



NETWORKS, CENTERS, OBSERVATORIES, AND FIELD STATIONS

The Organization of Biological Field Stations at Fifty

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Introduction

The study of ecology has resulted in major advances in human understanding of complex ecosystems, yet its central focus has drifted over time away from organismal and natural history research toward theoretical and modeling approaches (Barrows et al. 2016). Despite this shift, vibrant, field-based science education and research is occurring across the globe via integrated, transformative, hands-on activities at field stations (Billick et al. 2013). Field stations facilitate observation and tracking of environmental change, link ecology and human health, spark new biomedical technology, and create a collaborative learning community. Field station studies range from molecular to organismal, from simple experiments to high-tech genomic and isotopic work, from micro- to macro-landscapes.

Field stations are centers for research, teaching, and engagement that provide environmental information and education around the globe (Tydecks et al. 2016). Field stations provide a physical and intellectual space for at least four societal functions, including (1) observation of environmental change,

(2) training the next generation of scientists and continuing training of practicing educators and natural resource professionals, (3) engaging the public in science and discovery of the natural world, and (4) space to test new technologies and methods (NRC 2014). Field stations also are important repositories of long-term data sets and plant and animal collections. These data sets are especially valuable in the face of local to global changes in temperature, precipitation, storm intensity, phenology, and other factors associated with changing climate and land use.

The Organization of Biological Field Stations was founded a half-century ago. The mission of the Organization of Biological Field Stations always has been to facilitate the highest quality environment for scientists, students, teachers, and the public in pursuing research and education to enhance biological and environmental understanding. Independently and working with the Organization of Biological Field Stations, field stations connect society via shared goals, including caring for the land through science, informing policy, and making science and nature accessible to all. Acknowledging that a comprehensive review of field station history and impacts on science and policy is beyond the scope of this article, we summarize some of the more relevant reports and activities of the Organization of Biological Field Stations and field stations here; additional publications and materials are available on the Organization of Biological Field Stations website (www.obfs.org).

Varied as the Land Itself

Field stations have existed since at least 1843 when the Rothamsted Agricultural Experiment Station was founded in England (notably, the *H.M.S. Beagle* functioned as a mobile field station and enabled Darwin's expeditionary science in the decade prior). The earliest field stations in North America were established in the late 1800s. Arvey and Riemer (1966) noted that field stations were developed "to exploit the out-of-doors as a teaching aid. Emphasis was on nature study. Only gradually was research added to the program." Williams pointed out that "Varied as the land itself, inland stations have at least one common feature—they are located in natural situations where field studies may be pursued with little chance of interruption by human activity. Among them an evolution has occurred, each station adapting to its own environment" (OIBFS 1966a).

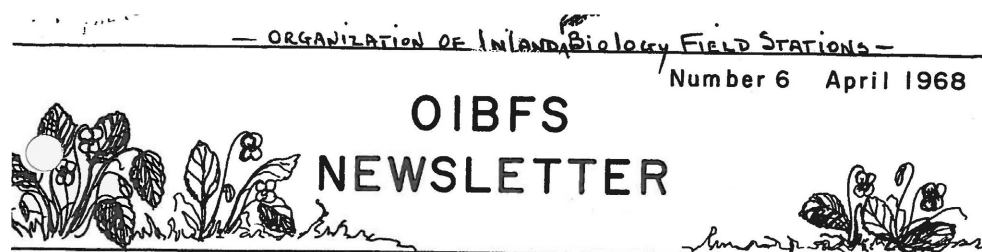
Each field station has a unique history and story, representing the goals of its founders, surrounding ecosystem, and scientific culture. By 1945, there were at least 53 such stations reported as operating in the United States. Post-World War II, many field stations were chronically underfunded and operated with little coordination of activities or innovations in teaching and research; by 1966, only 20 of those originally recognized facilities had survived. Vernberg et al. (1963) provided updated and detailed information on the facilities available at 31 marine and 15 inland field stations in addition to a number of fisheries units.

Arvey and Riemer (1966) summarized the basic functions and structures and the problems faced by inland biological field stations in the United States through the early 1960s. They were the first to identify a need for an organization that served field stations. Arvey and Riemer (1966) provided basic information on 42 field stations of which they were aware, although it is likely that many more field stations existed as university facilities focused primarily on supporting academic curricula via hands-on learning experiences (e.g., the University of Michigan's Camp Filbert Roth founded in 1937).

