libraries came on-line in 1990, and scientists in their laboratories, who are on the Woods Hole network, can connect to the catalog and see whether the library holds the book they are seeking.

Journal rates increase

Our Library has studied the effect of rising book and subscriptions costs beginning with the comprehensive Rockefeller Journal Use study. In 1990, the close to 30% projected journal price increase reduced our options and resulted in the cancellation of 338 current subscriptions. Our User Panel worked throughout the summer with lists of journals targeted for cancellation, using criteria established by the Joint Users Committee, to insure the best possible preservation of our collection and services.

This was not the only journal crisis of 1990—the space allocation for housing the journals had reached saturation. For over a year, the creation of a design to preserve our stack space has been developed and refined and the periodical collection will be moved during the beginning of 1991. The logical placement of the
collections according to the alphabet will be maintained, albeit into two places. The A–Z arrangement will be in the front part of the stacks for currently received journals and also in the back wing for the pre-1976 journals.

In an attempt to recover some of the escalating costs incurred in the Library, we have tried to create a model for users who are not directly associated with the contributing Woods Hole institutions. We have also changed our interlibrary loan policies and have increased resource sharing with a number of institutions, i.e., Brandeis, University of Massachusetts Medical School, Wesleyan, University of Rhode Island and the Pell Laboratory. Escalating costs and U.S. postage rates drove the increase in interlibrary loan charges, and at the International Association of Marine Science Libraries and Information Centers' conference in Seattle, Washington, we were challenged, without ill will, but with some concern from the international community, about our rate increases. A solution to this problem may involve sharing the responsibility for serials collection development at the national and international level during the 1990s.

Preservation

Two documents that have been of historic and sentimental value to the scientists, staff, and visitors of the MBL were appraised and declared endangered. Study Nature Not Books—the black charcoal, handwritten sign of Louis Agassiz—had adhered to its backing and tears, holes, stains, rust, scratches, and smudges were evident everywhere. The same was true of the two-page Last one to Go message to American soldiers by Katsuma Dan. Both of these documents were sent to the Northeast Document Conservation Center for treatment and have been returned to the library for display.

—Cathy Norton
Acting Librarian
Educational Programs

Summer Courses

Biology of Parasitism (June 10 to August 10)

Co-Directors
John Donelson, University of Iowa College of Medicine
Carole Long, Hahnemann Medical College

Faculty
Steven Anderson, University of Iowa
John Boothroyd, Stanford University
Ted Bianco, Imperial College of Science & Technology, UK
Patrick Farley, Hahnemann Medical College
Steven Hajduk, University of Alabama, Birmingham
Peter Ham, Liverpool School of Tropical Medicine, UK
Michael E. Harris, University of Alabama, Birmingham
Mary Alice Hartman, University of Kentucky
Kwang S. Kim, University of Iowa
Peter Kima, Hahnemann Medical College
Yien Ming Kuo, Imperial College, UK
Rick Martin, University of Iowa
David Moser, University of Iowa
Elonne Petrin, University of Cincinnati
David Russell, New York University
David Sachs, NIH
Judy Sakanari, University of California, San Francisco
Sam Turco, University of Kentucky

Lecturers
Nina Agabian, University of California, San Francisco
Steven Beverley, Harvard Medical School
Kent Campbell, Centers for Disease Control

Dickson Despommier, Columbia University
Paul Englund, Johns Hopkins School of Medicine
Don Harn, Harvard University
Stephanie James, NIH
Keith Joiner, Yale University School of Medicine
Patricia J. Johnson, UCLA
Don Krogstad, Washington University, St. Louis
Ira Mellman, Yale University School of Medicine
George Nelson, Liverpool School, UK
Ruth Nussenzweig, New York University
Victor Nussenzweig, New York University
Richard Olds, Brown University
Bill Petri, University of Virginia
Robert Sauer, Massachusetts Institute of Technology
Alan Sher, NIH
Irwin Sherman, University of California, Riverside
Larry Simpson, UCLA
Mitch Sogin, MBL
Rick Tarleton, University of Georgia
Merv Turner, Merck Sharp & Dohme Research Laboratory
C. C. Wang, University of California, San Francisco
Leon Weiss, University of Pennsylvania
Don Wiley, Harvard University
Dyann Wirth, Harvard University

Students
Wanida Asawanahasakda, Mahidol University, Thailand
Fernanda R. Gadelha, University of Illinois
Eileen S. Gruszynski, University of California, Los Angeles
Michael J. Howard, Vanderbilt University
Christopher A. Hunter, University of Glasgow, Scotland
Gregory J. Jennings, Tulane University
Christopher L. Leptak, Yale University
Congjun Li, Worcester Foundation for Experimental Biology
Leo X. Liu, Beth Israel Hospital/Harvard University
James J. McCoy, University of Virginia
Gloria I. Palma, Univ. del Valle, Colombia
Laura J. Rocco, Johns Hopkins University
Nicola N. Schweitzer, Imperial College of Science, UK
Frank Seeber, Institut für Tropenhygiene, Germany
Philippe G. Vandekerckhove, University of Leuven, Belgium
Gayl Wall, University of Dundee, Scotland

**Embryology: Cell Differentiation and Gene Expression in Early Development**
*(June 21 to July 30)*

**Directors**

<table>
<thead>
<tr>
<th>Director</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eric Davidson</td>
<td>California Institute of Technology</td>
</tr>
<tr>
<td>J. Richard Whitaker</td>
<td>MBL (Assistant Director)</td>
</tr>
</tbody>
</table>

**Faculty**

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael Akam</td>
<td>University of Cambridge, UK</td>
</tr>
<tr>
<td>Amy Bejsovie</td>
<td>University of Cambridge, UK</td>
</tr>
<tr>
<td>Marianne Bronner-Fraser</td>
<td>University of California, Irvine</td>
</tr>
<tr>
<td>Scott Fraser</td>
<td>University of California, Irvine</td>
</tr>
<tr>
<td>Katherine Harding</td>
<td>Columbia University</td>
</tr>
<tr>
<td>Janet Heasman</td>
<td>University of Cambridge, UK</td>
</tr>
<tr>
<td>Linda Huffer</td>
<td>MBL</td>
</tr>
<tr>
<td>Wendy Katz</td>
<td>California Institute of Technology</td>
</tr>
<tr>
<td>Robert Kingsbury</td>
<td>Carnegie Institution, Baltimore</td>
</tr>
<tr>
<td>Thomas Lallier</td>
<td>University of California, Irvine</td>
</tr>
<tr>
<td>Robert Leclerc</td>
<td>University of Maryland</td>
</tr>
<tr>
<td>Michael Levine</td>
<td>Columbia University</td>
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<tr>
<td>David McClay</td>
<td>Duke University</td>
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<tr>
<td>Steven McKnight</td>
<td>Carnegie Institution of Washington</td>
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<tr>
<td>Robert Nickells</td>
<td>California Institute of Technology</td>
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<tr>
<td>Jerome Regier</td>
<td>University of Maryland</td>
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<tr>
<td>John Shuman</td>
<td>Carnegie Institution, Baltimore</td>
</tr>
<tr>
<td>Paul Sternberg</td>
<td>California Institute of Technology</td>
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<tr>
<td>Nicholas Torpey</td>
<td>University of Cambridge, UK</td>
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<tr>
<td>Kellie Whittaker</td>
<td>California Institute of Technology</td>
</tr>
<tr>
<td>Christopher Wylie</td>
<td>University of Cambridge, UK</td>
</tr>
</tbody>
</table>

**Students**

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamran Ahmad</td>
<td>University of Utah</td>
</tr>
<tr>
<td>Michael J. Bank</td>
<td>Columbia University</td>
</tr>
<tr>
<td>Peter B. Bokor</td>
<td>Rockefeller University</td>
</tr>
<tr>
<td>James B. Castelli-Gair</td>
<td>University of Madrid, Spain</td>
</tr>
<tr>
<td>Robert A. Cornell</td>
<td>University of Washington</td>
</tr>
<tr>
<td>Maria G. Di Bernardo</td>
<td>Italian National Research Council, Italy</td>
</tr>
</tbody>
</table>

Win J. Dictus, University of Utrecht, The Netherlands
Anne D. Donaldson, MRC Laboratory, UK
Bruce W. Draper, University of Washington
Silvia B. Frenk, King's College, Cambridge, UK
Karen M. Guida, University of Paris, France
Nan Ho, University of California, Berkeley
Jon F. Kayym, California Institute of Technology
Dangerut Kersulyte, Acadamy of Sciences of Lithuania, USSR
Daniel S. Kessler, Rockefeller University
Mary Ellen Lane, Columbia University
Thierry Lepage, University of Nice, France
Donal T. Manahan, University of Southern California, Los Angeles
Jeffrey R. Miller, Duke University
Anne Marie Murphy, Johns Hopkins University
Christof Niehrs, European Molecular Biology Lab., Germany
Mary E. Pownall, University of Virginia
Inge J. Van Wijk, Max-Planck Institute, Germany
Tongweng Wang, University of Florida

**Marine Ecology: Concepts, Techniques and Applications of Molecular Probes**
*(June 17 to July 28)*

**Director**

<table>
<thead>
<tr>
<th>Director</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. Woodland Hastings</td>
<td>Harvard University</td>
</tr>
</tbody>
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**Faculty**

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Cheryl Booth</td>
<td>Falmouth, MA</td>
</tr>
<tr>
<td>Ann Bucklin</td>
<td>Marine Biological Laboratory</td>
</tr>
<tr>
<td>Thomas T. Chen</td>
<td>Center of Marine Biotechnology, University of Maryland</td>
</tr>
<tr>
<td>Clara Cheng</td>
<td>University of Maryland</td>
</tr>
<tr>
<td>Toby Cole</td>
<td>Hopkins Marine Station, Stanford, University</td>
</tr>
<tr>
<td>Lynna Hereford</td>
<td>Hopkins Marine Station, Stanford, University</td>
</tr>
<tr>
<td>Chun-Mean Lin</td>
<td>University of Maryland</td>
</tr>
<tr>
<td>Kenneth Nealson</td>
<td>Great Lakes Research Center, University of Wisconsin, Milwaukee</td>
</tr>
<tr>
<td>Dennis Powers</td>
<td>Hopkins Marine Station, Stanford, University</td>
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<tr>
<td>T. Roenneberg</td>
<td>University of Munich, Germany</td>
</tr>
<tr>
<td>Simona Sorger</td>
<td>Hopkins Marine Station, Stanford, University</td>
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<tr>
<td>Keno Truper</td>
<td>Bonn, Germany</td>
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<tr>
<td>Barbara Wimpee</td>
<td>Great Lakes Research Center, University of Wisconsin, Milwaukee</td>
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<tr>
<td>Charles Wimpee</td>
<td>University of Wisconsin, Milwaukee</td>
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</tr>
</tbody>
</table>

20 Annual Report
Lecturers

- David Caron
- Colleen Cavanaugh
- Penny Chisholm
- Ed De Long
- Paul Dunlap
- Brian Fry
- Linda Goff
- John Kessler
- Lynn Margulis
- James McCarthy
- Dan Morse
- Rob Olsen
- Hans Paerl
- Jack Palmer
- Ned Ruby
- G. Saylor
- Ann Sesholz
- Bob Simon
- Mitch Sogin
- Felix Strumwasser
- John Waterbury

Microbiology: Molecular Aspects of Cellular Diversity (June 10 to July 26)

Co-Directors
- Martin Dworkin, University of Minnesota
- John Breznak, Michigan State University

Faculty
- Richard Behmlander, University of Minnesota
- Pamela Contag, University of Minnesota
- Christiane Dahl, University of Bonn, Germany
- Deborah Eastman, University of Minnesota
- Andrew M. Kropinsk, Queen’s University, Canada
- Hans Truper, University of Bonn, Germany
- Stefan Wagener, Michigan State University

Lecturers
- Paul Dunlap, Woods Hole Oceanographic Institution
- Holger Jannasch, Woods Hole Oceanographic Institution
- J. Waterbury, Woods Hole Oceanographic Institution

Students
- Abdiel J. Alvarez, University of Puerto Rico
- Joanna S. Brooke, University of Western Ontario, Canada
- Joseph P. Calabrese, West Virginia University
- Neena Din, University of British Columbia, Canada
- Arnis Druka, Latvian State University, USSR
- Olivia T. Harriott, University of Connecticut
- Robert Huber, University of Regensburg, Germany
- Jennifer B. Klenz, University of Saskatchewan, Canada
- Judith A. Koskella, New York University
- Bridget E. Laue, University of Colorado
- Jared R. Leadbetter, Goucher College
- Timothy C. Liburn, University of British Columbia, Canada
- Shi Liu, University of Oklahoma
- Lynn V. Mendelman, Harvard Medical School
- Elizabeth J. Orle, Colorado State University
- Mechthild Pohlschroder, University of Massachusetts, Amherst
- Frank J. Slack, Tufts University
- Barth F. Smets, University of Illinois
- Claire S. Ting, Cornell University
- Mary A. Wyka, Merck & Co., Inc.

