



Marine Biological Laboratory



THE UNIVERSITY OF
CHICAGO

2016-2017 ANNUAL REPORT

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The MBL Annual Report is published by the Marine Biological Laboratory. Although the greatest possible care has been taken in the preparation of this record, the MBL recognizes the possibility of inaccuracies. If any are noted, please accept our apology and advise us of any corrections to be made.

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Marine Biological Laboratory
7 MBL Street
Woods Hole, MA 02543
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From the President and Director

In May 2017 we were privileged to add the role of Interim Co-Directors to our existing long-time connections to the Marine Biological Laboratory.

As we started our work, a primary goal was to listen to the diverse perspectives of the MBL community while a search was conducted for long-term leadership. Through the interim year we worked to implement strategic initiatives for the MBL that had been developed over the past four years. The research and education highlights shared in this report reflect some of the progress made in these initiatives over the 2016-2017 time period.

The MBL's transformative impact on science is a result of the ways in which it has fostered collaboration and innovation for well over a century. Throughout this time, the critical asset of the MBL has been, and continues to be, its people—the scientists, staff and diverse supporters that make its distinctive research and learning possible. In that regard, we thank you for your input, energy, and engagement as we support and champion the MBL in our new roles as Interim Co-Directors.

Sincerely,



Melina Hale,
Vice Provost for Academic Initiatives,
and William Rainey Harper Professor
in the College and the Department
of Organismal Biology and Anatomy,
University of Chicago



Neil Shubin,
Robert R. Bensley Professor in the
Department of Organismal Biology
and Anatomy, and Associate Dean for
Academic Strategy in the Biological
Sciences Division



Highlights



David Mark Welch, Jennifer Morgan Receive Appointments

Evolutionary biologist David Mark Welch, Director of the Josephine Bay Paul Center and MBL Senior Scientist was named Interim Director, Division of Research. Mark Welch has been associated with the MBL for more than 15 years. He has been Director of the Bay Paul Center since 2013. MBL Associate Scientist Jennifer Morgan was named Director of the Eugene Bell Center for Regenerative Biology and Tissue Engineering. Morgan was recruited to the MBL in 2012 and has served as the Associate Director of the Bell Center since that time. Morgan's research program focuses on understanding how synapses normally function and how synaptic function is affected by neurological diseases. They succeed Jonathan Gitlin, who retired in June 2017, and previously held both positions.



"Smart" Cephalopods Trade Off Genome Evolution for Prolific RNA Editing

A study led by Senior Scientist Joshua Rosenthal suggested that the cephalopod's evolutionary path to neural sophistication includes a novel mechanism: prolific RNA editing at the expense of evolution in their genomic DNA. The story was widely covered in the popular media, including the *New York Times* and *The Atlantic*. Rosenthal is a neurobiologist whose research focuses on developing new, genetically tractable marine model organisms and understanding how they are affected by a changing environment. He is leading the MBL's Marine Organisms strategic theme, bringing cutting edge imaging, genomic, and computational tools to bear on the use of marine organisms to better understand basic biology. Specifically, Rosenthal and colleagues have embarked on a groundbreaking effort to culture cephalopods in the laboratory with the goal of creating a new genetic model system.



Four Scientists are Named Distinguished Scientists

Four scientists were named Distinguished Scientists of the Marine Biological Laboratory. The title is conferred to highly accomplished scientists whose exceptional work at the Marine Biological Laboratory is of recognized national and international significance. The honors were conferred at a meeting of the MBL Society. Following the announcement, a permanent exhibit honoring the Laboratory's Distinguished Scientists was unveiled in the lobby of Lillie Building. Named Distinguished Scientists of the Marine Biological Laboratory were John E. Dowling, Avram Hershko, Joan V. Ruderman, and Ronald D. Vale. Previously named MBL Distinguished Scientists are: Shinya Inoué (1986); John E. Hobbie (2005); Osamu Shimomura (2008); Jerry M. Melillo (2010); Mitchell L. Sogin (2014); and Ivan Valiela (2014).



