Impact of Aerosols on Northern Michigan Air
Focus of New Research

Ozone action days in Minneapolis. Forest fires in Canada. These things can’t have a direct effect on Pellston air quality, can they? Yes, says University of Michigan Assistant Professors Kerri Pratt, Andrew Ault, and Eric Kort. These new Michigan faculty teamed up as part of an MCubed grant to look at aerosol pollution in the upper Great Lakes region. They found we are literally subject to the whims of the winds. “Models do not predict air quality well in remote regions like this,” Pratt says. This is because few researchers have studied the far downwind impacts of pollution. More fundamentally, scientists are still learning how forests interact with the atmosphere to produce new chemicals. “You need to understand what’s there first,” Pratt says. The next step is seeing what comes in with different air masses. Only then

see Aerosols p. 7

FORTY YEARS OF LOWE

Turks ask him for tips on how to wear a fez. He’s wrestled wild monkeys for an iPad. Leeches and mosquitoes give him their blood. And doctors only refer to his colon as “unremarkable” out of jealousy. Rex Lowe is one of a kind. And he has been bringing his rogue personality and teaching to the University of Michigan Biological Station for forty years.

Like many field ecologists, Lowe’s first experience at a field station sold him on the scene. He attended Iowa Lakeside Lab in 1967, the summer after he started graduate school. He says he immediately thought, “This has to be a part of my life somehow.” When Gene Stoermer invited him to be his teaching assistant at the University of Michigan Biological Station in 1969, Lowe came without reservation.

In 1974, Stoermer took a break from teaching and recommended Lowe to take his place. Lowe laughs when he recalls how often then director David Gates stressed to him, “This is only for one summer.” The next year, however, UMBS switched from offeringing two classes

see Lowe p. 6
This summer the Biological Station community took a step back from its immediate concerns and spent a day focused on the future. With the help of facilitators from Zingtrain (an Ann Arbor-based consultant group) and the input of more than 40 participants, we used Sunday, August 17 to draft a vision for the Biological Station in 20 years. Participants included students, administration and staff members, representatives of lake associations and local stewardship groups, UMBS advisory board and executive committee members, alumni, UMBS faculty and researchers, and citizens from neighboring communities.

Zingtrain's overarching advice was that a vision should answer the question “What do we want to create.” It should be inspiring. It should describe the future we hope to have. The vision we created in August and refined through the fall describes our field station in 2034 as:

- A diverse community of researchers (undergraduate through faculty and investigators) that reflects the US population in ethnicity, race, gender identification, geographic location, and socio-economic background.
- A model “green” campus that houses year-round education and research.
- A Science and Education Center that is the hub of outreach to and collaboration with local residents and organizations and visitors to the region.
- Hands-on courses and interdisciplinary research that address the needs of a changing world.

The complete vision will be available on the UMBS website soon. This vision matches our broad fundraising priorities in the current University of Michigan “Victors for Michigan” campaign (http://goo.gl/jb1XG2): student financial support, designing a carbon- and waste-neutral campus, acquiring sensitive lands and habitats and visiting researcher funding.

We are looking for leadership gifts to establish the University of Michigan Biological Station as the preeminent inland field station in North America. Estate gifts are an easy but often overlooked way to optimize your gift and preserve your sense of financial security.

We are already moving ahead on a few fronts that connect to the UMBS vision for 2034. Jim Fitzpatrick, Linda Greer and Gary Rentrop are joining our External Advisory Board. Jim is a retired executive from General Motors, where he was Vice President for Marketing and Communications. He has served on the boards of several conservation focused organizations. Linda is an alum of the UMBS CLEAR Program (see related article p. 4) and is head of the Health Program at the Natural Resources Defense Council. Gary is an attorney with extensive expertise in land use planning and property preservation/conservation. He is the founding partner of Rentrop & Morrison law firm in Bloomfield Hills and is active with many professional and civic organizations including the Emmet County Lakeshore Association. These individuals broaden the expertise and network already embodied in our Advisory Board, now entering its sixth year of existence. We are greatly appreciative of their volunteering to serve on our board.