Neural Systems & Behavior (June 10 to August 1)

Co-Directors
- Ronald Calabrese, Emory University
- Martha Constantine-Paton, Yale University
Faculty

Arthur Arnold, University of California, Los Angeles
Alexander Borst, Max-Planck-Institut für Biologisch Kybernetik, Germany
John Byrne, University of Texas Medical School
Thomas Carew, Yale University
Leonard Cleary, University of Texas Medical School at Houston
Robin Cloues, Harvard University
Michael Davis, Yale University
Robert M. Douglas, University of British Columbia, Canada
Lise Eliot, Center for Neurobiology & Behavior
Russell Fernald, University of Oregon
Leslie Fischer, Columbia University
William Frost, University of Texas Medical School
Cole Gilbert, University of Arizona
Dennis Gorlick, Columbia University
Jon Hayashi, Arizona Research Laboratory
Sally Hoskins, City College of CUNY
John Koester, New York State Psychiatric Institute
Richard B. Levine, University of Arizona
Yurin Levy, Brandeis University
Margaret Livingstone, Harvard Medical School
Anne Lohoff, Columbia University
Eduardo R. Macagno, Columbia University
Emilie Marcus, Yale University
Eve Marder, Brandeis University
Michael P. Nusbaum, University of Alabama, Birmingham
Mu-Ming Poo, Columbia University
David J. Sandstrom, University of California
Patricia Steen, Yale University
Nacita Tabti, Columbia University
Janis C. Weeks, University of Oregon
Angela Wenning, Universität Konstanz, Germany
Michael Nitabach, Columbia University

Lecturers

Catherine Carr, University of Rochester
Joe Martinez, Jr., University of California

Students

Robert A. Berkowitz, Washington University
James P. Burke, University of Alabama, Birmingham
Belinda S. Chang, Harvard University
Miles G. Cunningham, Massachusetts Institute of Technology
Graeme W. Davis, University of Massachusetts, Amherst
Mayra Garcia-Ruiz, University of Nat. Autonoma, Mexico
John F. Hamilton, Meharry Medical College, Nashville

Tamara L. Harris, University of Ottawa, Canada
Valerie L. Kilman, University of Illinois
Barlett W. Mel, California Institute of Technology
Brett D. Mensch, Baylor College of Medicine
Alison R. Mercer, University of Otago, New Zealand
Edward P. Monaghan, University of California, Berkeley
Tanja Quenzer, Max-Planck-Institut, Germany
Adina L. Roskies, University of California, San Diego
Hyunjune S. Seung, Harvard University
Deana L. Shackelford, University of Oklahoma
Petra Skiebe, Universität Hamburg, Germany
John E. Spiro, University of California, San Diego
Douglas Syme, University of California, Irvine

Neurobiology (June 10 to August 11)

Co-Directors

Leonard Kaczmarek, Yale University
Irwin Levitan, Brandeis University
Christopher Miller, Brandeis University

Faculty

Cecilia Armstrong, University of Pennsylvania
Gary Banker, University of Virginia
Synnove Beckh, Max-Planck-Institut für Biophysikalische Chemie, Germany
Andrew Czernik, Rockefeller University
Jan De Weer, Duke University
Judith Drazba, NINDS/NIH
Keith Elmslie, Case Western Reserve University
Stuart Firestein, Yale University School of Medicine
Paul Forscher, Yale University
Robert French, University of Calgary, Canada
Sara Garber, University of Alabama, Birmingham
Allison Hall, Case Western Reserve University
Richard Horn, Roche Institute for Molecular Biology
Richard Huganir, HHMI, Johns Hopkins Medical School
Stephen Jones, Case Western Reserve University
Richard Kramer, Columbia University
Kyu-Ho Lee, Johns Hopkins Medical School
Andrew Matus, Friedrich Meischer Institute, Switzerland
Robert Miller, Case Western Reserve University
Angus Nairn, Rockefeller University
Randall Reed, HHMI, Johns Hopkins Medical School
Thomas Reese, NINDS/NIH
Talvinder Sihra, Rockefeller University
Carolyn Smith, NINDS/NIH
Walter Stuhmer, Max-Planck-Institut für Biophysikalische Chemie, Germany
Students
Ricardo C. Araneda, Albert Einstein Medical School
Sylvester Chyby, Wesleyan University
Dan H. Cox, Tufts University
Stuart D. Critz, University of Texas Medical School
Peter F. Drain, MIT
Kathryn J. Edson, University of Minnesota
Julie A. Haack, University of Utah
Lise R. Heanbotham, Harvard University
Marc A. Post, University of Michigan
Haohua Qian, University of Illinois
Hanno M. Roder, Massachusetts Institute of Technology
Maria A. Sosa, University of Florida

Physiology: Cell and Molecular Biology
(June 10 to July 21)

Director
Thomas D. Pollard, Johns Hopkins University

Faculty
Steven Almo, Johns Hopkins Medical School
Kerry Bloom, University of North Carolina
William Busa, Johns Hopkins University
Antony Galione, Johns Hopkins University
Neal R. Glicksman, University of North Carolina
Robert Jensen, Johns Hopkins School of Medicine
Margaret Kenna, University of North Carolina
John Maslanski, Johns Hopkins University
Jonathan McMenamin-Balano, University of Massachusetts, Boston
Robert Palazzo, Marine Biological Laboratory
Katherine Pollard, Johns Hopkins Medical School
Ted Salmon, University of North Carolina
Sue Schmidt, Glyndon, MD
John Simon, University of North Carolina
John Sinard, Johns Hopkins Medical School
Tammy Smith, University of North Carolina
Cynthia V. Stauffacher, Purdue University
Murray Stewart, Medical Research Council, UK
Elaine Yeh, University of North Carolina

Students
Robert L. Bacallao, University of California, Los Angeles
Sandra A. Brockman, Carnegie Mellon University
Thomas O. Carpenter, Yale University
Isabelle A. Carre, SUNY, Stony Brook
Joseph A. Cerro, Columbia University
Marc D. Coltrera, University of Washington
Tod A. Critchlow, Scripps Institute of Oceanography
Spencer J. Danto, Cornell Medical College
Michele J. Flatters, Tufts University
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Supriya Jayadev, Duke University
John R. Jordan, University of Utah
David L. Keefe, Yale University
Karen L. King, Florida State University
Qingwen Li, University of Kansas
Helen McNeill, University of Pennsylvania
Michael E. Mendelsohn, Harvard/Brigham & Women’s Hospital
Christa S. Merzendorf, Harvard University
Robert Mirro, University of Tennessee
Karen M. Page, Dartmouth College
Alice P. Pentland, Washington University, St. Louis
Zhican Qu, Johns Hopkins University
Joe W. Ramos, University of Virginia
Jean F. Regal, University of Minnesota
Eric A. Shelden, University of Massachusetts, Amherst
Charles B. Shuster, Tufts University
Thomas W. Smith, Brigham & Women’s/Brigham Medical School
Robin L. Stears, SUNY, Stony Brook
Salme Taagepera, University of Virginia
Charlotte M. Vines, Harvard Medical School
Yingjian Wang, University of Miami
Christiane Wiese, Johns Hopkins Medical School
Elizabeth L. Winter, City College of New York
Vicki L. Wolff, Brandeis University
Qi Yang, University of Connecticut
Guangwen Zhou, Oregon State University

Short Courses
Analytical and Quantitative Light Microscopy in Biology, Medicine, and Materials Science
(May 10 to 18)

Co-Directors
Edward D. Salmon, University of North Carolina
Greenfield Sluder, Worcester Foundation for Experimental Biology
David E. Wolf, Worcester Foundation for Experimental Biology

Faculty and Course Assistants
Brad Amos, MRC, Cambridge, UK
Orit Baha, Worcester Foundation for Experimental Biology
Steven M. Block, Rowland Institute for Science
Richard Cardullo, Worcester Foundation for Experimental Biology
Walter Carrington, University of Massachusetts Medical School
Gordon Ellis, University of Pennsylvania  
Fred Fay, University of Massachusetts Medical School  
Jeff Gelles, Brandeis University  
Richard Haugland, Molecular Probes, Eugene, OR  
Linda Huffer, MBL  
Shinya Inoué, MBL  
Anthony Moss, Worcester Foundation for Experimental Biology  
Rudolf Oldenbourg, MBL  
Stephen Parsons, University of North Carolina  
Robert V. Skibbens, University of North Carolina  
Kenneth R. Spring, NIH  
D. Lansing Taylor, Carnegie-Mellon University  
Richard Walker, University of North Carolina  

Students  
Julia Barsony, NIDDK/NIH  
Harold G. Bohlen, Indiana University Medical School  
Daniel J. Brat, Mayo Graduate School  
Barry J. Burbach, SUNY, Stony Brook  
John P. Caufield, Harvard Medical School  
Wendy Cheng, International Paper Company, Tuxedo, NY  
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Ulrich Dirnagl, Forschungslabor, Germany  
Cynthia J. Forehand, University of Vermont  
John J. Freeman, Monsanto Co., St. Louis, MO  
Jill Gemmill, University of Alabama, Birmingham  
John A. Hammer, III, NHLBI/NIH  
Ray S. Hartman, Children’s Hospital of Los Angeles  
Donald T. Haynie, The Johns Hopkins University  
Walter J. Koroshetz, Massachusetts General Hospital  
Julia M. Lash, Indiana University School of Medicine  
Michael I. Lethem, University of North Carolina  
Steve Paddock, University of Wisconsin  
Shoshana Paglin, Boston University School of Medicine  
James R. Sellers, NHLBI/NIH  
Anna Spudich, Stanford University  
Fei Wang, Syracuse University

Measurement and Control of Chemical Stimuli (April 25 to 30)

Director  
Greg A. Gerhardt, University of Colorado  

Faculty and Course Assistants  
Barry W. Ache, C.V. Whitney Laboratory, University of Florida  
Jelle Atema, Boston University Marine Program, MBL  
Scott Brock, University of Colorado  
Marilyne Friedemann, University of Colorado  
John S. Kauer, Tufts—New England Medical Center  
Stuart Firestein, Yale University School of Medicine  
Paul Moore, Boston University Marine Program, MBL  
Mike Palmer, University of Colorado  
Michael Parrish, University of Colorado  
Wayne L. Silver, Wake Forest University

Students  
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Richard L. Doty, Hospital of the University of Pennsylvania  
Heather L. Eisthen, Indiana University  
Tim Granata, Southeastern Massachusetts University  
Kristina-Viveka Hillegaart, Astra Research Centre, Sweden  
Herman K. Lehman, University of Arizona  
Celia Marrase, Boston University Marine Program, MBL  
Pricilla E. Purnick, Columbia University  
John R. Welborn, University of Southern California

Methods in Computational Neuroscience  
(August 5 to September 1)

Co-Directors  
James M. Bower, California Institute of Technology  
Christof Koch, California Institute of Technology
Lecturers and Instructors
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Edward Adelson, Massachusetts Institute of Technology
Daniel Alkon, NIH
Richard Anderson, Massachusetts Institute of Technology
David Beeman, University of Colorado, Boulder
Avis H. Cohen, Cornell University
Norberto Grzywacz, Massachusetts Institute of Technology
Nancy Kopell, Boston University
Rudolfo Llinas, NYU Medical Center
Kevan Martin, MRC, Oxford, UK
Michael Mascagni, Washington, DC
Kenneth Miller, University of California, San Francisco
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David Rumelhart, Stanford University
Sylvia Ryckebusch, California Institute of Technology
Terrence Sejnowski, Salk Institute
Allen I. Selverston, University of California, San Diego
John Uhley, California Institute of Technology
David Van Essen, California Institute of Technology
Lucia Vaina, Boston University
Matthew Wilson, California Institute of Technology

Dietmar Rapf, MPI für biologische Kybernetik, Germany
Walter Schneider, University of Pittsburgh
Nelson Spruston, Baylor College of Medicine
Christoph Staub, Brain Research Institute, Switzerland
Fan-Gang Zeng, Syracuse University

Molecular Evolution (August 19 to 31)

Director
Mitchell L. Sogin, MBL

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W. Ford Doolittle, Dalhousie University, Canada
Robert Dorit, Harvard University
John W. Drake, National Institute of Environmental Health Sciences
Joseph Felsenstein, University of Washington
Walter M. Fitch, University of California, Irvine
Barry G. Hall, University of Rochester
Andrew Knoll, Botanical Museum of Harvard University
David R. Maddison, Harvard University
Peter Maloney, The Johns Hopkins Medical School
Roger Milkman, The University of Iowa
Gary Olsen, University of Illinois
Norman R. Pace, Indiana University
David Joseph Patterson, University of Bristol, UK
Margaret Riley, University of Massachusetts, Amherst
David A. Shub, SUNY, Albany
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Temple F. Smith, Dana Farber Cancer Institute
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Allan C. Wilson, University of California, Berkeley
Elizabeth A. Zimmer, Smithsonian Institution

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Dale Anders, University of California, San Diego
Evatar Av-Ron, The Weizmann Institute of Science, Israel
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Eyal Bartfeld, Rockefeller University
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Neil J. Berman, Oxford University, UK
Peter J. Braam, University of Utah
Dennis Bray, Colorado State University
Trevor Darrell, Massachusetts Institute of Technology
Gyongyi Gaal, University of Pennsylvania
Kurt Haas, Albert Einstein College of Medicine
Dirk Kautz, University of Oregon
Markus Lappe, NIH
Sean Marrrett, Montreal Neurological Institute, Canada
Douglas Morton, Case Western Reserve University