Long-term Ecological Research Sites Receive Grant Renewals

Anne Giblin, Ecosystems Center Interim Director was awarded a \$6.8 million National Science Foundation grant to study how sea-level rise, climate change, and human impacts are reshaping the marshes and estuaries behind Plum Island, Mass., the largest remaining marsh area in the northeastern United States. Giblin received the grant as lead investigator of NSF's Long-Term Ecological Research (LTER) program at Plum Island Sound. MBL ecologists have been conducting research at the site since the late 1980s and have directed the Plum Island LTER since its creation in 1998. For the fourth consecutive decade, MBL scientists will lead the nation's primary research project on Arctic ecology and its responses to climate warming, with \$6.8 million in NSF funding awarded to Senior Scientist Edward B. Rastetter, lead investigator of the LTER site at Toolik Lake, Alaska.



Hibbitt Early Career Fellowship Program Established

Three talented postdoctoral scientists were named the inaugural Hibbitt Early Career Fellows in Spring 2017. The fellowships were awarded to Caroline Albertin, Kristen Hunter-Cevera, and Duygu Özpolat. The opportunity attracted a strong applicant pool, and 100% of the offers made were accepted. Albertin is interested in the unusual body plans of the cephalopods and was part of a team that reported the first genome sequence from a cephalopod. Hunter-Cevera studies the population dynamics of marine cyanobacterium and how changes in ocean temperature affect key species of phytoplankton. Özpolat is a developmental biologist who studies the mechanisms of reproductive cell regeneration. The program, funded by a generous gift from Susan and David Hibbitt, MBL Trustee, provides talented scientists the chance to set up research programs of their own as an alternative to traditional postdoctoral positions.



Education Program Score High Marks from Alumni; Launches New Course

The MBL was exceedingly highly rated in an independent survey of MBL Discovery Course alumni from 2005-2016. The overwhelming majority of alumni respondents felt their time at MBL was well spent—even extraordinary in many cases. 99% of the more than 600 respondents rated it as either very worthwhile or transformative. In 2016 a new course titled Physical Biology of the Cell, directed by Rob Phillips (Caltech) and Hernan Garcia (UCSF), explored a broad array of topics from modern biology using the language of physics and mathematics. The course was aimed at those interested in learning more about how to construct theoretical models of biological systems as well as the use of computational tools to simulate and test the predictions of those models.



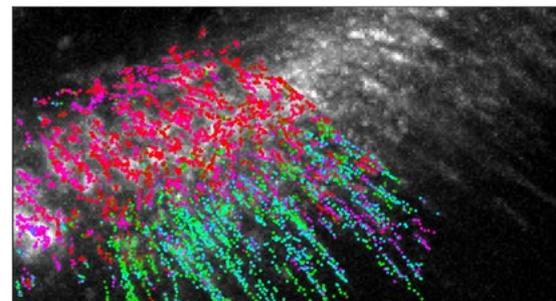
Ron Vale Receives Shaw Prize for Discovery of Motor Protein Family, Kinesin, at MBL

Ronald Vale, who led a group of scientists at the MBL to the seminal discovery of kinesin, one of the major families of motor proteins, was awarded the prestigious 2017 Shaw Prize in Life Science and Medicine, often called the “Nobel of the East.” Vale was a student visiting the MBL in the mid-1980s when he and collaborators purified a mystery motor protein from the axoplasm of squid, which they later called kinesin. The discovery opened up a still-flourishing research field exploring kinesin’s critical biological functions including moving molecular cargo in cells and separating chromosomes during cell division. Vale is a Professor at the University of California-San Francisco, a Howard Hughes Medical Institute Investigator, and MBL Distinguished Scientist. He received the Shaw Prize along with Ian Gibbons of University of California-Berkeley, who discovered the other major family of motor proteins, dynein, in the 1960s.