Formation of the Organization of Biological Field Stations

The early vision for the Organization of Biological Field Stations was to address opportunities and challenges specific to field stations operating independently or distant from the home academic institution. Initially, the Organization of Biological Field Stations name included the word “Inland” to distinguish itself from marine and oceanographic laboratories; at that time, the Organization of Inland Biological Field Stations included 34 charter members (Fig. 1). The name was shortened to the Organization of Biological Field Stations a few years later when several marine stations became members. The Organization of Biological Field Stations’ sister organization, the National Association of Marine Laboratories or NAML, was established in 1990 with similar goals for marine-focused facilities. Many coastal and marine stations now belong to both organizations.

A series of meetings, conferences, and publications in the early 1960s pointed to the need for inland biological stations to come together and discuss common goals. These were chronicled in the first newsletter of the newly formed Organization of Inland Biological Stations (OIBFS 1966b). Several field station directors met on 22 June 1963 at the Science Lodge Mountain Research Station in Colorado in conjunction with the dedication of the Alpine Laboratory at the University of Colorado Institute of Arctic and Alpine Research. At that time, Arvey (1964) outlined the need for increased support for both marine and inland field stations and described recent investments by National Science Foundation in arctic biology. The first official meeting



CHARTER MEMBERS

Loren Putnam reports (4/16/68) 34 charter members as follows:
M. Dale Arvey, University of the Pacific; Robert L. Birch, West Virginia University; Richard V. Bovbjerg, University of Iowa; L. Floyd Clarke, University of Wyoming; J. B. Cragg, The University of Calgary; Robert C. Dalglish, The Edmund Niles Huyck Preserve, Inc.; John Davis University of California; Robert V. Drexler, Wilderness Field Station; Millicent S. Ficken, University of Wisconsin--Milwaukee; Cameron E. Gifford, Earlham College; Mary K. Hartz, Muskegon Community College; William T. Helm, Utah State University; Loren G. Hill, University of Oklahoma; Matthew H. Hohn, Central Michigan University; Thelma Howell, The Highlands Biological Station, Inc.; Donald Hunsaker, San Diego State College; Mario Iona, University of Denver; J. D. Ives, University of Colorado; George H. Lauff, Michigan State University; James N. Layne, American Museum of Natural History; William H. Marshall, University of Minnesota; George R. Maxwell, State University College at Oswego; Richard L. Meyer, Chico State College; John G. New, State University College; John D. Parsons, Southern Illinois University; Loren S. Putnam, Ohio State University; Carl D. Riggs, University of Oklahoma; Vincent D. Roth, American Museum of Natural History; A. Randolph Shields, Field Biology Teaching & Research Center; Richard Solberg, University of Montana; Frederick K. Sparrow, University of Michigan; C. A. Tryon, University of Pittsburgh; Jennifer M. Walker, University of Manitoba; John E. Warnock, Western Illinois University.

This is an encouraging response and indicates the need for the organization. The geographical spread is excellent and will provide a wide base for any activities the organization may undertake.

Fig. 1. Newsletter from the Organization of Inland Biological Field Stations listing charter members, 1968.

took place in 1966 at the University of Minnesota's Cedar Creek Natural History Area (now the Cedar Creek Ecosystem Science Reserve). Continued discussions over the next two years led to the official formation of the Organization of Biological Field Stations in 1968. The organization's goals were to provide a forum for field station directors and managers to advance biological research, to solve common problems, and to determine how to best use field facilities for scientific study and development of educational and research approaches. Organization of Biological Field Stations members recognized early on that a key offering of field stations was to enable study of an entire, complex ecosystem not broken into individually manipulated components.

Field Stations Worldwide

For many decades, there was a clear dominance of North American field stations in Organization of Biological Field Stations membership reflecting the organization's origins and support in the United States along with some practical limitations such as language barriers, financial structures, political stability, and other challenges to global participation (Wyman et al. 2009). However, international field stations have operated successfully for many decades and have generally similar goals and operational needs to U.S. and Canadian field stations; see Whitesell et al. (2002) for a review of the contribution of tropical field stations to global science. As of 2017, Organization of Biological Field Stations membership includes more than 230 sites located in 20 countries on six continents (Fig. 2). While this number is impressive, it is far from comprehensive; Tydecks et al. (2016) in their worldwide assessment identified 1,268 biological field stations in 120 countries.