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Bruce J. Cochrane, University of South Florida
Rafael O. De Sa, University of Texas, Austin
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Philippe Djian, Harvard Medical School
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Kenneth A. Rice, Harvard University
Bernardo Rudy, NYU Medical Center
Frank G. Salinas, University of Houston
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Rama S. Singh, McMaster University, Canada
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Elizabeth T. Snow, NYU Medical Center
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Jeffrey L. Stein, University of California, San Diego
Youngbae Suh, Louisiana State University
Thomas R. Sutter, CIIT, Research Triangle Park, NC
Cheryl L. Tarr, University of North Dakota
Richard N. Williams, Boise State University
Charles G. Wray, Yale University

**Optical Microscopy & Imaging in the Biomedical Sciences (October 6 to 12)**

**Co-Directors**
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Colin S. Izzard, SUNY, Albany

**Faculty and Course Associates**
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John M. Murray, University of Pennsylvania
Kenneth Orndorff, Dartmouth College
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Stephen J. Smith, Stanford University School of Medicine
Kenneth R. Spring, NHLBI/NIH
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Shinya Inoué, MBL
Ernst Keller, Carl Zeiss, Inc., Thornwood, NY
Rudolf Oldenbourg, MBL

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Dean Cole, Los Alamos National Laboratory
R. Ford Denison, USDA
Camille DiLullo, University of Pennsylvania
Harold F. Dvorak, Beth Israel Hospital
David H. Eidelman, McGill University, Canada
T. R. Gowrishankar, University of Chicago
John W. Hanrahan, McGill University, Canada
Christopher M. Kenyon, Centre Hospitalier Thoracique de Montreal, Canada
Jeff Lansman, University of California, San Francisco
Stephen Lin, Harvard Medical School
William W. Mantulinn, University of Illinois, Urbana—Champaign
Jose A. Mari Mutt, University of Puerto Rico
Jane E. Minturn, Yale University School of Medicine
Spering A. Scott, Purdue University
Jacqueline Sterner, University of Rochester
Scott J. Sternberg, Colorado State University
Xiao-Ying Tien, Case Western Reserve University
Susan M. Wall, NIH
David C. Zawieja, Texas A&M University

*Pathogenesis of Neuroimmunologic Diseases (August 19 to 31)*

**Co-Directors**
J. Murdoch Ritchie, Yale University School of Medicine
Byron H. Waksman, Foundation for Microbiology

**Faculty**
Vahi E. Amassian, SUNY Health Science Center
Barry G. W. Arnason, University of Chicago
Joel A. Black, Yale University
Pietro DeCamilli, Yale University Medical School
Judah A. Denburg, McMaster Medical Center, Canada
Marc A. Dichter, University of Pennsylvania
Charles A. Dinarello, Tufts University Medical School
Diane Griffin, The Johns Hopkins University
Stephen L. Hauser, Massachusetts General Hospital
Henry Khachaturian, NIMH/NIH
Norman Latov, College of Physicians and Surgeons of Columbia University
Carl M. Leventhal, NINDS/NIH
W. Ian Lipkin, University of California, Irvine
Cathy G. McAllister, University of Pittsburgh
Dale E. McFarlin, NINDS/NIH
John Newsom-Davis, Oxford University, UK
Robert B. Nussenzblatt, NEJ/NIH
Nathanial G. Pitts, National Science Foundation
Jerome B. Posner, Memorial Sloan-Kettering Cancer Center
Donald L. Price, Johns Hopkins Hospital
Richard W. Price, University of Minnesota Health Center
James W. Prichard, Yale University Medical School
Cedric S. Raine, Albert Einstein College of Medicine
Anthony T. Reder, University of Chicago
David M. Regan, York University, Canada
Stephen C. Reingold, National Multiple Sclerosis Society
Benjamin F. Roy, Georgetown University School of Medicine
Clifford B. Saper, University of Chicago
Randolph B. Schiffer, Strong Memorial Hospital
Eli E. Sercarz, University of California, Los Angeles
Moon L. Shin, University of Maryland, Baltimore
Michael E. Shy, Thomas Jefferson University Hospital
Lawrence Steinman, Stanford Medical Center
Stephen G. Waxman, Yale University Medical School
Howard L. Weiner, Brigham and Women’s Hospital
Jerry Wolinsky, University of Texas Health Science Center at Houston

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Peter-Brian Andersson, Sir William Dunn School of Pathology, UK
Jody L. Baron, Yale University School of Medicine
Bruce F. Bebo, Jr., Texas A&M University
John R. Bethea, University of Alabama, Birmingham
Helen Clare Bodmer, Institut de Chimie Biologique, France
Arlene R. Collins, SUNY, Buffalo
Steven W. Dow, Colorado State University
Lorise C. Gahring, Research Institute of Scripps Clinic
Maureen N. Gannon, Rockefeller University
Claude Paul Genain, University of Kentucky
Koenraad Gijbels, University of Leuven, Belgium
Jonathan D. Glass, Johns Hopkins Hospital
John J. Hemperly, Becton Dickinson Research Center
Nancy A. Johnson, Washington University Medical School
Abraham Kessler, Weizmann Institute of Science, Israel
Judith Luber-Narod, University of Massachusetts Medical School
Mary Ann McKee, Columbia Presbyterian Hospital
Rune Midgard, Molde County Hospital, Norway
Nicholas T. Potter, University of Connecticut School of Medicine
Reijo Salonen, University of Turku, Finland
Jun-ichi Satoh, University of British Columbia, Canada
Tiziana Savio, Instituto Superiore di Sanita, Italy
Daryth D. Stallone, University of Pennsylvania School of Medicine
Sharon A. Stranford, Hahnemann University
Ursula J. Wesselmann, Northwestern University
Jurgen Zielask, Diabetes Research Institute, Germany
Summer Research Programs

Principal Investigators

Alkon, Daniel, NIH, LMCN
Armstrong, Clay M., University of Pennsylvania
Armstrong, Peter, University of California
Augustine, George J., University of Southern California

Baker, Robert, New York University Medical Center
Barlow, Robert, Syracuse University
Barry, Daniel, University of Michigan Medical Center
Barry, Susan R., University of Michigan
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Borst, David W., Illinois State University
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Charmantier-Daures, Mireille, Université des Sciences etTechniq. du Languedoc, France
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Fishman, Harvey M., University of Texas Medical Branch

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Garrick, Rita Anne, New Jersey Medical School and Fordham University
Giuditta, Antonio, University of Naples, Italy
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Goldman, Robert D., Northwestern University Medical School
Gonzalez-Serratos, Hugo, University of Maryland School of Medicine
Griff, Edwin, University of Cincinnati
Haimo, Leah T., University of California
Hernandez-Cruz, Arturo, Roche Institute of Molecular Biology
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Holman, Molly A., The Whitney Laboratory, University of Florida
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Ilan, Judith, Case Western Reserve University
Ip, Wallace, University of Cincinnati

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Karp, Richard, University of Cincinnati
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Lauffer, Hans, University of Connecticut
Lee, Youngsook, Harvard University
Lehman, Michael, University of Cincinnati
Levin, Jack, University of California School of Medicine, San Francisco
Levine, Robert Paul, Washington University School of Medicine
Lian, Jane, University of Massachusetts Medical School
Linck, Richard W., University of Minnesota
Lipicky, Raymond John, U. S. Food and Drug Administration
Lisman, John, Brandeis University

Llinas, Rodolfo R., New York University Medical Center
Loewenstein, Werner R., University of Miami School of Medicine
Lohmann, Kenneth J., University of Washington

Malchow, Robert Paul, University of Illinois College of Medicine
Malinowska, D. H., University of Cincinnati
Martinez, Joe L., Jr., University of California
Matteson, Donald R., University of Maryland
Meinertzhagen, Ian A., Dalhousie University, Canada
Metuzals, Janis, University of Ottawa, Canada
Mitchison, Timothy, University of California, San Francisco
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Nelson, Leonard, Medical College of Ohio
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Rafferty, Nancy S., Northwestern University
Rakowski, Robert F., UHS/The Chicago Medical School
Renderer, JoAnn, Hamilton College
Ripps, Harris, University of Illinois College of Medicine
Rose, Birgit, University of Miami School of Medicine
Ross, William N., New York Medical College
Ruderman, Joan V., Harvard Medical School
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Speksnijder, Johanna E., Utrecht University, The Netherlands  
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Spiegel, Melvin, Dartmouth College  
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Tykocinski, Mark L., Case Western Reserve University  
Tytell, Michael, Bowman Gray School of Medicine of Wake Forest University  

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Yeh, Jay Z., Northwestern University  

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Zottoli, Steven J., Williams College  
Zukin, R. Suzanne, Albert Einstein College of Medicine  

Summer investigators (left to right) David Borst, Guy Charmantier, Mireille Charmantier-Daures, Hans Laufer, and Brian Tsukimura  

Other Research Personnel  

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Landau, Matthew. Stockton State College
Larsen, Mark. University of Puget Sound
Lasser-Ross, Nechama. New York Medical College
Latorre, Ramon. Universidad de Chile, Chile
Lederhendler, I. Izja, NIH, NINDS
Leidigh, Christopher, Brown University
Leonard II, Edward E., University of Pittsburgh
Levitan, Herbert, University of Maryland
Lin, Jen-Wei, New York University Medical Center
Locke, Rachel, Washington University
Lowe, Kris, New College
Luca, Frank, Harvard Medical School

Martin, Melissa, Illinois State University
McDonald, John K., Emory University School of Medicine
Menichini, Enrico, University of Naples, Italy
Miledi, Ricardo, University of California
Milgram, Sharon L., Emory University School of Medicine
Mimori, Tsuneyo, Keio University, Japan
Misevic, Gradimir, University Hospital of Basel, Switzerland
Moogan, Teresa, Hunter College
Moreira, Jorge E., NIH, NINDS
Moshiach, Simon, NIH
Murray, Sandra A., University of Pittsburgh

Niclas, Joshua, University of California, San Francisco
Nitabach, Michael, Massachusetts Institute of Technology
Norgren, Robert, University of Cincinnati

Olds, James, NIH, LMCN

Papaconstantinou, Eleni, University and Cantonal Hospital, Switzerland
Pardo, Alex, Hampshire College
Parsey, Ramin, University of Maryland
Parsons, Stephen, University of North Carolina, Chapel Hill
Perozo, Eduardo, University of California, Los Angeles
Piccoli, Renata, University of Naples, Italy
Plant, Charles P., Tufts University
Powers, Maureen K., Vanderbilt University
Pumpkin, David W., University of Maryland, Baltimore

Quigley, James P., SUNY, Stony Brook

Rafferty, Keen A., University of Illinois
Rasgado-Flores, Hector, University of Health Sciences/Chicago Medical School
Reese, Thomas, NIH, NINDS
Rodriguez, Katrin, University of Illinois
Romero, Adarli, Washington University
Roth, William W., Emory University School of Medicine
Russell, Joshua C., University of Texas Medical Branch

Sagi, Amir, Hebrew University, Israel
Sakakibara, Manabu, Toyohashi, Japan
Sala, Salvador, University of Maryland, Baltimore
Sanchez, Ivelisse, Hunter College
Sanchez-Andres, Juan V., NIH
Sato, Eimei, Kyoto University, Japan
Schiminovich, Samuel, Englewood, NJ
Seemes, Eliana, University of Sao Paulo, Brazil
Sheetz, Jennifer, Woods Hole, MA
Sheller, Rebecca, University of Texas, Austin
Shibuya, Ellen, Harvard Medical School
Sivaramakrishnan, Shobhana, University of Southern California

Sosnicki, Andrzej A., University of Pennsylvania
Spires, Sherrill, University of Rochester
Steffen, Walter, University of Minnesota
Stewart, Patricia, University of Rochester
Stokes, Darrell R., Emory University
Stout, Matthew P., SUNY, Buffalo
Sugimori, Mutsuyuki, New York University Medical Center
Sweet, Hyla C., Union College
Syme, Douglas, University of California

Tewari, Kirti, University of Texas Medical Branch
Todaro, M. Antonio D., University of Modena, Italy
Tsukimura, Brian, Illinois State University
Turner, Robert, Lehman College

Ueno, Hiroshi, Rockefeller University

Vargas, Fernando, U. S. Food and Drug Administration
Vogel, Jackie M., Illinois State University

Wache, Susanne C., University of Connecticut
Wadsworth, Patricia, University of Massachusetts
Watson, Win, University of New Hampshire
Wells, Dan, Lexington, MA
Wiercinski, Floyd J., Northeastern Illinois University
Wu, Jian-Young, Yale University School of Medicine

Zakevicius, Jane M., University of Illinois College of Medicine
Zecevic, Dejan, University of Belgrade, Yugoslavia
Zheng, Qiang, Baylor College of Medicine
Zhi-quo, Liang, Population Council
Zigman, Bunnie Rose, University of Rochester School of Medicine and Dentistry
Zipser, David, E. Lansing, MI
Library Readers: General