Gary Rentrop and his wife Sue were among the guests we invited to participate in a Great Lakes science cruise at the end of August. Taking advantage of the fact that the Biological Station already had access to the NOAA Research Vessel Laurentian and three Great Lakes experts, we organized a day-long study cruise for northern Michigan residents with a demonstrated interest in the ecological well-being of the fresh water systems in our region. Instructors Gary Fahrenstiel, Tom Nalepa and Dave Schwab led a UMBS mini-course, Great Lakes Oceanography the week before the cruise. They stayed an extra day to teach our group about everything from invasive quagga mussels to the tricky Straits water currents.

As always, we invite you to join us not only in perpetuating all that is exceptional about the Biological Station, but also in planning for and realizing its role in this next century. You who know the value of field study and research at UMBS please send like-minded people our way: students, educators, researchers, supporters. And please also take advantage of upcoming opportunities (Ski Weekend, Discovery Day, 2016 Friends and Alumni Weekend) to remind yourself why this place is dear to you.

Knute Nadelhoffer
UMBS Director

Director's Notes
Facilities Updates

- The College of Literature, Science and the Arts (LSA) funded an audio-visual system upgrade in the Gates Lecture Hall and Alumni Room. The lecture hall's new projector is ceiling mounted (no more cords in the aisle). Microphones include a cordless lapel and handheld.

- Our Administrative Building restrooms went green with a spring renovation. Water saving toilets and sinks and LED motion-sensitive lighting were the primary changes. The bathrooms also have new countertops and soap dispensers.

- Workers are currently updating the LaRue Computer Lab with new wiring, climate control system, counters and ceiling. LSA is also funding these improvements.

Post-Session Numbers Soar

We are always saying “there is no off season.” As an example, how many people do you think stayed at the Station between August 16 (when Summer Session ended) and October 31?

a) 68  
b) 174  
c) 420  
d) 705

(Answer on bottom of this page.)

Lab Manager Moves West

This fall we said goodbye to Chemistry Lab Manager Jennifer Croskrey. She moved to Colorado to start a position with the U.S. Geological Society’s National Water Quality Lab. She is a Chemist in their Nutrients division. Many thanks to Jennifer for her conscientious and dedicated service to UMBS.

The Station administration is interviewing replacement candidates and should have a new lab manager in place for the 2015 research season.

A NEW TRADITION

The UMBS Winter Research Meeting will return for its 4th consecutive year. All are invited to stop by the Michigan Union on Friday, February 20, to listen to research presentations. Details are available under the “Events” heading of our website.

More Maps to Come

Bob Vande Kopple is customizing a map of Sugar Island and the Chase Osborn Preserve (detail below) for Station audiences. It should be available in 2015 for anyone planning to visit the UMBS-managed property.
Record Season for Student Researchers (and Student Research Funding)

Thanks to recent gifts for research funding, the Biological Station had a noticeable boost in student researchers this year. Associate Director Karie Slavik says the Station awarded twice as much student research funding this year compared to 2013 and funded more than three times as many students as it could even just three years ago. “It’s a direct result of new endowments.”

Twenty-five students from eight different institutions received more than $62,000 in 2014 to offset housing, dining and research fees while they were at the Station. U-M doctoral student Leslie Decker received a fellowship sponsored by the Ann Arbor Branch of the Woman’s National Farm and Garden Association. She says, “My fellowship was extremely helpful for my research. It paid for my room and board which was a huge relief. Additionally, some of the money went to purchasing essential supplies like the CO₂ gas I needed to create future atmospheric conditions for my study.”

“Our research would not have happened without the fellowships,” says Kerri Pratt, one of three faculty studying aerosols at the PROPHET lab (see article on the front page). Four graduate students who worked on Pratt’s project received UMBS funding.