Field-Based Education and Research

Undergraduate and graduate student training and research continues to be a major focus of most field stations (Figs. 3–5). Hodder (2009) detailed how availability of experienced mentors, long-term

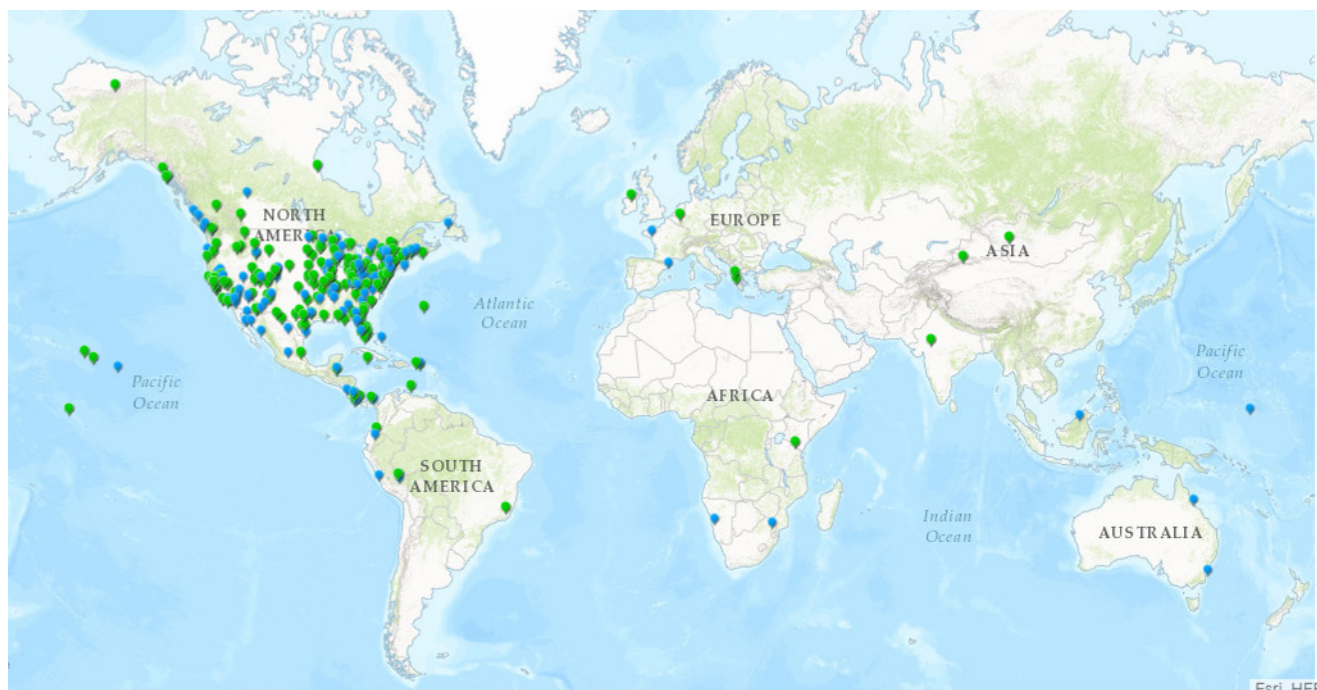


Fig. 2. Map of Organization of Biological Field Stations member field stations worldwide, 2016.



Fig. 3. Students at SUNY ESF's Adirondack Ecological Center install an automated recording system to survey the biological soundscape. Photograph by Stacy A. McNulty.

data, and student-focused facilities creates a collaborative learning environment at a field station to train the next generation of scientists, educators, and science-literate citizens. The synergistic links between research and education that occur at field stations are well documented (Lohr et al. 1995). Fukami (2013) and others have shown learning gains from hands-on field experiences in college-level biology courses when comparing field station-based instruction with laboratory instruction.

Klug et al. (2002) summarized the role of field stations in K-12 education: “Field experiences provide a venue for the actual conduct of science and experiencing inquiry-based learning in all types of biology. The challenge is to provide opportunities to experience field biology to all sectors of society including those concentrated in urban settings.” Klug et al. (2002) emphasized that “During their K-12 and undergraduate careers students need exposure to the complexity of field studies to develop and refine interests in continuing their interests and studies in these directions.”