Adler, Elizabeth, MBL
Apter, Nathaniel, Nova University
Baccetti, Baccio, University of Siena, Italy
Barrett, Dennis, University of Denver
Bartolucci, Simonetta, Naples, Italy
Burdick, Jonathan, MBL
Bursztajn, S., Baylor College of Medicine
Carriere, Rita M., Downstate Medical Center
Child, Frank M., Trinity College
Chinard, Francis P., New Jersey Medical School
Cobb, Jewel Plummer, California State University, Fullerton
Cohen, Leonard, American Health Foundation
DeSimone, Douglas W. , University of Virginia Health Science Center
DeToledo-Morrell, Leyla, Rush Medical Center
Dowling, John, Harvard University
Duncan, Thomas K., Nichols College
Edds, Kenneth T., SUNY, Buffalo
Eisen, Herman, Massachusetts Institute of Technology
Farmanfarmaian, A., Rutgers University
Fox, Tom, Harvard Medical School
Frenkel, Krystyna, NYU Medical Center
Friedler, Gladys, Boston University School of Medicine
German, James L., The New York Blood Center
Gilbert, Daniel L., NIH
Goldstein, Moise H., John Hopkins University
Goodman, Dewitt S., Columbia University
Gormley, Gerard, MBL
Guttenplan, Joseph, NYU Dental Center
Hill, Richard, Michigan State University
Humphreys, Tom, University of Hawaii
International Wildlife, MBL
Kaltenbach, Jane, Mount Holyoke College
Karl, Arthur, Columbia University
Kelly, Robert, U.I.C., College of Medicine
Kisten & Babitsky, MBL
Klemow, Kenneth M., Wilkes University
Kremer, James N., University of South California
Laderman, Aimlee D., Yale University
Lee, John J., City College of CUNY
Levitz, Mortimer, NYU Medical Center
Marine Research, MBL
May, Ronald, MBL
Mitchell, Ralph, Harvard University
Mooseker, Mark S., Yale University
Musacchia, X. J., University of Louisville
Olins, Ada L., University of Tennessee, Oak Ridge
Olins, Donald, University of Tennessee, Oak Ridge
Oschman, James L., MBL
Passano, Leonard, University of Wisconsin
Peisach, Jack, Albert Einstein College of Medicine
Pollan, Daniel, University of Massachusetts Medical School
Prosser, C. Ladd, University of Illinois
Prusch, Robert, Gonzaga University
Robinson, Denis, MBL
Romagnani, Sergio, Università di Firenze, Italy
Rossi, Mose, Naples, Italy
Rourke, John, MBL
Russell-Hunter, W. D., Syracuse University
Sanger, Jean, University of Pennsylvania
Sanger, Joseph W., University of Pennsylvania
Schipper, Jay M., WAFRA, New York, NY
Shriftman, Mollie-Starr, North Nassau Health Center
Singh, Ajai Pratap, Bareilly College
Solomon, Dennis, MBL
Stein, Leonard, Health Sciences Center SUNY
Stephens, Philip J., Villanova University
Stephenson, William K., Earlham College
Sweet, Frederick, Washington University School of Medicine
Szent-Gyorgyi, Andrew, Brandeis University
Szulman, Aron, MaGeWomens Hospital
Trager, William, The Rockefeller University
Van Holde, Kensal E., Oregon State University
Vaina, Lucia, Boston University
Wagner, Robert R., University of Virginia
Wallace, Robert W., MBL
Warren, Leonard, Wistar Institute
Wilber, Charles G., Colorado State University
Wimpee, Charles, MBL
Wittenberg, Jonathan, Albert Einstein College of Medicine
Wolken, Jerome, Carnegie Mellon University
Worgul, Basil, Columbia University
Worgul, Kathleen, MBL
Young, Wise, NYU Medical Center
Young, Lily, NYU Medical Center
Library Readers: Desks

Anderson, Everett, Harvard Medical School
Avioli, Louis V., Jewish Hospital, St. Louis
Boyer, John F., Union College
Candelas, Graciela C., University of Puerto Rico
Chaet, Alfred B., University of W. Florida
Clark, Arnold, MBL
Cohen, Seymour, MBL
Collier, Marjorie M., St. Peters College
Copeland, Eugene, MBL
Corliss, Bruce, Duke University
Crews, David, University of Texas, Austin
Czinn, Steven J., RB&C Hospital, Cleveland
Festoff, Barry, VA Medical Center, Kansas City
Fussell, Catherine, University of Pennsylvania
Gibson, Kevin, University of Pittsburgh
Gross, Paul R., University of Virginia
Grossman, Albert, NYU
Gruner, John, NYU Medical Center
Haubrich, Robert, Denison University
Herskovitz, Theodore, Fordham University
Inoue, Sadayuki, McGill University, Canada
Katz, George M., Merck, Sharp & Dohme
King, Kenneth, Childrens Hospital
Krane, Stephen, Mass. General
Kravitz, Edward, Harvard Medical School
Leighton, Joseph, Peralta Cancer Research
Lorand, Laszlo, Northwestern University
Malbon, Craig C., SUNY
Mauzarall, David, Rockefeller University
Mizell, Merle, Tulane University
Morrell, Frank, St. Lukes Medical Center, Chicago
Narahashi, Toshio, Northwestern University Medical School
Nickerson, Peter A., SUNY, Buffalo
Paton, David, MBL
Person, Philip, VA Medical Center, Brooklyn
Robinson, Denis, MBL
Roth, Jay, University of Connecticut
Roth, Lorraine, MBL
Shanklin, Douglas, University of Tennessee
Shepard, Frank, Woods Hole Database
Shepro, David, Boston University
Sonnenblick, B. P., Rutgers University
Spector, Abraham, Columbia University
Speck, William, Case Western Reserve
Stuart, Ann, University of North Carolina
Sundquist, Eric, USGS, Woods Hole
Sydlik, Mary Anne, Eastern Michigan University
Tweedel, Kenyon, University of Notre Dame
Webb, Marguerite, MBL
Wittenberg, Beatrice, Albert Einstein College of Medicine
Yow, Frank, Kenyon College

Library Readers: Rooms

Hines, Michael, Duke University Medical School
Moore, John W., Duke University Medical School
Rabinowitz, Michael, Harvard Medical School
Reynolds, George, Princeton University
Weidner, Earl, Louisiana State University
Weissman, Gerald, NYU Medical Center
Zweig, Ronald, MBL

Domestic Institutions Represented

Alabama, University of Birmingham
Albert Einstein College of Medicine
American Bionetics, Inc.
American Psychological Association
Ames Laboratory
Analytical Luminescence Laboratory
Applied Biosystems
Arizona Research Laboratory
Arizona, University of
Arizona, University of, School of Medicine
Aspen Research Institute
Atlantex & Zieler Instrument Corporation
Axon Instruments, Inc.
Bareilly College
Baruch College of CUNY
Baylor College of Medicine
Beckman Instruments, Inc.
Bethesda Research Labs
Bio-Rad Laboratories
Bodega Marine Station
Boston University
Boston University School of Medicine
Bowling Green State University
Bowman Gray School of Medicine
Brandeis University
Brigham & Women’s Hospital
Brinkmann Instruments, Inc.
Brooklyn College of CUNY
Brown University
Bryn Mawr College

duPont

Bunton Instrument Company, Inc.

California Institute of Technology

Coy

California, University of, Berkeley

Connecticut,

California, University of, Davis

Connecticut,

California, University of, Irvine

Columbia

California, University of, Los Angeles

Columbia

California, University of, Riverside

Columbia

California, University of, San Diego

Columbia

California, University of, San Francisco

Cambridge Instruments

Carnegie Technology

Carnegie-Mellon Institute of Washington

Carnegie-Mellon University

Case Western Reserve University

Center for Agricultural Biotechnology

Center for Marine Biotechnology

Center for Microbial Ecology, Michigan State University

Chicago, University of

Children's Hospital Medical Center

Ciba Corning Diagnostics Corp.

Cincinnati, University of

City College of New York

City University of New York (CUNY)

Clark University

Colgate University

Colorado College

Colorado, University of, Boulder

Columbia University

Columbia University College of Physicians and Surgeons

Connecticut, University of

Connecticut, University of, Health Center

Cornell University

Coy Laboratory Products

Crimson Camera Technical Sales

CSPI, Inc.

Dage MTI, Inc.

Dana-Farber Cancer Institute

Dartmouth College

Dawson Company

Delaware, University of

Diamond General Corporation

Digital Equipment Corporation

Donsanto Corporation

Duke University

Duke University Medical School

E. I. duPont de Nemours & Co., Inc.

Eastern Michigan University

East Tennessee State University

Eastman Kodak Company

E.G. & G., Inc.

Emory University

Emory University School of Medicine

Eppendorf, Inc.

Fisher Scientific

Florida State University

Florida, University of

Flow Laboratories

Fotodyne, Inc.

General Scanning, Inc.

Georgetown University Medical School

Georgia, University of

Gilson Medical Electronics, Inc.

Gonzaga University

Goucher College

Grass Instrument Company

Great Lakes Research Center

Hacker Instruments, Inc.

Frederick Haer & Company

Hahnemann Medical College

Hamilton College

Hampshire College

Harvard Medical School

Harvard University

Hawaii, University of

Health Sciences, University of

Holy Cross College

Honeywell Corporation

Howard Hughes Medical Institute

Howard University

Hunter College

Hunter College and CUNY Graduate Center

I.B.M.-T. J. Watson Research Center

ICN Radiochemicals

Illinois Institute of Technology

Illinois Natural History Survey

Illinois State University

Illinois, University of

Indec Systems, Inc.

Indiana University

International Biotechnologies, Inc.

Iowa, University of

Iowa, University of, College of Medicine

Institute for Basic Research in Developmental Disabilities

Institute of Neuroscience

ISCO, Inc.

JEOL

Jewish Hospital, St. Louis

Johns Hopkins University School of Medicine

Kansas, University of

Kentucky, University of

Kentucky, University of, Medical School

Kenyon College

Kinetic Systems

Kipp & Zonen

David Kopf Instruments

Lab Line Instruments, Inc.

Laser Science

Lehman College of CUNY

Linberg Enterprises

Loma Linda University

Los Alamos National Laboratories

Loyola University

Ludlum Measurements, Inc.

MaGee Womens Hospital

Maryland, University of

Maryland, University of, School of Medicine

Massachusetts Institute of Technology

Massachusetts, University of, Amherst

Massachusetts, University of, Boston

Massachusetts, University of, Medical Center

Massachusetts, University of, Medical School

Medical College of Ohio

Medical College of Virginia

Medical Systems Corporation

Merck & Company, Inc.

Merck Sharp & Dohme Research Laboratory, New Jersey

Miami, University of

Miami, University of, School of Medicine

Michigan State University

Michigan, University of, Ann Arbor

Minnesota, University of

Molecular Probes

Monsanto Company

Mount Holyoke College

Murray State University

National Institutes of Health/NINDS

National Institutes of Health/NIEHS

National Institutes of Health/NIDDK

National Jewish Center for Immunology & Respiratory Medicine

National Science Foundation

Naval Medical Research Institute

Neslab Instruments, Inc.

New Brunswick Scientific Company, Inc.

New College of the University of South Florida

New England Medical Center

New Hampshire, University of

New Jersey Medical School

New York Medical College

New York University Medical Center

New York University Medical Center
Nikon, Inc.
North Carolina, University of, Chapel Hill
North Dakota University
Northeastern University
North Nassau Health Center
Northwestern University Medical School
Notre Dame, University of
Ohio University
Oklahoma, University of
Olympus Corporation
Oregon State University
Oregon, University of
Pennsylvania State University
Pennsylvania, University of
Pennsylvania, University of, School of Medicine
Perceptics Corporation
Perkin-Elmer Corporation
Pharmacia, Inc.
Pharmacia LKB Nuclear, Inc.
Photometrics, Ltd.
Photonic Microscopy, Inc.
Photon Technology International
Pittsburgh, University of
Pittsburgh, University of, Medical School
Polaroid Corporation
Pomona College
Ponce School of Medicine
Population Council-CBR, The
Portland State University
Princeton University
Puerto Rico, University of
Puget Sound, University of
Purdue University
Quantex Corporation
Radiomatic Instruments & Chemical Company, Inc.
Reed College
Roche Institute of Molecular Biology
Rochester, University of
Rochester, University of, School of Medicine & Denistry
Rockefeller University, The
Salk Institute
San Francisco State University
Sarastro, Inc.
Savant Instruments, Inc.
Skanalytics
Scripps Clinic and Research Foundation
Scripps Institute of Oceanography
Sequoia Turner
Smith College
Sony Medical Electronics
Southern California, University of
Stanford University
Stanford University Medical Center
State University of New York
State University of New York, Albany
State University of New York, Buffalo
State University of New York, Purchase
State University of New York, Stony Brook
State University of New York, Syracuse
Stockton State College
Stratagene
Sutter Instrument Company
Swarthmore College
Swift Instruments, Inc.
Syracuse University
Technical Manufacturing Corporation
Technical Products International, Inc.
Technical Video, Ltd.
Temple University
Tennessee, University of
Texas Christian University
Texas Tech. University
Texas, University of, Austin
Texas, University of, Medical Branch
Texas, University of, Medical School
Texas, University of, Southwestern Medical Center
Tufts University School of Medicine
Tufts University School of Veterinary Medicine
Tulane University
Turner Designs
UHS/Chicago Medical School
Union College
United States Food & Drug Administration
Universal Imaging Corporation
Utah, University of
Vanderbilt University
Vassar College
Veterans Administration Medical Center
Videoscope International, Ltd.
Virginia, University of
Vital Images
Wake Forest University
Wake Forest University/Bowman Gray Medical School
Washington, University of
Washington University
Washington University School of Medicine
Wesleyan University
West Florida, University of
Wheaton College
Whitman College
Wild Leitz USA, Inc.
Williams College
Wisconsin, University of
Wistar Institute
Woods Hole Oceanographic Institution
Worcester Foundation for Experimental Biology
Yale University
Yale University School of Medicine
Zeiss, Carl, Inc.

