THE BULLETIN

Mount Desert Island Biological Laboratory

Volume 45
2006

Published by the Mount Desert Island Biological Laboratory
May 2006
$10.00

THE BULLETIN

VOLUME 45, 2006

Mount Desert Island Biolgical Laboratory
Salisbury Cove, Maine 04672

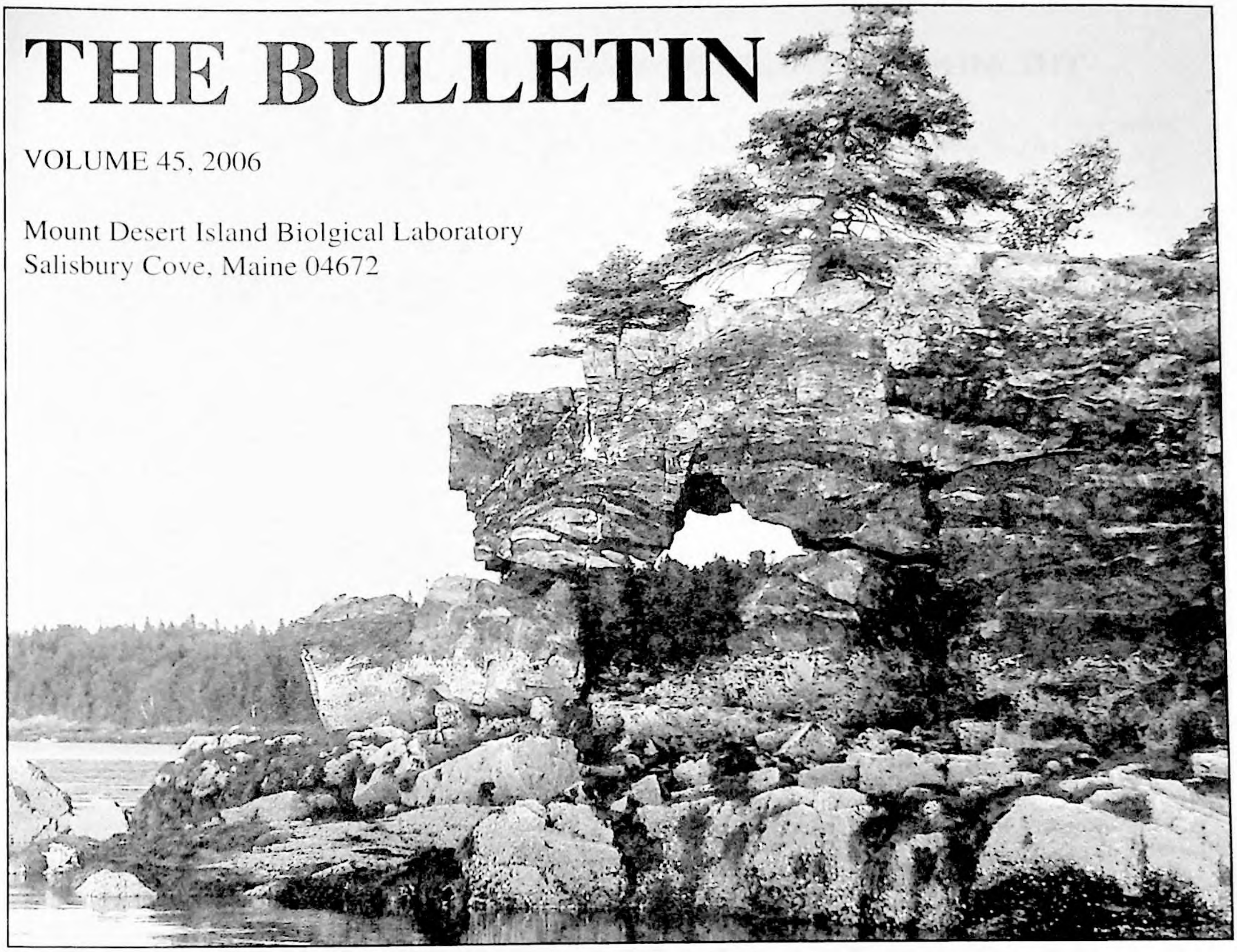

TABLE OF CONTENTS

THE MOUNT DESERT ISLAND BIOLOGICAL LABORATORY

RESEARCH AND EDUCATION IN THE BIOLOGY OF MARINE ANIMALS

INTRODUCTION

The Mount Desert Island Biological Laboratory (MDIBL) is an independent, non-profit marine and biomedical research facility and international center for comparative physiology, toxicology and marine functional genomic studies. The Laboratory is located on the north shore of Mount Desert Island, overlooking the gulf of Maine about 120 miles northeast of the Portland near the mouth of the Bay of Fundy. The island, well known for Acadia National Park, provides a variety of habitats including shallow and deep saltwater, a broad intertidal zone, saltwater and freshwater marshes, freshwater lakes and streams, forests and meadows.

The Laboratory is among the oldest cold-water research facilities in the Eastern United States, and its unique site provides an outstanding environment for studying the physiology of marine and freshwater flora and fauna. During 2005, the scientific personnel included 86 doctoral level scientists (including 59 Investigators), plus 103 students, and technical staff, representing 56 institutions in 26 states, Australia, and Europe.

HISTORY AND ORGANIZATION

MDIBL was founded in 1898 at South Harpswell, Maine by J.S. Kingsley of Tufts University. The Wild Gardens of Acadia donated its present site at Salisbury Cove, and relocation was completed in 1921. The Wild Gardens of Acadia, a land-holding group headed by George B. Dorr and John D. Rockefeller, Jr., who was instrumental in the founding of Acadia National Park.

In 1914, the Laboratory was incorporated under the laws of the State of Maine as a non-profit scientific and educational institution. Founded as a teaching laboratory, MDIBL is now a center for marine research and education that attracts investigators and students from across the U.S. and around the world. Since the pioneering work of H.W. Smith, E.K. Marshall and Roy P. Forster on various aspects of renal and osmoregulatory physiology of local fauna, the Laboratory has become known worldwide as a center for investigations in electrolyte and transport physiology, developmental biology, electrophysiology and marine molecular biology.

The Mount Desert Island Biological Laboratory is owned and operated by the Board of Trustees and Members of the Corporation; at present, there are 378 members. Officers of the Corporation - Chair, Vice-Chair, Director, Secretary, Treasurer, Clerk - and an Executive Committee are elected from among the Trustees. The Chair and Executive Committee oversee and promote long-range goals of the Laboratory. The Director, with the aid of a full-time Administrative Director, staff and a Scientific Advisory Committee is responsible for implementing the scientific, educational and public service activities of the Laboratory.