Many Organization of Biological Field Stations field stations including Mountain Lake Biological Station, the Rocky Mountain Biological Laboratory, and La Selva Biological Station have developed NSF-supported Research Experiences for Undergraduates (REU) programs. Several of these programs pair students with a mentor for a 5- to 10-week field-based research project. REU programs at field stations are guided, yet provide a high degree of independence for participants pursuing careers in field ecology and biology in a collaborative, supportive environment.

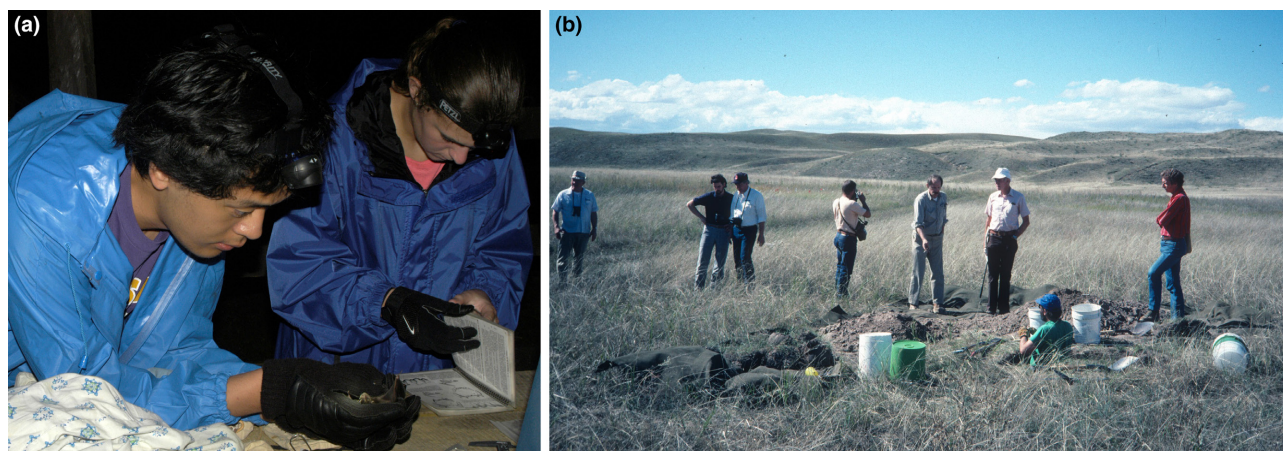


Fig. 4. (a) Students identifying a bat at the Bijagual Ecological Reserve, Costa Rica. Photograph by Heather A. York. (b) Arthropod sampling at Arapaho Prairie, associated with University of Nebraska's Cedar Point Biological Station. Photograph by James N. Layne.

Discoveries in the Field

Michener et al. (2009) underscored the importance of field stations to society due to their legacy of long-term, place-based data and scientific knowledge stores. In addition, they state: “because they serve as gathering places for a rich diversity of highly creative and motivated scientists, students, and citizens, biological field stations are frequently where serendipitous scientific discoveries take place.” For example, at the E. N. Huyck Preserve, a field station near Albany, NY, in 1938, a researcher named Donald Griffin discovered bat echolocation, leading to development of sonar and radar technology in World War II (OBFS 2016). Researchers at Sevilleta Field Station in New Mexico have drawn on the station's long-term data sets to demonstrate that hantavirus outbreaks are linked to deer mouse populations and El Niño weather patterns. Scientists studying a population of parasitic flies at the Brackenridge Field Laboratory in Texas discovered that the fly had a previously unknown acoustical organ. This finding has led to a groundbreaking design for innovative directional hearing aids. Indeed, Wyman et al. (2009) offer what is likely an underestimate of the contribution of field stations worldwide to research, documenting 11% of papers published in 2005–2006 in *Conservation Biology* and 26% of *Ecology* papers were supported in some way by a field station.

Field Stations, the Organization of Biological Field Stations, and the National Science Foundation

Funding for the basic operations and infrastructure of field stations comes from many sources including home institutions, foundations, endowments, and federal grants. As important as any has been the support of the National Science Foundation, particularly in the formation of the Organization of Biological Field Stations and subsequent programs to enhance the ability of field station to provide services to science.