Foreign Institutions Represented

Academy of Sciences, USSR
Bonn, University of, Germany
British Museum of Natural History, UK
Catania, University of, Italy
Centro de Investigacion del IPN, Mexico
Chiba University, Japan
Chiba University School of Medicine, Japan
Chile, University of, C.E.C.S., Chile

Basel, University of, Switzerland
Belgrade, University of, Yugoslavia
Bergen, University of, Norway
Bielefeld, University of, Germany
Biozentrum, Basel, Switzerland

Calgary, University of, Canada
Cambridge, University of, UK
Carlton University, Canada
CINEVESTAV-IPN, Mexico
Cologne, University of, Germany
Dalhousie University, Canada
Dalhousie University Medical School, Canada
Ecole normale supérieure, France
Federal University of Rio de Janeiro, Brazil
Freie Universität Berlin, Germany
Friedrich Miesener Institut, Switzerland
Göttingen, University of, Germany
Hamamatsu Photonics, K. K., Japan
Hebrew University, Israel
Hong Kong, University of, Hong Kong
Imperial College of Science & Technology, UK
Institute for Biological Research, Yugoslavia
Instituto di Biologia dello Sviluppo, CNS, Italy
Instituto M. y. M. Ferreyra, Argentina
Kaiserslautern, University of, Germany
Katholieke Universiteit Leuven, Belgium
Keio University, Japan
Kobe University, Japan
Köln, University of, Germany
Konstanz, University of, Germany
Kyoto University, Japan
Life Sciences Institute, Israel
London School of Hygiene & Tropical Medicine, UK
London, University of, Egham, UK
Max-Planck-Institüt für Biophysikalische Chemie, Germany
Max-Planck-Institut, Göttingen, Germany
McGill University, Canada
Medical Research Council, UK
Milan, University of, Italy
Modena, University of, Italy
Montreal, University of, Canada
Naples, University of, Italy
Nice, University of, France
Nottingham, University of, UK
Osnabrück, University of, Germany
Ottawa, University of, Canada
Paris, University of, France
Paul Scherrer Institute, Switzerland
Philips-Universität, Marburg, Germany
Philips-Universität, Germany
Protein Research Institute, USSR
Queens College, UK
Queens University, Canada
Queensland, University of, Australia
Regensburg, University of, Germany
Sao Paulo, University of, Brazil
Saskatchewan, University of, Canada
St. Andrews University, Scotland, UK
Seoul National University, Korea
Siena, University of, Italy
Simon Bolivar, University of, Venezuela
State University of Utrecht, The Netherlands
Stazione Zoologica, Italy
Stockholm, University of, Sweden
Swiss Federal Institute, Switzerland
Swiss Federal Institute of Technology, Switzerland
Toronto, University of, Canada
Tubingen, University of, Germany
Università di Firenze, Italy
Università di Palermo, Italy
Université des Sciences et Techniq. du Languedoc, France
University College, UK
University Hospital of Basel, Switzerland
Utrecht University, The Netherlands
Vienna, University of, Austria
Vrije Universiteit Brussel, Belgium
Wolfson College, UK
Z.L.F. Kantonsspital, Basel, Switzerland
Zoologie Institut, Germany
Year-Round Research Programs

**Boston University Marine Program**

**Faculty**
- Atema, Jelle (Professor of Biology, Program Director)
- Humes, Arthur G. (Professor of Biology Emeritus)
- Strickler, J. Rudi (Professor of Biology, Program Director)
- Tamm, Sidney L. (Professor of Biology)
- Valiela, Ivan (Professor of Biology)
- Ache, Barry (C. V. Whitney Lab, St. Augustine, Florida)
- Bambach, Richard (Virginia Polytech and State University)
- Bloomer, Sherman (Boston University)
- Borsy, Gary (University of Wisconsin, Madison)
- Caballero, Pascual (University of Las Palmas, Gran Canaria)
- Chang, Donald (Baylor College of Medicine, Texas)
- D'Avanzo, Charlene (Hampshire College)
- Dionne, Vincent (University of California)
- Gerhardt, Greg (University of Colorado)
- Good, Michael (Utrecht University, The Netherlands)
- Hinga, Kenneth (University of Rhode Island)
- Josephson, Robert (University of California, Irvine)
- Kauer, John (Tufts University)
- Kaufman, Les (New England Aquarium)
- Kremer, James (University of Southern California)
- Linck, Richard W. (University of Minnesota, St. Paul)
- Marrase, Celia (University of Barcelona, Spain)
- Meinertzhalen, Ian (Dalhousie University, Canada)
- Nakamura, Shogo (Toyama University, Japan)
- Patterson, David (University of Bristol, UK)
- Peckol, Paulette (Smith College)
- Perez Castillo, Fernando (CIQRO, Mexico)
- Rhoads, Donald (Adjunct Professor of Geology)
- Rietema, Carol (SUNY, New Paltz)
- Rosenbaum, Joel (Yale University)
- Sardet, Christian (Villefranche-sur-Mer, France)
- Sarda, Rafael (Centre d'Estudio Avancats de Blancs, Spain)
- Singarajah, K. V. (University of Brazil, Brazil)
- Steffan, Walter (University of Minnesota, St. Paul)
- Speksnijder, Annelies (Utrecht University, The Netherlands)
- Sulak, Ken (Huntsman Marine Science Centre, Canada)
- Terasaki, Mark (NIH)

**Research staff**
- Foreman, Kenneth (Research Associate)
- Gerardo, Hortense (Research Associate)
- Tamm, Signhild (Senior Research Associate)
- Voigt, Rainer (Research Associate)

**Teaching assistants and staff**
- Alber, Merryl (Course Assistant)
- Coughlin, David (Course Assistant)
- Cowan, Diane (Course Assistant)
- Gomez, George (Course Coordinator)
- Hahn, Dorothy (Senior Administrative Secretary)
- Hersh, Douglas (Course Assistant)
- LaMontagne, Michael (Course Assistant)
- Mosiach, Simon (Course Assistant)
- Mushow, Sandor (Course Assistant)
- Paulin, Susanne (Assistant to the Director)
- Scholz, Nathaniel (Course Assistant)
- Sunley, Madeline (Administrative Manager)
- Varela, Diana (Course Assistant)

**Graduate students**
- Alber, Merryl
- Banta, Gary
- Brewer, Matthew
- Bohachevsky, Boris
- Bryden, Cynthia
- Coughlin, David
- Cowan, Diane
- Eiskus, Adria
- Gallagher, Scott
- Gomez, George
- Hersh, Douglas
- Hwang, Jiang-shiou
- Karavanich, Christy
- Katz, Andrea
Kennedy, Blain
LaMontagne, Michael
Lavalli, Kari
Lindstrom, Daniel
Mazel, Charles
Merrill, Carl
Moore, Paul
Mosiach, Simon
Mulsow, Sandor
Portnoy, John
Scholz, Nathaniel
Strubel, Ilana
Tamse, Armando
Trager, Geoffrey
Usup, Gires
Varela, Diana
Weinstein, Diana
White, David

Undergraduate students Fall 1990
Annis, Eric
Boulanger, Lisa
Brand, Michelle (University of California, San Diego)
Carrama, Carolyn
Christine, Stephanie
Collumb, Chris (Trinity University)
Christman, Laurie
Cruse, Jennifer
Deiner, Michael (Tulane)
DeSantis, Michael
Dougall, David (University of Pittsburgh, Johnstown)
Fernandez, Cecilia
Forrest, Davina
Fox, Pamela
Gibson, Mark (Wesleyan)
Goodbred, Steven
Guertin, Laura (Bucknell)
Harris, Matthew
Havert, Michael
Hoyer, Eric (Lawrence University)
Kinkade, Christopher
Kozlowski, Wendy
MacDonald, Robin
McKee, Nancy (Middlebury)
McNeil, Sean
Polsky, Matthew
Russell, John (Franklin & Marshall)
Seton-Haris, Genevieve
Shaz, David
Smith, Douglas
Smith, Kirsten
Spradlin, Trevor
Staunton, Edward
Steenburgh, Eric
Stoulas, Brett (Lawrence University)
Tello, Christine
Valdes, Hugo
Warner, Jacqueline

BUMP graduate student Diane Cowan explains the finer points of the lobster to BUMP undergrads.

Youngberg, Jill
Ziembra, Robert

Visiting graduate students Fall 1990
Burner, Michael (Lawrence University)
Jones, Fynn (Vanderbilt)
Klaper, Rebecca (University of Illinois)
Maselli, Andrew (Knox College)
Naessig, Tricia (Augusta College)
Theis, Lisa (Lawrence University)

Summer undergraduate interns
Altes, Hester
Bergles, Dwight
Butler, Nina (Westtown School, PA)
Casterline, Jennifer
Call, Christopher
Hoagland, Todd (Bucknell)
Lacomis, Lynne (SUNY, Binghamton)
Pfeifer, Shaili
Pardo, Alex (Five Colleges)
Reischauer, Alyssa (USC)
Sanders, Sophie (Dalton School)
Short, Graham
Szulgit, Greg

Fall undergraduate intern
Waggett, Caryl (Brown)


**Laboratory of Jelle Atema**

Organisms use chemical signals as their main channel of information about the environment. These signals are transported in the marine environment by turbulent currents, viscous flow, and molecular diffusion. Receptor cells extract signals through various filtering processes. Currently, the lobster with its exquisite sense of taste and smell, is our major model to study the signal filtering capabilities of the whole animal and its narrowly tuned receptor cells. Research focuses on amino acids (food signals) and pheromones (courtship and dominance) neurophysiology of receptor cells, behavior guided or modulated by chemical signals, and computational models of odor plumes and neural filters.

**Laboratory of Arthur G. Humes**

Research interests include systematics, development, host specificity, and geographical distribution of copepods associated with marine invertebrates. Current research is on taxonomic studies of copepods from invertebrates in the tropical Indo-Pacific area, and pocillostomatoid and siphonostomatoid copepods from deep-sea hydrothermal vents and cold seeps.

**Laboratory of Ivan Valiela**

Our major research activity involves the Waquoit Bay Land Margin Ecosystems Research Project. This work examines how human activity in coastal watersheds (including landscape use and urbanization) increases nutrient loading to groundwater and streams. Nutrients in groundwater are transported to the sea, and, after biogeochemical transformation, enter coastal waters. There, increased nutrients bring about a series of changes. The Waquoit Bay LMER is designed to help us to understand and model the coupling of land use and consequences to receiving waters, and to study the processes involved.

A second long-term research topic is the structure and function of salt marsh ecosystems, including the processes of predation, herbivory, decomposition, and nutrient cycles.

**The Ecosystems Center**

The Center was established in 1975 to promote research and education in ecosystems ecology. Eleven senior scientific staff and forty research assistants and support staff study the terrestrial and aquatic ecology of a wide variety of ecosystems ranging from northern Europe (trace gas emission from acid-rain affected forests) to the Alaskan Arctic (long-term studies of the controls of tundra, lake, and stream biota) to the Harvard Forest (long-term studies of the effects of disturbance in forest ecosystems) to Buzzards Bay (controls of anaerobic decomposition). Many projects, such as those dealing with sulfur transformations in lakes and nitrogen cycling in the forest floor, investigate the movements of nutrients and make use of the Center's mass spectrometry laboratory (directed by Brian Fry) to measure the stable isotopes of carbon, nitrogen, and sulfur. The research results are applied wherever possible to questions of the successful management of the natural resources of the earth. In addition, the ecological expertise of the staff is made available to public affairs groups and government agencies who deal with such problems as acid rain, ground water contamination, and possible carbon dioxide-caused climate change. Opportunities are available for postdoctoral fellows.

**Staff and consultants**

Hobbie, John E., Co-Director
Mehillo, Jerry M., Co-Director
Banta, Gary
Bauman, Carolyn
Berger, Laurel
Bowles, Francis
Bowles, Margaret
Castro, Nancy
Cochran, Wendy
Davis, Sarah
Deegan, Linda
Dornblaser, Mark
Downs, Martha
Fatinski, Stephen
Fry, Brian
Garritt, Robert
Giblin, Anne
Gregg, Tim
Griffin, Elisabeth
Helfrich, John
Hopkinson, Charles
Hullar, Meredith
Jesse, Martha
Jordan, Marilyn

**Postdoctorals**

Bowden, Richard
Castro, Mark
Kling, George
McKane, Robert

**Visiting scholars**

Joyce, Linda, U.S.D.A. Forest Service
McGuire, David, U.S.D.A. Forest Service
Neill, Christopher, University of Massachusetts, Amherst

**Laboratory for Marine Animal Health**

The laboratory provides diagnostic, consultative research, and educational services to the institutions and scientists of the Woods Hole community concerned with marine animal health. Diseases of wild, captive, and cultured animals are investigated.