National *Xenopus* Resource Expands; Provides Critical Resources to Scientists

The National *Xenopus* Resource (NXR) provides customized transgenic and mutant frogs to the *Xenopus* research community, as well as advanced training workshops and research facilities for visiting scientists. With growth over the last six years and advances in genome technology leading to new mutant lines of animals, the need for expansion was identified. Marko Horb, NXR Director and Principal Investigator received an NIH expansion grant that funded an expansion that will allow the facility to hold 100-200 additional lines and keep pace with the changing technologies. The new space will also help the NXR to continue to attract visiting scientists.

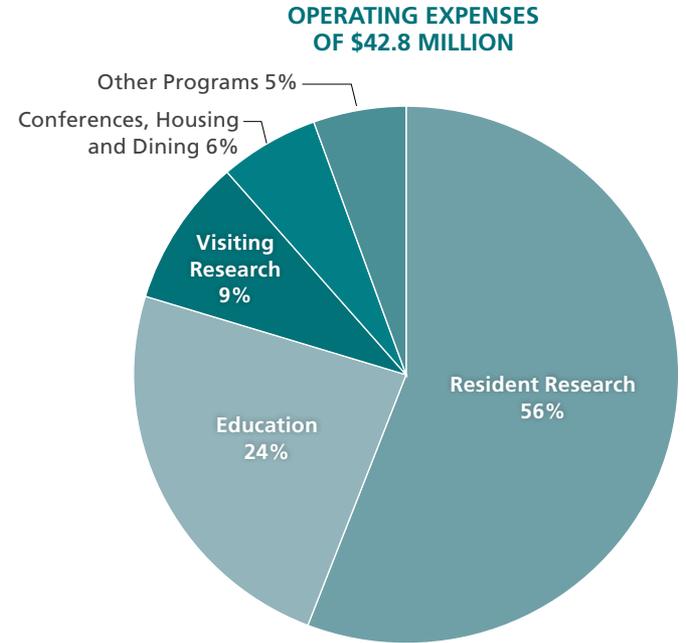
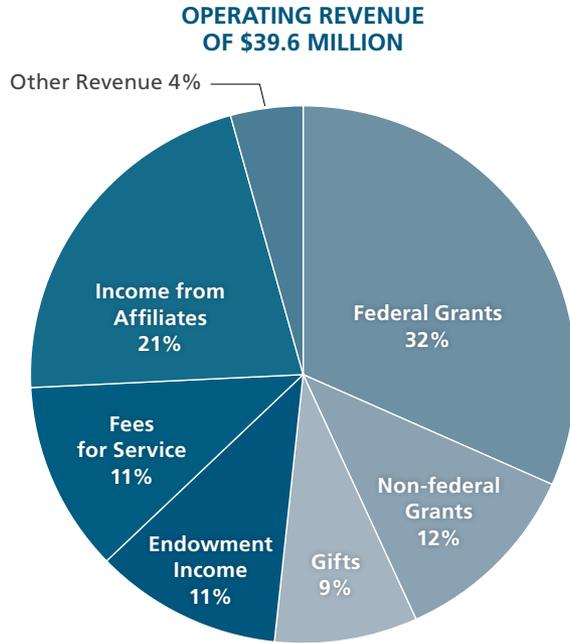