Investment in field stations by the National Science Foundation began in the 1950s and 1960s with funding by the Division of Biological and Medical Sciences to facilities such as the University of Michigan Biological Station, Mountain Lake Biological Station, Lake Itasca Forestry and Biological Station, Highlands Biological Station, and the Rocky Mountain Biological Laboratory. The program we know today as “Improvements in Facilities, Communications, and Equipment at Biological Field Stations and Marine Laboratories (FSML)” had its immediate antecedents in the Division of Environmental



Fig. 5. Students at Murray State University's Hancock Biological Station launching automated water quality buoy on Kentucky Lake. Photograph by David White.

Biology (known as the Division of Biotic Systems and Resources until 1989). BSR had a program titled "Biological Research Resources" that supported infrastructure such as collections, living stocks, instrumentation, and field stations. With the launch of the Long-Term Ecological Research program in 1980, investment in field stations was clearly fundamental to BSR's research. Awards in the mid-1980s by BSR included support for seawater system improvements, collections support, research vessels, and laboratory improvements. The first instance of co-funding with the Geosciences Directorate was in 1988 for instrumentation at Woods Hole Oceanographic Institute and Marine Biological Laboratory. This began a synergy between BIO and GEO that continues today.

The Division of Biological Instrumentation and Resources separated from BSR in 1987 with John Wooley as its division Director. Research Resources became a cluster, and the program we know as FSML was formally defined. A number of program officers have been associated with the program including Jim Edwards until 1990, Tom Callahan until 1997, Gerald Selzer until 2007, and Peter McCartney from 2007 to the present day. A list of all awards made by this program to date can be found on the public NSF award database by searching on the Program Element Code "1104." Over the last three decades, investment levels have fluctuated from around \$2M per year in the 1990s to around \$4M in the last five years. The goals of the FSML program have remained constant, though there have been some changes in how they have been accomplished. Long-term funding to the Organization of Tropical Studies for operation of the La Selva Biological Station in Costa Rica, which had begun in 1979 under BSR, was phased out in 2007 as the program decided FSML could serve the field station community better by focusing exclusively on infrastructure improvements.

Field station funding in the United States has reflected societal and technological changes. Stanford and McKee (1999), as well as Organization of Biological Field Stations leaders, identified the need for a coordinated network of field stations to provide information necessary to answer important questions about national natural resource conditions; other authors concurred and expanded these network science concepts (e.g., Brunt and Michener 2009, Johnson et al. 2010). In 2002, an NSF Research Coordination Network award provided extensive training to field station staff in biological informatics, GIS, and data management. This was followed by an increase in requests for cyberinfrastructure upgrades as these activities took on increased importance at field stations. In 2008, the first collaborative project was funded, reflecting a trend toward supporting regional-scale research that transcended the bounds of a single station. NSF FSML planning grants were initiated in the early 1990s by Tom Callahan to encourage stations to develop strategic plans; by 2012, many of these also took on a regional or thematic scope reflecting this scaling trend. Advances in technology in the last decade have led to a growth in requests for sensor monitoring networks and advanced laboratory equipment such as sequencers, mass spectrometry, and even genome-editing equipment (Porter et al. 2009). Most recently, FSML awards have been made that position field stations as centers of innovation in new observing technologies such as automated animal tracking, unmanned aerial vehicles, and sensor design and fabrication. The Organization of Biological Field Stations provides a reservoir of experienced field station directors and managers who provide advice to colleagues on these topics.

The FSML program has supported two national-scale studies of field stations, one as a joint NAML-OBFS activity and one as a National Academy of Science study (see below). These efforts document the continued value of field stations for research and education and guide the FSML program in making the investments that keep this community at the forefront of field biology. In addition to the FSML program, the NSF Established Program to Stimulate Competitive Research has provided resources for increased cyberinfrastructure at field stations, for example, Flathead Lake Biological Station, MT, in collaboration with Hancock Biological Station, KY.