**Staff**

Abt, Donald A., Director and The Robert R. Marshak Term Professor of Aquatic Animal Medicine and Pathology.
School of Veterinary Medicine, University of Pennsylvania
A view of Alaska’s Brooks Range form the Ecosystems Center’s Toolik Lake research station. Photo by Mark Dornblaser.

Bullis, Robert A., Research Associate in Microbiology, University of Pennsylvania
Leibovitz, Louis, Director Emeritus
McCafferty, Michelle, Histology Technician, University of Pennsylvania
Moniz, Priscilla C., Secretary
Smolowitz, Roxanna, Research Associate in Pathology, University of Pennsylvania
Wadman, Elizabeth A., Microbiology Technician, University of Pennsylvania

Laboratory of Aquatic Biomedicine

This laboratory investigates leukemias of soft shell clams. Monoclonal antibodies developed by this laboratory and techniques in molecular biology are used to investigate the differences between normal and leukemic cells and their ontogeny. The impact of pollutants on leukemogenesis is currently being studied with an emphasis on regional superfund sites.

Staff

Reinisch, Carol L., Investigator, MBL, and Chairperson
Department of Comparative Medicine, Tufts University
School of Veterinary Medicine
Miosky, Donna, Laboratory Technician
White, Marja, Postdoctoral Fellow

Laboratory of Cell Biochemistry

This laboratory studies developmental, metabolic, and environmental influences on the genetic regulation of cellular enzymes. Current emphasis is on the gene products involved in hepatic heme biosynthesis and utilization in marine fish. These processes are responsive to hormonal and nutritional signals as well as to environmental pollutants and carcinogens. This work is being conducted with fish liver in vivo, with primary cultures of normal hepatocytes, and with cultured hepatoma cells isolated from a fish tumor. Gene activity is quantitated with cDNA probes, and the relevant genes are being cloned in bacteria to define better the actions of chemical inducers. Other research is concerned with translocation of proteins between various subcellular compartments both in fish hepatocytes and in invertebrate eggs before and after fertilization.

Staff

Cornell, Neal W., Senior Scientist
Bruning, Grace, Research Assistant
Foley, Kathleen, Research Assistant

Visiting scientist

Fox, T.O., Harvard Medical Center
Laboratory of Developmental Genetics

This research group studies the early gene control of cellular differentiation pathways (cell lineage determination) in the embryos of tunicates and other marine invertebrate species.

Staff
Whittaker, J. Richard, Senior Scientist
Crowther, Robert, Research Assistant
Loescher, Jane L., Research Assistant
Meeel, Thomas H., Assistant Scientist

Visiting investigators
Collier, J. R., Brooklyn College
Lee, James J., Columbia University, College of Physicians & Surgeons

Laboratory of Judith P. Grassle

Studies on the population genetics and ecology of marine invertebrates living in disturbed environments, especially of sibling species in the genus Capitella (Polychaeta).

Staff
Grassle, Judith P., Senior Scientist
Feinsilber, Sigalit, Research Assistant
Mills, Susan W., Research Assistant

Laboratory of Haryln O. Halvorson

This laboratory is interested in the molecular process of sporulation and germination in members of the genus Bacillus. Our earlier work has involved characterization of the gerJ gene in Bacillus subtilis, and determination of the germination requirements of marine endospore-forming bacteria.

Over the past year, we have isolated a large number of sporeformers from various marine environments like deep sea cores and sediments. Our intention is to characterize these bacteria at the molecular level, with emphasis on genes associated with sporulation and germination. Protocols based on DNA fingerprinting and quantitative hybridizations have been developed to differentiate these bacteria from one another, as well as from terrestrial sporeformers. The hybridization data has shown that the bacterial isolates are not closely related to one another.

Numerical taxonomic methods are also being used to cluster the various isolates. The physiologically interesting sporeformers will also be characterized by physical mapping using rare-cutting restriction endonucleases.

Staff
Halvorson, Haryln O., Principal Investigator
Chikarmane, Hemant, Assistant Scientist
Glick, Beatriz, Research Assistant
Pratt, Sara, Research Assistant
VanLooy, Lori, Research Assistant

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Laboratory of Shinya Inoué


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Stukey, Jetly, Research Assistant
Szent-Gyorgyi, David, Research Assistant
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Woodward, Bertha M., Laboratory Manager

Visiting investigators
Inoué, Theodore, Universal Imaging Corporation, West Chester, Pennsylvania
Silver, Robert B., Cornell University, Ithaca, New York
Stemmer, Andreas, University of Basel, Switzerland

Laboratory of Alan M. Kuzirian

The research explores the functional morphology and ultrastructure of various organ systems in opisthobranch mollusks. The program includes mariculture of the nudibranch, Hermissenda crassicornis, with emphasis on developing reliable culture methods for rearing and maintaining the animal as a research resource. Studies include optimization of adult and larval nutrition, control of facultative pathogens and disease, and development of morphologic criteria for staging larvae and juveniles. These morphologic studies stress the ontogeny of neural and sensory structures. Concurrent with these studies is the development of a new technique to obtain and reconstruct serial block face images (SBFI) of epoxy embedded tissue actually sectioned inside an SEM by an in situ miniature ultramicrotome. Additional collaborative research includes histochemical investigations on strontium's role in initiating calcification in molluscan embryos (shell and statoliths), as well as immunocytochemical labelling of cell-surface and secretory product antigens of neurosecretory neurons in the eye of Aplysia.

Staff
Alan M. Kuzirian, Assistant Scientist
Catherine T. Tamse, Research Assistant
that are triggered by it. In another project, the laboratory has discovered and is continuing research on a novel second messenger enzyme, an NADase, in the oocytes of *Aplysia* that generates cyclic ADPR, a Ca\(^{2+}\)-mobilizing product.

**Staff**

Strumwasser, Felix, Director
Cox, Rachel L., Senior Research Assistant
Glick, David, Senior Postdoctoral Fellow
Hellmich, Mark, Postdoctoral Fellow
Rainville, Carol, Laboratory Assistant
Vogel, Jackie, Research Assistant

**Laboratory of Robert E. Palazzo**

This laboratory studies the biochemical regulation of cellular events during meiosis and mitosis. An integral part of the research effort is the design of reconstitution systems that faithfully execute cell cycle dependent events under defined conditions. Current cell biological, immunological, biochemical, and microscopic methodologies are employed. Using marine eggs as a material source, assays have been developed that allow the study of germinal vesicle breakdown (GVBD), aster formation, and reactivation of isolated mitotic apparatus *in vitro*. Current focus of the laboratory is on the identification of cell cycle dependent regulatory events with major emphasis on protein phosphorylation and other post-translational modifications. The ultimate goal is the identification of key enzymes and target substrates that are involved in the regulation of cell division and are highly conserved during evolution.

**Laboratory of Monica Riley**

Research in this laboratory focuses on the molecular evolution and gene expression in the bacterium *Escherichia coli*. In a collaborative effort, a database containing information on the intermediary metabolism and biochemical pathways of *E. coli* is being developed. When completed, this database is expected to contain information on each metabolic reaction, the enzyme, the reactants, products, cofactors, activators, inhibitors, kinetics, equilibrium constants, binding constants, etc.

Related research is on the evolution of the *E. coli* DNA and organization of the genes in the chromosome. Comparative nucleotide and amino acid sequence data provide information on the evolutionary relationships of *E. coli* genes to homologous genes in related bacteria.

**Laboratory of Sensory Physiology**

Since 1973, the laboratory has conducted research on various aspects of vision. Current studies focus on photoreceptor cells, on their light-absorbing pigments, and on their biochemical reactions initiated by light stimulation. Microspectrophotometric and biochemical techniques are used to study the receptors of both vertebrates (amphibia, fish, and mammals) and invertebrates (horseshoe crab and squid).
Staff
Harosi, Ferenc, Director, Associate Scientist, MBL, and Boston University School of Medicine
Szuts, Ete, Associate Scientist, MBL, and Boston University School of Medicine

Visiting investigators
Evans, Barbara I., University of Oregon, Eugene
Hawryshyn, Craig W., University of Victoria, Canada
Lall, Abner B., Johns Hopkins University

Laboratory of Osamu Shimomura
Biochemical studies of the various types of bioluminescent systems. Preparation of the improved forms of aequorin for measuring intracellular free calcium.

Staff
Shimomura, Osamu, Senior Scientist, MBL, and Boston University School of Medicine
Shimomura, Akemi, Research Assistant

Visiting investigator
Nakamura, Hideshi, Harvard University

Laboratory of Raquel Sussman
We investigate the molecular mechanism of DNA damage-inducible functions in E. coli. Present studies deal with novel genes that affect radiation-induced mutagenesis and analysis of RecA functions.

Staff
Sussman, Raquel, Associate Scientist
Hemant Chikarmane, Postdoctoral Research Associate
Dudley, Karen, Research Assistant

National Vibrating Probe Facility
We are exploring the roles of ionic currents, gradients, and waves in controlling development. We focus on controls of pattern and controls by calcium ions.

Staff
Stephens, Raymond E., Principal Investigator
Szent-Gyorgy, Gwen, Research Assistant
Warren, Lisa, Research Assistant

Other Year-Round Investigators and Staff
Allen, Nina, Wake Forest College
Bates, William, Carleton University, Canada
Buonanno, Mark, Massachusetts Institute of Technology
Chrstal, Jane, University of Sidney, Australia
Cornwall, Carter, Boston University
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Gillot, Isabelle, Station Zoologique, Villefranche-sur-mer, France
 Isaacs, Hugh, Brookhaven National Laboratories
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Saunders, Mary Jane, University of South Florida, Tampa
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Shapiro, James, University of Chicago
Smith, Peter, Cambridge University, UK
Speksnijder, Johanna, University of Utrecht, The Netherlands
Friday Evening Lectures

Dennis Powers, Stanford University, Hopkins Marine Station, 29 June “Adapting to a Changing Environment: Genetic and Physiological Mechanisms”
Joan Ruderman, Harvard Medical School, 6 July “Controlling Cell Division”
James Spudich, Stanford University School of Medicine, 13 July “Manifestation of a Molecular Motor: From Muscle to Amoebae”
Ricardo Miledi, University of California, 19, 20 August (Forbes Lectures) “How to Study the Brain Using Frog Oocytes”
James Tiedje, Michigan State University, 27 July “Destruction of PCBs and Other Pollutants by a New Class of Anaerobic Sediment Microorganisms”
Ruth Sager, Dana-Farber Cancer Institute, 3 August “Tumor Repressor Genes”
A. James Hudspeth, University of Texas Southwestern Medical Center, 10 August “How the Ear's Works Work: Mechanoelectrical Transduction, Frequency Tuning, and Synaptic Transmission by Hair Cells of the Internal Ear”
Phil Leder, Harvard Medical School, 17 August “Limb Deformity: A Pleiotropic Mutation Governing Embryonic Pattern Formation in the Mouse”
Brian Fry, MBL Ecosystems Center, 24 August “Consumers and Carbon Isotopes: Good Chemistry in the Sea”
Thoru Pederson, Worcester Foundation for Experimental Biology, 31 August “Between Nucleus and Cytoplasm: The Baroque Process of Making mRNA as Studied from the Perspective of Cell Biology”

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Eugeni A. Vaisberg, Protein Research Institute, USSR

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Nikon Fellowship
Timothy Mitchison, University of California, San Francisco

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Bill Krasean, *Kalamazoo Gazette*
June Kinoshita, Freelance
Keming Kuo, Voice of America
Beth Livermore, Freelance
Michael Skoler, National Public Radio
Pamela Weintraub, *Onni*
Rick Weiss, *Science News*

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Youngsook Lee, Harvard University

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Robert Paul Malchow, University of Illinois
JoAnn Render, Hamilton College
Katherine Swenson, Harvard Medical School
Johanna E. Speksnijder, Utrecht University, The Netherlands
Eugenii Vaisberg, Protein Research Institute, USSR

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ARCS Foundation Fellow
Daniel S. Kessler, Rockefeller University

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Robert L. Bacallao, University of California, Los Angeles
Miles G. Cunningham, Massachusetts Institute of Technology
Charlotte M. Vines, Harvard Medical School

Biology Club of CUNY
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Hanno M. Roder, Massachusetts Institute of Technology

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Sylwester Chyb, Wesleyan University
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Maria G. DiBernardo, Instituto di Biologia dello Sviluppo, CNS, Italy

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Karen M. Page, Dartmouth College
Eric A. Shelden, University of Massachusetts, Amherst
Salme Taagepera, University of Virginia
Sandra A. Brockman, Carnegie-Mellon University
Tod A. Critchlow, Scripps Institute of Oceanography

Planetary Biology Internship
Jennifer E. Klenz, University of Saskatchewan, Canada

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Abdiel J. Alvarez, University of Puerto Rico
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Ebenezer Yamoah, University of Alberta, Canada

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Brian J. Binder, Massachusetts Institute of Technology
Sandra A. Brockman, Carnegie-Mellon University
Isabelle Carre, SUNY, Stony Brook
Joseph Cerro, Columbia University
Ka Hou Chu, Chinese University of Hong Kong, Hong Kong
Tod A. Critchlow, Scripps Institute of Oceanography
Michele I. Flatters, Tufts University
Holly Y. Goodson, Stanford University
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Certificate of Organization

Articles of Amendment

Bylaws of the MBL

Certificate of Organization

(On File in the Office of the Secretary of the Commonwealth)

No. 3170

We, Alpheus Hyatt, President, William Stanford Stevens, Treasurer, and William T. Sedgwick, Edward G. Gardner, Susan Mims and Charles Sedgwick Minot being a majority of the Trustees of the Marine Biological Laboratory in compliance with the requirements of the fourth section of chapter one hundred and fifteen of the Public Statutes do hereby certify that the following is a true copy of the agreement of association to constitute said Corporation, with the names of the subscribers thereto:

We, whose names are hereunto subscribed, do, by this agreement, associate ourselves with the intention to constitute a Corporation according to the provisions of the one hundred and fifteenth chapter of the Public Statutes of the Commonwealth of Massachusetts, and the Acts in amendment thereof and in addition thereto.