Two New Microscopes Developed at MBL

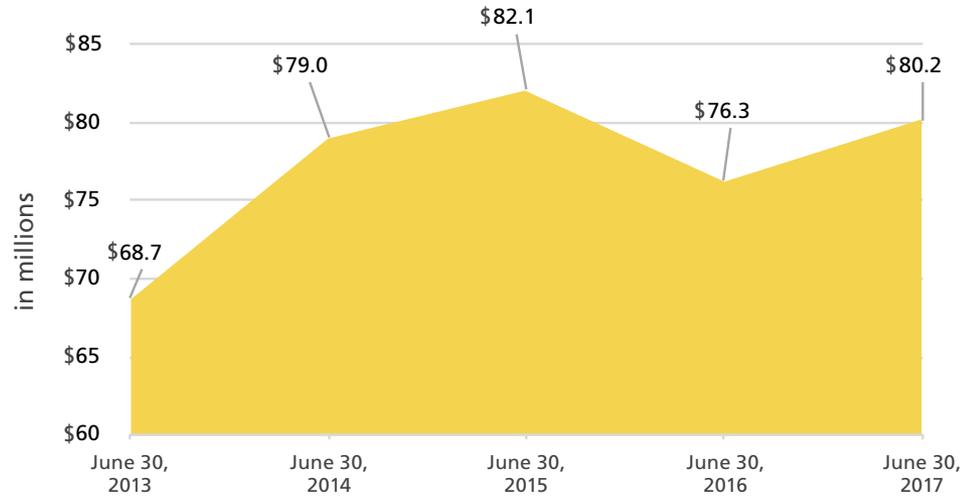
Taking a cue from medical imaging, scientists working in the Whitman Center invented a multi-view microscope that captures higher-resolution, 3D images of live cells and tissues without upping the dose of potentially harmful radiation the specimens receive. MBL Fellows Hari Shroff (National Institute of Biomedical Imaging and Bioengineering) and Patrick La Rivière (University of Chicago) reported that the new system achieved resolution which is double the volumetric resolution of traditional fluorescence microscopy methods. Another new microscope, developed by MBL scientists Tomomi Tani and Shalin Mehta (now at Chan Zuckerberg Biohub) can track the position and orientation of individual molecules in living cells—nanoscale measurements that until now have posed a significant challenge. Tani and Mehta used the microscope to address various biological questions in collaboration with a team of MBL Resident and Whitman Scientists.



Financials
Fiscal Year
June 30, 2017



ENDOWMENT VALUE



The financial statements of the Marine Biological Laboratory for the fiscal year ending June 30, 2017 were audited by KPMG. Complete financial statements are available on request from:

Financial Services
 Marine Biological Laboratory
 7 MBL Street
 Woods Hole, MA 02543



Report of the Development Committee



I am pleased to report on the Marine Biological Laboratory's development progress for the 2017 Fiscal Year: July 1, 2016 through June 30, 2017.

In FY17 we raised \$7,076,738 in new private support for MBL's research and educational programs from over 900 individuals, foundations, and companies. This impressive figure is a testament to the MBL's history of scientific excellence, our powerful impact on biological research, and the vision of an equally impactful and sustainable future.

Funds raised during this time include several major gifts in support of MBL programs and initiatives, including: David and Susan Hibbitt, who provided \$2 million to establish the Hibbitt Early Career Fellows Program, giving talented scientists the chance to establish their own research programs; The Burroughs Wellcome Fund, who pledged \$660,000 in support of the MBL Physiology and Embryology courses; and The Grass Foundation, who pledged \$486,000 in support of the Neurobiology and Neural Systems and Behavior courses. Please see a full list of our supporters in the pages that follow.

We also raised \$1,008,966 in Annual Giving in FY17 — unrestricted funds that are immediately available to meet operational needs. Much of this impressive figure is made up of gifts of \$50, \$20, and sometimes even \$10, but they can add up to a large sum. We continued to expand annual giving, participating in our second annual 'Giving Day,' a joint fundraising effort with the University of Chicago. This one-day event added \$46,000 to our annual fund, a wonderful group effort by the development teams at MBL and the University.

The MBL community is wide-reaching, and there is strength in numbers. Every gift, whether it's \$20 or \$20,000, makes an impact. I'm grateful to our Trustees, MBL Council and Society members, scientists, alumni, faculty, friends, and to every one of our extraordinary donors.

On behalf of the Development Committee, the Board of Trustees, and the staff of the MBL – thank you all for your generosity!

A handwritten signature in black ink, appearing to read 'JP', written in a cursive style.

Gratefully,
Jeffery Pierce, Chair

The Marine Biological Laboratory gratefully acknowledges the generous contributions and pledges of the individuals, foundations, and companies who supported our programs and operations.