Field Stations and Marine Labs: Teaming Up

In 2011–2012, NAML and the Organization of Biological Field Stations co-sponsored a series of meetings culminating in a workshop in Colorado Springs, CO, that brought together many field station and marine laboratory users, directors, and stakeholders to evaluate the relationship of marine laboratories and field stations to science, education, and policy constituents (Billick et al. 2013). This NSF-funded planning focused on identifying the emerging science needs that field stations can best address in several broad categories including environmental change, ecosystem dynamics, macrosystems, organismal and population biology, and molecular biology and genomics. There also were two crosscutting themes of education and resource management. The results of the workshop (1) defined many of the unique attributes of field stations that allow them to address research and education needs, (2) generated examples and scenarios of how these attributes apply to address emerging science needs and grand challenges, (3) linked the science drivers to societal value and the emerging goal of global sustainability, and (4) framed a network architecture that would connect the field stations together to form a more robust observing system to address the research, education, and management challenges.

The Billick et al. (2013) report was followed up by a separate NSF initiative conceived by John Wingfield, then head of BIO at NSF, to support a review by the National Research Council of the National Academy of Science on the role of field stations. The report, *Enhancing the Value and Sustainability of Field*

Stations and Marine Laboratories in the 21st Century (2014 NRC), was summarized by Baker (2015) and demonstrated the significant value of field stations to science and society and provided recommendations to guide their future sustainability. In 2014, the Organization of Biological Field Stations and NAML held a joint meeting at the Marine Biological Lab in Woods Hole, Massachusetts. Participants identified the urgent need to engage a broader audience to share the ideas put forth in the NRC report.

Given that today's regional and global issues require a high degree of collaboration and communication, the NRC report also explored what is needed to make field stations more relevant and responsive to current societal needs. For example, exponential advances in information technology allow scientists to transmit data from field stations instantly, accurately, and efficiently, but continued investment in field station infrastructure is needed to enable high-caliber (National Research Council 2014) and big data-based science (Hampton et al. 2013).

Major Initiatives of the Organization of Biological Field Stations

As a professional organization, the Organization of Biological Field Stations serves many functions for field station directors, managers, and users. As noted by Wyman (2009), the Organization of Biological Field Stations is “recognized as the leading advocate for field stations, and it has proved useful in helping the National Science Foundation develop programs to assist field stations with infrastructure development.” Open exchange of data was an early frontier. Regional networks of field stations followed, and the Organization of Biological Field Stations is now expanding its role by engaging in global networks. The Organization of Biological Field Stations and member stations participate in the National Ecological Observatory Network (NEON), Global Lakes Ecological Observatory Network, the Long-Term Ecological Research Network (LTER), and the International Long-Term Ecological Research Network (ILTER). ILTER describes itself as “a network of networks” (Vanderbilt and Gaiser 2017). Most recently, the Global Network of Mountain Observatories (GNOMO) joined Organization of Biological Field Stations networking efforts as an Ad Hoc Committee. GNOMO members come from mountainous areas all over the world to work together on common socio-ecological themes and issues.

Science communication and policy

For many years, the Organization of Biological Field Stations has recognized the importance of connecting scientists with policy makers to establish two-way communication. For example, the Organization of Biological Field Stations is an active and contributing member of the American Institute of Biological Sciences and supports science-policy initiatives. The Organization of Biological Field Stations provides direct support for volunteer members of the Organization of Biological Field Stations to meet with their congressional representatives in Washington, D.C., through AIBS Congressional Visits Day or at the field station through the AIBS Congressional District Visits program to discuss the beneficial role of science in society. Each year, these events plant the seeds of the value of field stations to the nation into the heads and hearts of legislators and their staff.

The Organization of Biological Field Stations publishes newsletters at least once a year containing minutes of meetings and news of general interest. Copies of the earlier newsletters are available from the Organization of Biological Field Stations Historian, and later issues are on the Organization of Biological Field Stations website. An annual report replaced the newsletter in 2006; annual reports are

available on the public documents section of the Organization of Biological Field Stations website. In the 1980s and 1990s, the Organization of Biological Field Stations created and mailed a poster of college courses offered at member field stations. Now, the Organization of Biological Field Stations website is the central location for such information, as well as job announcements, REU opportunities, and news items of interest to field station members, communities, and anyone interested in field science.