The name by which the Corporation shall be known is

THE MARINE BIOLOGICAL LABORATORY.

The purpose for which the Corporation is constituted is to establish and maintain a laboratory or station for scientific study and investigations, and a school for instruction in biology and natural history.

The place within which the Corporation is established or located is the city of Boston within said Commonwealth.

The amount of its capital stock is none.

In Witness Whereof, we have hereunto set our hands, this twenty seventh day of February in the year eighteen hundred and eighty-eight, Alpheus Hyatt, Samuel Mills, William I. Sedgwick, Edward G. Gardner, Charles Sedgwick Minot, William G. Farlow, William Stanford Stevens, Anna D. Phillips, Susan Mims, B. H. Van Vleck.

That the first meeting of the subscribers to said agreement was held on the thirteenth day of March in the year eighteen hundred and eighty-eight.

In Witness Whereof, we have hereunto signed our names, this thirteenth day of March in the year eighteen hundred and eighty-eight, Alpheus Hyatt, William I. Sedgwick, Edward G. Gardner, Charles Sedgwick Minot, William G. Farlow, William Stanford Stevens, Anna D. Phillips, Susan Mims, B. H. Van Vleck.

Bylaws of the Corporation of the Marine Biological Laboratory

(Revised August 17, 1990)

(These Bylaws have been extensively amended by the Board of Trustees and are subject to approval by the Corporation. If these amendments are not approved by the Corporation, the existing Bylaws will then remain in place.)
ARTICLE I—THE CORPORATION

1. Name and Purpose: The name of the Corporation shall be The Marine Biological Laboratory. The Corporation's purpose shall be to establish and maintain a laboratory or station for scientific study and investigation and a school for instruction in biology and natural history.

2. Nondiscrimination: The Corporation shall not discriminate on the basis of age, religion, color, race, national or ethnic origin, sex or sexual preference in its policies on employment and administration or in its educational and other programs.

ARTICLE II—MEMBERSHIP

1. Members: The Members of the Corporation ("Members") shall consist of persons elected by the Board of Trustees (the "Board"). The Corporation's bylaws, or other such procedures, shall be in accordance with such procedures, and shall not be inconsistent with law or these Bylaws, as may be determined by the Board. At any regular or special meeting of the Board, it may elect a Member or Members or any Member to vote at any meeting of the Members either in person or by proxy executed not more than three months prior to the date of such meeting. Except as otherwise limited therein, proxies shall entitle the persons named therein to vote at any adjournment of such meeting, but shall not be valid after final adjournment of such meeting. Proxies need not be sealed or attested and proxy purported to be executed by or on behalf of a Member entitled to vote shall be deemed valid unless challenged at or prior to its exercise. Members shall serve until their death or resignation unless otherwise removed from or without cause by the affirmative vote of two-thirds of the Trustees then in office. Any Member who has retired from his or her home institution may, upon written request to the Corporation, be designated a Life Member. Life Members shall not have the right to vote and shall not be assessed for dues.

2. Meetings: The annual meeting of the Members shall be held on the Friday following the second Tuesday in August of each year, at the Laboratory of the Corporation in Woods Hole, Massachusetts, at 9:30 a.m. If no annual meeting is held in accordance with the foregoing provision, a special meeting may be held in lieu thereof with the same effect as the annual meeting, and in such case all references in these Bylaws, except in this Article II.B., to the annual meeting of the Members shall be deemed to refer to such special meeting. Members shall transact business as may properly come before the meeting. Special meetings of the Members may be called by the Chairman or the Trustees, and shall be called by the Clerk, or in the case of the death, absence, incapacity or refusal by the Clerk, by any other officer, upon written application of Members representing at least ten percent of the smallest quorum of Members required for a vote upon any matter at the annual meeting of the Members, to be held at such time and place as may be designated. The Chairman of the Board shall preside at all meetings of the Corporation.

3. Notice of Meetings: Notice of any annual meeting or special meeting of Members, if necessary, shall be given by the Clerk by mailing notice of the time and place and purpose of such meeting at least 15 days before such meeting to each Member at his or her address as shown on the records of the Corporation.

4. Waiver of Notice: Whenever notice of a meeting is required to be given a Member under any provision of the Articles of Organization or Bylaws of the Corporation, a written waiver thereof, executed before or after the Meeting by such Member, or his or her duly authorized attorney, shall be deemed equivalent to such notice.

5. Adjournments: Any meeting of the Members may be adjourned to any other time and place by the vote of a majority of those Members present or represented at the meeting, whether or not such Members constitute a quorum, or by any officer entitled to preside at or to act as Clerk of such meeting, if no Member is present or represented. It shall not be necessary to notify any Members of any adjournment unless no Member is present or represented at the meeting which is adjourned, in which case, notice of the adjournment shall be given in accordance with Article II.E. Any business which could have been transacted at any meeting of the Members as originally called may be transacted at an adjournment thereof.

ARTICLE III—ASSOCIATES OF THE CORPORATION

1. Associates of the Corporation: The Associates of the Marine Biological Laboratory shall be an unincorporated group of persons (including associates and corporations) interested in the Laboratory and shall be organized and operated under the general supervision and authority of the Trustees. The Associates of the Marine Biological Laboratory shall have no voting rights.

ARTICLE IV—BOARD OF TRUSTEES

1. Powers: The Board of Trustees shall have the control and management of the affairs of the Corporation. The Trustees shall annually elect a Chairman of the Board who shall serve until his or her successor is selected and qualified. They shall annually elect a President of the Corporation who shall also be the Vice Chairman of the Board and Vice Chairman of meetings of the Corporation. They shall annually elect a Treasurer. They shall elect a Clerk, who shall be a resident of Massachusetts and shall serve a term of four years. Eligibility for re-election of Members of the Board shall be in accordance with the content of this Article IV as applied to Corporate or Board Trustees. They shall elect Trustees-at-Large as specified in this Article IV. They shall appoint a Director of the Laboratory for a term not to exceed five years, provided the term shall not exceed one year, if the candidate has attained the age of 65 years prior to the date of the appointment. They may choose such other officers and agents as they shall think best. They may fix the compensation of all officers and agents of the Corporation and may remove them at any time. They may fill vacancies occurring in any of the offices. The Board shall have the power to choose an Executive Committee from their own number as provided in Article V, and to delegate to such Committee such of their own powers as they may deem expedient in addition to those powers conferred by Article V. They shall, from time to time, elect Members to the Corporation upon such terms and conditions as they shall have determined, not inconsistent with law or these Bylaws.

2. Composition and Election: There shall be four groups of Trustees:

   (1) Trustees (the "Corporate Trustees") elected by the Members according to such procedures, not inconsistent with these Bylaws, as the Trustees shall have determined. Except as provided below, such Trustees shall be divided into four classes of six, one class to be elected each year to serve for a term of four years. Such classes shall be designated by the year of expiration of their respective terms.

   (2) Trustees ("Trustees-at-Large"). Nominees for Trustees-at-Large shall be introduced at the annual meeting of the Corporation for subsequent election by the Board according to such procedures, not inconsistent with these Bylaws, as the Trustees shall have determined. Such Trustees-at-Large shall be divided into four classes of four Trustees, one class to be elected each year to serve for a term of four years. Such classes shall be designated by the year of expiration of their respective terms. It is contemplated that, unless otherwise determined by the Trustees for good reason, Trustees-at-Large shall be individuals who have not been considered for elections as Corporate Trustees.

   (3) Trustees ex officio shall be the Chairman, the President, the Treasurer, the Clerk and the Director of the Laboratory.

   (4) Trustees emeriti shall include any Member who has retired from his or her home institution and has requested to serve as a Trustee emeritus provided he or she is a Member of the Board and has served as a Trustee for both these and prior years. A Trustee emeritus shall serve as a Trustee emeritus provided he or she has served as Trustee ex officio for at least eight years. Trustees ex officio and emeriti shall have all the rights of the Trustees, except that Trustees emeriti shall not have the right to vote.

   (5) The total number of Corporate Trustees and Trustees-at-Large elected in any year (excluding Trustees elected to fill vacancies which do not result from expiration of a term) shall not exceed ten. The number of Trustees-at-Large so elected shall not exceed four and, unless otherwise determined by vote of the Trustees, the number of Corporate Trustees so elected shall not exceed six. Corporate Trustees shall always constitute a majority on the Board of those elected or approved by the Members.

   (6) Newly elected Trustees shall take office at the February meeting of the Board, but may participate in discussions at intervening meetings following their election, without voting rights.

   (7) The Trustees and officers shall hold their respective offices until their successors are chosen and qualified.

3. Eligibility: A Corporate Trustee or a Trustee-at-Large who has served an initial term of at least two years' duration shall be eligible for re-election to a second term, but shall be ineligible for re-election to any subsequent term until two years have elapsed after he/she has last served as a Trustee.

4. Removal: Any Trustee may be removed from office at any time without cause, by the vote of a majority of the Members so entitled to vote in the election of Trustees. Any Trustee may be removed for cause by the vote of two-thirds of the Trustees then in office. A Trustee may be removed for cause only if notice of such action shall have been given to all of the Trustees or Members entitled to vote, as the case may be, prior to the meeting at which such action is to be taken and if the Trustee to be so removed shall have been given reasonable notice and opportunity to be heard before the body proposing to remove him or her.

5. Vacancies: Any vacancy in the Board, unless and until filled by the Members at any annual or special meeting of the Members, may be filled by vote of a majority of the remaining Trustees present at a meeting of Trustees at which a quorum is present or by appointment of all of the Trustees if less than a quorum shall remain in office.

6. Meetings: The annual meeting of the Trustees shall be held promptly after the annual meeting of the Members at the Laboratory in Woods Hole, Massachusetts. Special meetings of the Trustees may be called by the Chairman, the President or
by any seven Trustees to be held at such time and place as may be designated. The Chairman of the Board, when present, shall preside over all meetings of the Trustees. Written notice shall be sent to a Trustee's usual or last known place of residence at least two weeks before the meeting. Notice of a meeting need not be given to any Trustee if a written waiver of notice executed by such Trustee before or after the meeting is filed with the minutes of the meeting, or if such Trustee shall attend the meeting without protesting prior thereto or at its commencement the lack of notice given to him or her.

G Quorum Twenty-five Members shall constitute a quorum at any meeting. Except as otherwise required by law or these Bylaws, the affirmative vote of a majority of the Members voting in person or by proxy at a meeting attended by a quorum (present in person or by proxy) shall constitute action on behalf of the Members.

H Transfers of Interests in Land. There shall be no transfer of title or long-term lease of real property held by the Corporation without proper approval of not less than two-thirds of the Trustees. Such real property transactions shall be finally acted upon at a meeting of the Board only if presented and discussed at a prior meeting of the Board. Either meeting may be a special meeting and no less than four weeks shall elapse between the two meetings. Any property acquired by the Corporation after December 1, 1989 may be sold with the prior approval of not less than two-thirds of the Trustees (other than any Trustee or Trustees with a direct or indirect financial interest in the transaction being considered for approval) who are present at a regular or special meeting of the Board at which there is a quorum.

ARTICLE V—COMMITTEES

A Executive Committee The Executive Committee is hereby designated to consist of not more than ten Trustees, including the ex officio Trustees (Chairman of the Board, President, Treasurer, and Director of the Laboratory); and six additional Trustees, two of whom shall be elected by the Board each year, to serve for a three-year term.

Beginning with the Members elected for terms ending in 1990, one of the Trustees elected to serve on the Executive Committee shall be a Trustee-at-Large. Beginning with the Members elected for terms ending in 1991, the Trustees will elect, to the Executive Committee, Trustees to ensure that the Committee includes four Corporate Trustees and two Trustees-at-Large.

The Chairman of the Board shall act as Chairman of the Executive Committee and the President as Vice Chairman. The Executive Committee shall meet at such times and places and upon such notice and appoint such subcommittees as the Committee shall determine.

The Executive Committee shall have and may exercise all the powers of the Board during the intervals between meetings of the Board except those powers specifically withheld, from time to time, by vote of the Board or by law. The Executive Committee may also appoint such committees, including persons who are not Trustees, as it may, from time to time, approve to make recommendations with respect to matters to be acted upon by the Executive Committee or the Board.