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\$100,000 - \$999,999

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Huntington** and Vicki Willard

GIFTS AND GRANTS TO FELLOWSHIPS, SCHOLARSHIPS, AND OTHER FUNDS

We gratefully acknowledge donors to the following funds that enable the Marine Biological Laboratory to stay competitive by attracting and supporting top researchers and students.

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The Josephine Bay Paul Center for Comparative Molecular Biology and Evolution

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Elizabeth Spelke, Harvard University
Thomas Spencer, University of Missouri
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Rob Steele, University of California, Irvine
Wolfgang Stein, Illinois State University
Claudio Stern, University College London
Andrea Streit, King's College London
Michael Stryker, University of California, San Francisco
David Swofford, Duke University
Lidia Szczupak, Universidad de Buenos Aires
Tracy Teal, Data Carpentry
Jamie Theobald, Florida International University
Julie Theriot, Stanford University School of Medicine
Manuel Thery, Hopital Saint-Louis
Krista Todd, University of California, San Diego
James Townsel, Meharry Medical College
Paul Trainor, Stowers Institute for Medical Research
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Matthijs Van Der Meer, Dartmouth College
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John Wallingford, University of Texas, Austin
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Melanie Wellington, University of Rochester Medical Center
Theodore White, University of Missouri – Kansas City
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Carmen Williams, National Institute of Environmental
Health Sciences
Emma Wilson, University of California, Riverside
Daniel Wolpert, University of Cambridge
Emma Wood, University of Edinburgh
Terrence Wright, California State University, Sacramento
David Wu, University of Chicago
Ryohei Yasuda, Max Planck Florida Institute
for Neuroscience
Deborah Yelon, University of California, San Diego
Anne Yoder, Duke University
Rafael Yuste, Columbia University
Robert Zeller, San Diego State University
Yi Zuo, University of California, Santa Cruz
Derrick Zwickl, University of Arizona
Daniel Zysman, Massachusetts Institute of Technology

*deceased

**former Trustee

Photos

Cover: Pygmy Squid *Idiosepius paradoxus* (Tom Kleindinst)

Inside front cover: MBL campus from the Belltower Gardens (Emily Zollo)

P1: Interim Co-Directors Melina Hale and Neil Shubin

P2: L to R: David Mark Welch (Emily Zollo); Jennifer Morgan (Emily Zollo); California Two-Spot Octopus *Octopus bimaculoides* (Tom Kleindinst); MBL Distinguished Scientists: John Dowling, Ronald Vale, Joan Ruderman, Avram Hershko, Shinya Inoué, Mitchell Sogin (Elizabeth Armstrong)

P3: L to R: Toolik Lake LTER (Jim Laundre); Caroline Albertin; Kristen Hunter-Cevera; Duygu Özpolat (Aaron Pomerantz); Physical Biology of the Cell student Lokesh Pimpale and course co-director, Hernan Garcia (Megan Costello)

P4: L to R: Ronald Vale (Ryan Anson / AP Images for HHMI); Marko Horb, Marcin Wlizla, Sean McNamara (Emily Zollo); Color-coded actin filament orientation overlaid on an image of fluorescence intensity (Shalin Mehta and Tomomi Tani)