Annual meeting

Each year, an Organization of Biological Field Stations member station hosts a multiday conference including sessions on scientific advances in the field, improvements to infrastructure, land management issues, science communication, and other relevant topics. Meetings include tours of the host facility, exploration of nearby natural and cultural resources, and business meetings. Recent annual meetings have hosted more than 100 participants. Over the last 50 yr, 42 stations have hosted an annual meeting from the Sitka Sound Science Center in southeast Alaska to La Selva Biological Station in Costa Rica (see www.obfs.org/annual-meeting).

The Organization of Biological Field Stations held its 2017 meeting at the University of Minnesota's Itasca Biological Station and Laboratories from 20 to 24 September. Field station representatives continued to connect field stations, local communities, users, and other stakeholders with shared objectives that strengthen programs in teaching, engagement, and science. Workshops at the 2017 meeting included the ESA-hosted *Strategies for Success: a Mini-Course for Field Station Leaders*, and a facilitated workshop on *Outreach at Field Stations: Best Practices for Engaging Participants*. The 2018 annual meeting will be held at the Schoodic Institute near Acadia National Park, ME.

Each year, Organization of Biological Field Stations meeting support awards are available to enable students, early-career professionals, and station representatives, particularly from small stations in developing countries and those with limited resources, to attend the Organization of Biological Field Stations annual meeting and interact with colleagues. More recently, the Organization of Biological Field Stations has recognized the importance of incorporating early-career professionals into the organization by creating an Early Career Member At-Large seat on the board and supporting travel to the annual meeting.

Human Diversity Award

The Human Diversity Award was created in 2007 to recognize an Organization of Biological Field Stations member field station for unique activities, programs, or approaches that increase the involvement, engagement, and sustainability of underrepresented groups in field science. Broadly speaking, underrepresented groups in field science may include, but are not limited to, ethnic minorities, women, first-generation college students, inner-city youth, disadvantaged rural communities, K-12 groups, tribal colleges, community colleges, undergraduate institutions with small programs, and citizen science monitoring programs. The first award went to the Organization for Tropical Studies (based at Duke University, NC). Subsequent recognition has gone to a variety of programs and field stations, including the Intercultural Center for the Study of Deserts and Oceans (Mexico), the Hawaii Experimental Tropical Forest (HI), Powdermill Nature Reserve (PA), and the Santa Rosa Island Research Station (CA) among several others.

Friend of OBFS Award

In an effort to project the value of research and education at field stations beyond the scientific community, the Organization of Biological Field Stations recently created the Friend of OBFS Award. The Organization of Biological Field Stations presented the inaugural Friend of OBFS Award in 2015 to Miles O'Brien, an internationally known science correspondent for media outlets including CNN and PBS. O'Brien was recognized for his efforts to create a lasting network of field stations devoted to the discovery and understanding of the environmental challenges of our time. In 2016, Dr. Peter Connors, former Reserve Director of the Bodega Bay Marine Laboratory in California, was awarded the Friend of OBFS Award for his longtime service to the Organization of Biological Field Stations and his leadership and promotion of field stations. At the 2017 annual meeting, the Organization of Biological Field Stations presented the award to actor Mark Ruffalo. Ruffalo was recognized for his participation in Organization of Biological Field Stations development efforts and collaboration on water quality issues with the University of Massachusetts Nantucket Field Station.

Development and friend-raising

The Organization of Biological Field Stations holds events to share the assets of and excitement about field stations with a broader cross section of society and to stimulate private funding investment in the Organization of Biological Field Stations. Attendees learn about the role of Organization of Biological Field Stations member stations in education and research. The first development event was held in 2011 at Stanford University's Jasper Ridge Biological Preserve and followed by two development events on Nantucket, MA. The science journalist and social media presence Andy Revkin was interviewed by Wavemaker creator and former CNN producer Michael Schulder at the 2015 Organization of Biological Field Stations Nantucket development event. At each event, visits to member stations across the country were auctioned to enthusiastic bidders; these field station visits are helping to spread the word to new audiences about the scientific vitality, value, and beauty of field stations.

In October 2016, nearly a hundred people attended an Organization of Biological Field Stations friend-raising event at the New York Academy of Sciences. The featured guest was actor Mark Ruffalo (Fig. 6) who is a passionate activist for clean water and renewable energy. Ruffalo advised that scientists needed to engage people directly to be effective and urged the scientists in the audience to "drop your fear" when speaking about the inclusion of science in policy. At that event, Dr. Gene Likens of the Cary Institute for Ecosystem Studies received the first OBFS Award for Distinguished Service to Field Science. Research by Likens and colleagues led to the characterization of acid rain, ultimately resulting in improvements in national air and water quality via landmark policy via the U.S. Clean Air Act Amendments of 1990. In his acceptance speech, Likens emphasized that field stations ignite a lifelong spark of discovery in young people.