The Executive Committee shall keep appropriate minutes of its meetings, which shall be reported to the Board. Any actions taken by the Executive Committee shall also be reported to the Board.

The elected Members of the Executive Committee shall constitute a Standing Committee for the Nominations of Officers, responsible for making nominations at each annual meeting of the Members and of the Board for candidates to fill each office as the respective terms of office expire (Chairman of the Board, President, Treasurer, Clerk and Director of the Laboratory).

B Board Committees Generally The Board shall have the power, by vote of a majority of the Trustees then in office, to elect an Investment Committee, a Nominating Committee and any other committee and, by like vote, to delegate thereto some or all of the powers of the Board except those which by law, the Articles of Organization or these Bylaws they are prohibited from delegating. The members of any such committee shall have such tenure and duties as the Trustees shall determine. The Investment Committee, which shall oversee the management of the Corporation’s endowment funds and marketable securities shall include as ex officio members, the Chairman of the Board, the Treasurer and the Chairman of the Audit Committee, together with such Trustees as may be required for not less than two-thirds of the Investment Committee to consist of Trustees. Except as otherwise provided by these Bylaws or determined by the Trustees, any such committee may make rules for the conduct of its business, but, unless otherwise provided by the Trustees or in such rules, its business shall be conducted as nearly as possible in the same manner as is provided by these Bylaws for the Trustees.

C Actions Without a Meeting Any action required or permitted to be taken at any meeting of the Executive Committee or any other committee elected by the Trustees may be taken without a meeting if all Members of such committees consent to the action in writing and such written consents are filed with the records of meetings. Members of the Executive Committee or any other committee elected by the Trustees may also participate in any meeting by means of a telephone conference call, or otherwise take action in such a manner as may, from time to time, be permitted by law.

ARTICLE VI—OFFICERS

A Enumeration The officers of the Corporation shall consist of a President, a Treasurer and a Clerk, and such other officers having the powers of President, Treasurer and Clerk as the Board may determine, and a Director of the Laboratory. The Corporation may have such other officers and assistant officers as the Board may determine, including (without limitation) a Chairman of the Board, and one or more Vice-Presidents, Assistant Treasurers or Assistant Clerks. Any two or more offices may be held by the same person. An officer need not be a Member or Trustee of the Corporation. If required by the Trustees, any officer shall give the Corporation a bond for the faithful performance of his or her duties in such amount and with such surety or sureties as shall be satisfactory to the Trustees.

B Term Except as otherwise provided by law, by the Articles of Organization or by these Bylaws, the President, Treasurer, and all other Officers shall hold office until the first meeting of the Board following the annual meeting of Members and thereafter, until his or her successor is chosen and qualified.

C Resignation Any officer may resign by delivering his or her written resignation to the Corporation at its principal office or to the President or Clerk and such resignation shall be effective upon receipt unless it is specified to be effective at some other time or upon the happening of some other event.

D Removal The Board may remove any officer with or without cause by a vote of a majority of the entire number of Trustees then in office, at a meeting of the Board called for that purpose and for which notice of the purpose thereof has been given, provided that an officer may be removed for cause only after having an opportunity to be heard by the Board at a meeting of the Board at which a quorum is personally present and voting.

E Vacancy A vacancy in any office may be filled for the unexpired balance of the term by vote of a majority of the Trustees present at any meeting of Trustees at which a quorum is present or by written consent of all of the Trustees if less than a quorum of Trustees shall remain in office.

F Director The Director shall be the chief operating officer and, unless otherwise voted by the Trustees, the chief executive officer of the Corporation. The Director shall, subject to the direction of the Trustees, have general supervision of the Laboratory and control of the business of the Corporation. At the annual meeting, the Director shall submit a report of the operations of the Corporation for such year and a statement of its affairs, and shall, from time to time, report to the Board all matters within his or her knowledge which the interests of the Corporation may require to be brought to its notice.

G Deputy Director The Deputy Director, if any, or if there shall be more than one, the Deputy Directors in the order determined by the Trustees, shall, in the absence or disability of the Director, perform the duties and exercise the powers of the Director and shall perform such other duties and shall have such other powers as the Trustees may, from time to time, prescribe.

H President The President shall have the powers and duties as may be vested in him or her by the Board.

I Treasurer and Assistant Treasurer The Treasurer shall, subject to the direction of the Trustees, have general charge of the financial affairs of the Corporation, including its long-range financial planning, and shall cause to be kept accurate books of account. The Treasurer shall prepare a report on the financial status of the Corporation to be delivered at the annual meeting. The Treasurer shall also prepare or oversee all filings required by the Commonwealth of Massachusetts, the Internal Revenue Service, or other Federal and State Agencies. The account of the Treasurer shall be audited annually by a certified public accountant.

The Assistant Treasurer, if any, or if there shall be more than one, the Assistant Treasurers in the order determined by the Trustees, shall, in the absence or disability of the Treasurer, perform the duties and exercise the powers of the Treasurer, perform such other duties and shall have such other powers as the Trustees may, from time to time, prescribe.

J Clerk and Assistant Clerk The Clerk shall be a resident of the Commonwealth of Massachusetts, unless the Corporation has designated a resident agent in the manner provided by law. The minutes or records of all meetings of the Trustees and Members shall be kept by the Clerk who shall record upon the record book of the Corporation minutes of the proceedings at such meetings. He or she shall have custody of the record books of the Corporation and shall have such other powers and shall perform such other duties as the Trustees may, from time to time, prescribe.
The Assistant Clerk, if any, or if there shall be more than one, the Assistant
Clerks in the order determined by the Trustees, shall, in the absence or
disability of the Clerk, perform the duties and exercise the powers of the Clerk
and shall perform such other duties and shall have such other powers as the Trustees
may, from time to time, prescribe.

In the absence of the Clerk and an Assistant Clerk from any meeting, a temporary
clerk shall be appointed at the meeting.

K Other Powers and Duties. Each officer shall have in addition to the duties
and powers specifically set forth in these Bylaws, such duties and powers as are
customarily incident to his or her office, and such duties and powers as the Trustees
may, from time to time, designate.

ARTICLE VII—AMENDMENTS

These Bylaws may be amended by the affirmative vote of the Members at any
meeting, provided that notice of the substance of the proposed amendment is stated
in the notice of such meeting. As authorized by the Articles of Organization, the
Trustees, by a majority of their number then in office, may also make, amend,
or repeal these Bylaws, in whole or in part, except with respect to the (a) the provisions
of these Bylaws governing (i) the removal of Trustees and (ii) the amendment of
these Bylaws and (b) any provisions of these Bylaws which by law, the Articles of
Organization or these Bylaws, requires action by the Members.

No later than the time of giving notice of meeting of Members next following
the making, amending or repealing by the Trustees of any Bylaw, notice thereof
stating the substance of such change shall be given to all Members entitled to vote
on amending the Bylaws.

Any Bylaw adopted by the Trustees may be amended or repealed by the members
entitled to vote on amending the Bylaws.

ARTICLE VIII—INDIVIDUAL

Except as otherwise provided below, the Corporation shall, to the extent legally
permissible, indemnify each person who is, or shall have been, a Trustee, director
or officer of the Corporation or who is serving, or shall have served at the request
of the Corporation as a Trustee, director or officer of another organization in which
the Corporation directs or indirectly has any interest as a shareholder, creditor or
otherwise, against all liabilities and expenses (including judgments, fines, penalties,
and reasonable attorneys’ fees and all amounts paid, other than to the Corporation
or such other organization, in compromise or settlement) imposed upon or incurred
by any such person in connection with, or arising out of, the defense or disposition
of any action, suit or proceeding, whether civil or criminal, in which he or
she may be a defendant or with which he or she may be threatened or otherwise
involved, directly or indirectly, by reason of his or her being or having been such
a Trustee, director or officer.

The Corporation shall provide no indemnification with respect to any matter as
to which any such Trustee, director or officer shall be finally adjudicated in such
action, suit or proceeding not to have acted in good faith in the reasonable belief
that his or her action was in the best interests of the Corporation. The Corporation
shall provide no indemnification with respect to any matter settled or
compromised unless such matter shall have been approved as in the best interests of
the Corporation, after notice that indemnification is involved, by (i) a disinterested majority
of the Board of the Executive Committee, or (ii) a majority of the Members.

Indemnification may include payment by the Corporation of expenses in
defending a civil or criminal action or proceeding in advance of the final disposition
of such action or proceeding upon receipt of an undertaking by the person indem-
nified to repay such payment if it is ultimately determined that such person is not
entitled to indemnification under the provisions of this Article VIII, or under any
applicable law.

As used in the Article VIII, the terms “Trustee,” “director” and “officer” include
their respective heirs, executors, administrators and legal representatives, and an
“interested” Trustee, director or officer is one against whom in such capacity the
proceeding in question or another proceeding on the same or similar grounds is
then pending.

To assure indemnification under this Article VIII of all persons who are determined
by the Corporation or otherwise to be or to have been "indemnities" of any employee
benefits plan of the Corporation which may exist, from time to time, this Article
VIII shall be interpreted as follows: (i) “another organization” shall be deemed
to include such an employee benefit plan, including without limitation, any plan of
the Corporation which is governed by the Act of Congress entitled "Employee
("ERISA"); (ii) “Trustee” shall be deemed to include any person requested by the
Corporation to serve as such for an employee benefit plan where the performance
by such person of his or her duties to the Corporation also imposes duties on or
otherwise involves services by, such person to the plan or participants or beneficiaries
of such plan ("plan") shall be deemed to include any non-exempt tax plan pursuant
to ERISA, and (iv) actions taken or omitted by a person with respect to an employee
benefit plan in the performance of such person's duties for a purpose reasonably
believed by such person to be in the interest of the participants and beneficiaries
of the plan shall be deemed to be for a purpose which is in the best interests of
the Corporation.

The right of indemnification provided in this Article VIII shall not be exclusive
of or affect any other rights to which any Trustee, director or officer may be entitled
under any agreement, statute, vote of Members or otherwise. The Corporation's
obligations to provide indemnification under this Article VIII shall be offset to the
extent of any other source of indemnification of any otherwise applicable insurance
coverage under a policy maintained by the Corporation or any other person. Nothing
contained in the Article shall affect any rights to which employees and corporate
personnel other than Trustees, directors or officers may be entitled by contract,
vote of the Board or of the Executive Committee or otherwise.

ARTICLE IX—DISSOLUTION

The consent of every Trustee shall be necessary to effect a dissolution of the
Marine Biological Laboratory. In case of dissolution, the property shall be disposed
of in such a manner and upon such terms as shall be determined by the affirmative
vote of two-thirds of the Trustees then in office in accordance with the laws of the
Commonwealth of Massachusetts.

ARTICLE X—MISCELLANEOUS PROVISIONS

A Fiscal Year Except as otherwise determined by the Trustees, the fiscal year
of the Corporation shall end on December 31st of each year.

B Seal Unless otherwise determined by the Trustees, the Corporation may
have a seal in such form as the Trustees may determine, from time to time.

C Execution of Instruments. All checks, drafts, leases, transfers, contracts, bonds,
notes and other obligations authorized to be executed by an officer of the Corporation
in its behalf shall be signed by the Director or the Treasurer except as the Trustees
may generally or in particular cases otherwise determine. A certificate by the Clerk
or an Assistant Clerk, or a temporary Clerk, as to any action taken by the Members,
Board of Trustees or any officer or representative of the Corporation shall as to all
persons who rely thereon in good faith be conclusive evidence of such action.

D Corporate Records. The original, or attested copies, of the Articles of
Organization, Bylaws and records of all meetings of the Members shall be kept in
Massachusetts at the principal office of the Corporation, or at an office of the Corpo-
ration's Clerk or resident agent. Said copies and records need not be all kept in
the same office. They shall be available at all reasonable times for inspection by
any Member for any proper purpose, but not to secure a list of Members for a purpose
other than in the interest of the applicant, as a Member, relative to the affairs of
the Corporation.

E. Articles of Organization. All references in these Bylaws to the Articles of
Organization shall be deemed to refer to the Articles of Organization of the Cor-
poration, as amended and in effect, from time to time.

F. Transactions with Interested Parties. In the absence of fraud, no contract or
other transaction between this Corporation and any other corporation or any firm,
association, partnership or person shall be affected or invalidated by the fact
that any Trustee or officer of this Corporation is pecuniarily or otherwise interested
in or is a director, member or officer of such other corporation or of such firm,
association or partnership or is a party to or is pecuniarily or otherwise interested
in such contract or other transaction or is in any way connected with any person or
persons, firm, association, partnership, or corporation pecuniarily or otherwise interested
therein, provided that the fact that he or she individually or as a director,
member or officer of such corporation, firm, association or partnership is such
a party or so interested shall be disclosed to or shall have been known by the Board
of Trustees or a majority of such Members thereof as shall be present at a meeting
of the Board of Trustees at which action upon any such contract or transaction
shall be taken; any Trustee may be counted in determining the existence of a
quorum and may vote at any meeting of the Board of Trustees for the purpose of
authorizing any such contract or transaction with like force and effect as if he/she
were not so interested, or were not a director, member or officer of such other
corporation, firm, association or partnership, provided that any vote with respect
to such contract or transaction must be adopted by a majority of the Trustees then
in office who have no interest in such contract or transaction.