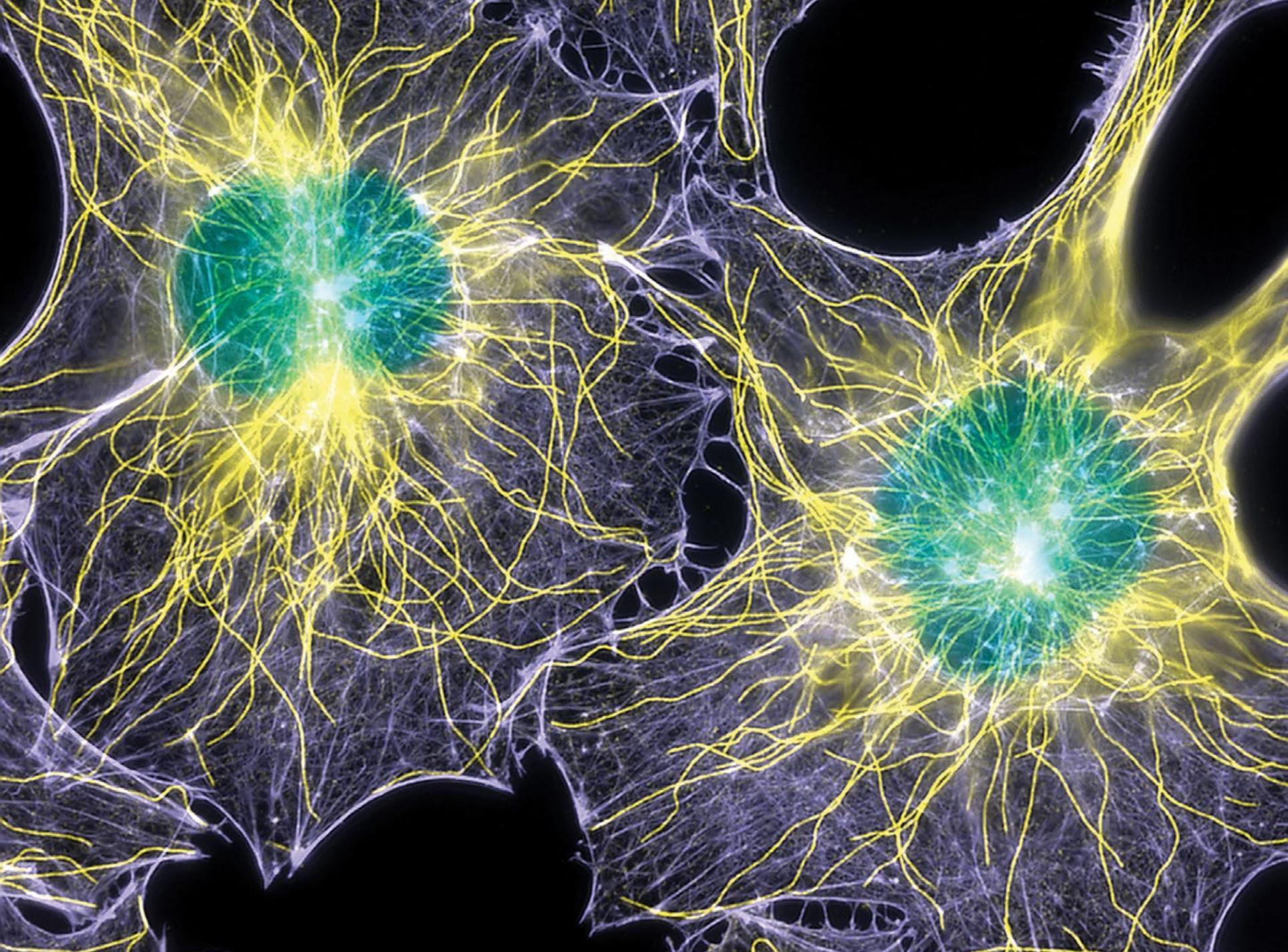
P5: Little Sippewissett Marsh (Megan Costello)

P7: UChicago student Jennifer Teng (Megan Costello)

P8: Jeffery Pierce (Dan Cutrona)

P21: Aerial view of Woods Hole and MBL campus (Matt Barton)

Inside back cover: Fluorescent light micrograph of two mouse fibroblast cells. (Torsten Wittmann)



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1888

The image is a monochromatic blue-toned graphic. At the center is a circular seal. Inside the seal is a shield-shaped emblem. The top of the shield features a stylized evergreen tree. Below the tree is a dark rectangular box containing the year '1888' in white, serif font. The shield is flanked by two figures, possibly representing scientists or explorers, holding the shield. The entire seal is surrounded by a circular border filled with intricate, detailed illustrations of various marine organisms, including shells, corals, and other sea creatures. The background of the entire image is a solid, dark blue color.