Local Hero Award

Whether located in urban environments or situated in wilderness, field stations maintain critical relationships with local landowners, agencies, and organizations. The Mary Hufty Local Hero Award



Fig. 6. Organization of Biological Field Stations officers, hosts, and guests at New York Academy of Sciences, New York, New York. Photograph by Garrett Ewald.

recognizes the important connection between science, education, and stewardship. Each year, the leadership of the field station hosting the annual Organization of Biological Field Stations meeting selects the individuals or group best representing the objectives and mission of the field station. In 2015, John Norton was recognized for building support for the Rocky Mountain Biological Lab within the larger community. In 2016 at Sitka Sound Science Center, the Local Hero Award was presented to Drs. David and Margaret Steward who grew up in the culture of science in and around field stations. Norton's and Steward's fathers worked in field stations in China and the western United States, respectively.

Emergent Activities of the Organization of Biological Field Stations

The Organization of Biological Field Stations has supported the integration of social science and natural science at field stations as well as links to arts and humanities. The convergence of arts and sciences at field stations creates unique opportunities to engage people in the inquiry process, and the Organization of Biological Field Stations is beginning to make investments in this area. The #ArtSciConverge at Field Stations and Marine Labs blog (<http://fsml-art.blogspot.com/>) highlights some of these achievements.

Recent research on sexual harassment and assault in field situations (Clancy et al. 2014) has increased awareness of this issue within the Organization of Biological Field Stations. The lead author of the study was invited to present a plenary address at the 2015 Organization of Biological Field Stations meeting where she encouraged the organization and its member field stations to consider these issues. The Organization of Biological Field Stations has established a working group on interpersonal safety with the goal of sharing experiences and tools among member stations.

The Future of Field Stations

The future of field stations is at once bright and precarious. “In an era of great emphasis on cellular and subcellular research, biological stations, in the view of many, have become almost a relict of days when descriptive biology was a companion to great geographical explorations of the 17th to early 20th centuries. Such assessment ignores a broad sweep of ecological training, research, and management programs fostered by these stations, and, more seriously, fails to recognize increasingly acute needs for these influences in an urban world.” Those words were written fifty years ago by Austin B. Williams, yet remain relevant today (OIBFS 1966a). The NRC (2014) report highlighted the importance of financial sustainability in managing field stations including diversifying revenue sources. Budget cuts to federal science programs potentially imperil field stations that rely on this funding source even as the need for field experiences in scientific training and discovery is as important as ever, if not more so (Fleischner et al. 2017). Field stations can thrive by inspiring bold decisions by administrators and encouraging a recommitment to financial resources from government, university, non-profit, and other partners. Field stations are in a unique position to connect directly with people and deepen public understanding of the value of science and place-based learning (Billick and Price 2010). Engagement through public events and open houses, lectures by scientists, social media, and pieces in traditional media are some of the many strategies employed by Organization of Biological Field Stations members to improve awareness and strengthen linkages between the field station and neighboring communities.

Summary

E. O. Wilson (1982) wrote that “in the not too distant future a much larger share of research on biology, from biochemistry to ecology, will be conducted at field stations. At present, there is no mechanism to evaluate whether field station-based research has grown or shrunk in recent years. The reasons are inherent in the history of the science. The only places to pursue biology at this advanced and long-term level are the field stations, where free-living species are secure and data sets cumulative over generations. The biological field stations of the future will consist of both nature preserves and laboratories equipped to analyze and monitor processes at every level of biological organization, including the molecular.” The promise of Wilson’s vision remains; the degree to which it has come to fruition is due in part to the Organization of Biological Field Stations. As a grassroots organization, the Organization of Biological Field Stations’ mission is to support and encourage field stations and their endeavors across the globe to participate in scientific networks. As the Organization of Biological Field Stations enters its second half-century, the organization will continue to facilitate research networks, engage with public agencies on technical and land management issues, and build connections between scientists and decision makers.

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