NIEHS CENTER FOR MEMBRANE TOXICITY STUDIES

The Center for Membrane Toxicity Studies (CMTS), an NIEHS Marine and Freshwater Biomedical Sciences Center was established at the Mount Desert Island Biological Laboratory (MDIBL) in 1985. The purpose of this Center has been to involve a group of internationally recognized investigators, who are primarily experts in mechanisms of epithelial transport, to study the biological effects of environmental pollutants on cell and membrane transport functions. The primary emphasis of this research effort has been to elucidate the mechanisms of toxicity of environmental pollutants at the cellular and molecular level, using novel aquatic models developed at this laboratory.

The focus of the research programs of the Center has broadened in the last several years from the more narrow objective of identifying the molecular targets for the effects of heavy metals (or metal compounds) on cell functions, to include the effects of a broader range of environmental toxicants (including marine toxins) and the mechanisms by which the organism takes up and eliminates a wide range of xenobiotics and environmental pollutants. However, the concept that a "membrane lesion" accounts for the cellular toxicity of many environmental toxins still remains as a paradigm.

Research Cores: The Center consists of two highly integrated research cores or themes consisting of:

- Signal Transduction and Ion Transport
- Xenobiotic Transport and Excretion

Investigators in the Signal Transduction and Ion Transport Core are examining the basic mechanisms concerning the cell's signaling response to changes in its external environment, particularly as related to environmental stress, heavy metal exposure, marine toxins and environmental estrogens. These signaling pathways often involve mechanisms of homeostasis of ion transport, pH and cell volume regulation. Investigators in the Core are interested in determining the fundamental mechanisms by which cells regulate their cell volume, maintain internal pH and secretory functions and how these processes are disturbed by environmental influences. Investigators in the Xenobiotic Transport and Excretion Core are examining the processes that are used by various epithelial tissues such as the liver and kidney to take up and excrete drugs and xenobiotics and other toxic compounds that enter from the environment and to study the effects of toxicants on this process. Investigators in this Core also interact with investigators working in the signal Transduction and Ion Transport Core.

Facilities Cores: The Center provides for five facility cores for Center investigators. These include:

- an Animal Core that is responsible for the acquisition, and maintenance of the many marine species available to investigators at this Center;
- an Instrumentation and Facilities Core that maintains the basic laboratory equipment that investigators would not otherwise be able to easily bring to the laboratory (a fully equipped cell culture and molecular biology facility, Marine DNA Sequencing Center, and an electrophysiology facility);
- a Cell Isolation, Culture and Organ Perfusion Core that provides isolated cells and tissues from marine species to Center investigators;
- an Imaging Core that maintains and operates a confocal fluorescent microscope as well as providing other imaging technology including epifluorescence and video-enhanced microscopy;
- a Bioinformatics Core that is the site of development of a national Comparative Toxicogenomics Database and webpage design. This core incorporates molecular data on marine sequences with a highly annotated database and provides comparative information with human genes of toxicologic interest.

All Center members and pilot recipients have free access to these core facilities. Non-Center members who utilize these facilities are charged appropriate fees.

Community Outreach and Education Program: The Center's outreach program involves community education on water monitoring programs. This is directed primarily at high school and college students in the immediate area of the laboratory. However, an extensive summer research educational program includes high school students from both regional and national sites, the latter emphasizing minority student education as well as college and postdoctoral fellowship training.

Pilot Projects: The Pilot Project Program provides support for investigators who are interested in pursuing a new project related to environmental toxicology in one or more of the Center's Research Cores. The purpose of these Pilot grants is to obtain preliminary data to facilitate new grant submissions. Grants are awarded competitively and successful applicants receive up to $10,000/season.

APPLICATIONS AND FELLOWSHIPS

Research space is available for the entire summer season (June 1 - September 30) or a half-season (June 1 - July 31 or August 1 - September 30). Applications for the coming summer must be submitted by February 1st each year. Investigators are invited to use the year-round facilities at other times of the year, but such plans should include prior consultation with the *MDIBL* office concerning available facilities and specimen supply.

A number of fellowships and scholarships are available to research scientists, undergraduate faculty and students, and high school students. These funds may be used to cover the cost of laboratory rent, housing and supplies. Stipends are granted with many of the student awards. Applicants for fellowships for the coming summer research period are generally due in January.

For further information on research fellowships, please contact:

Dr. Patricia H. Hand
Administrative Director
Mount Desert Island Biological Laboratory
P.O. Box 35
Salisbury Cove, Maine 04672
Tel. (207) 288-3605
Fax. (207) 288-2130
phand@mdibl.org

Students should contact:

Michael McKernan
Director of Education and Conferences
mmckernan@mdibl.org

ACKNOWLEDGEMENTS

The Mount Desert Island Biological Laboratory is indebted to the National Institutes of Health and National Science Foundation and for substantial support. Funds for building renovations and new construction continue to permit the Laboratory to expand and upgrade its research and teaching facilities. Individual research projects served by the Laboratory are funded by private and government agencies, and all of these projects have benefited from the NSF and NIH grants to the Laboratory. For supporting our educational initiative, MDIBL acknowledges the National Science Foundation Research Experience for Undergraduates, Maine IDeA Network for Biomedical Research Excellence (NCRR/NIH), Cserr/Grass Foundation, Milbury Fellowship Fund, Northeast Affiliate of the American Heart Association, Cystic Fibrosis Foundation, Blum/Halsey Fellowship, Stanley Bradley Fund, Stan and Judy Fund, Adrian Hogben Fund, Bodil Schmidt-Nielsen Fellowship Fund, Maine Community Foundation, the Hearst Foundation, the Betterment Fund and many local businesses and individuals.

REPORT TITLES

Invited Review

Ionic Regulation

Comparative Biochemistry and Molecular Biology

Comparative Physiology

Molecular Toxicology and Xenobiotic Transport