More than half the awards came from the Marian P. and David M. Gates Graduate Student Support fund. An anonymous donor initiated creation of this endowment in 2007 to take advantage of President Mary Sue Coleman’s campaign challenge. Several other donors also made large contributions to this fund. President Coleman matched 1:2 gifts for graduate and professional support. Now that all the pledges have been fulfilled, donors have contributed $285,000 to the fund. President Coleman matched with $142,000. Dividends from the Gates Graduate Student endowment alone allowed UMBS to award fellowships totaling more than $30,000 in 2014.

Ana Jurcak, currently a Ph.D. student from Bowling Green State University, received one of the Gates Fellowships. She says, “It gave me the opportunity to use the Stream Research Facility, a unique and one of a kind research facility. I was able to gather successful data for my Master’s degree as well as publish my work in the Journal for Crustacean Biology. It also allowed me to interact with other prominent scientists in my field.”

The Gates Graduate Fund isn’t the only fellowship to reach full endowment status. Professor Joel Heinen (Florida International University), a UMBS alumnus and spring session instructor, established his Student Research Fund in 2007. Alumna Marilyn McKenzie created the J.B. and Marilyn (Galacz) McK-
enzie Graduate Fellowship Fund in 2008; it was fully funded in December, 2012. Most recently, UMBS friend and mini-course participant Joanne “Joey” Arbaugh established the Mort Neff Scholarship for graduate research to honor her father, U-M alumnus and “Michigan Outdoors” television producer and host. Ms. Arbaugh established that endowment in 2009 and fulfilled her pledge in November 2013. These and older funds are allowing more students to conduct more research at UMBS. “Increasing graduate student research at the Biological Station is one of our top priorities,” says Director Knute Nadelhoffer. “We want researchers at all stages of their careers to overlap and work together here. We hear time and again how valuable it is to everyone involved to have both a diversity of disciplines and researchers at career stages from undergraduate students to world-class scientists working together in our community.”

ARE THE RESULT OF ALUMNI GIFTS

enhancing water quality in Northern Michigan. It evolved into the present-day non-profit organization, Tip of the Mitt Watershed Council.

The Station awarded the first scholarship from the Joel T. Heinen Undergraduate Support Fund in 2014. Heinen, an alumnus of the Station who returns to teach General Ecology in the spring session, had set up a UMBS research fellowship in 2007. His new scholarship is intended to help offset the rising cost of tuition, especially for out of state students. Heinen is a Professor of Earth and Environment at Florida International University. Additional funds are listed on the enclosed envelope if you wish to make a year-end donation to the Biological Station. You may also donate on-line at: https://leadersandbest.umich.edu/find/#!/scu/lsa/biological.
Lowe, from front page

– Phytoplankton Ecology and Algology – that met only once a week, to one class, Algology, that met two days a week. This meant Stoermer couldn’t teach two classes, so Gates called Lowe back to teach Algology. That offer has been repeatedly renewed by three permanent and several interim directors over the past four decades.

As a researcher and scholar, Lowe is nationally prominent. At this year’s Joint Aquatic Sciences Meeting, the Phycological Society of America (PSA) gave Lowe its 2014 Award of Excellence for his “nearly 50 years of sustained excellence in research, service and teaching in algal biology.” PSA recognized Lowe’s 130-plus peer-reviewed journal articles, nearly 70 research grants, and his service to more than 30 regulatory agencies.

Yet it is Lowe’s particular skill in teaching that has endeared him to so many of his students. Several factors contribute to this success. First is Rex’s approachability. “He can relate so well to other people that something esoteric, like scum, becomes interesting and meaningful,” says former Algology student and T.A. and current co-instructor of Algae at UMBS, Pat Kociolek.

Second is his attention to the craft of teaching, especially field instruction. He attributes this mindfulness to his thesis advisor, John Dodd. Writing in a special edition of *Hydrobiologia* (Volume 561, Issue 1, May 2006: “Advances in Algal Biology: A Commemoration of the Work of Rex Lowe”), Lowe said, “Dodd wrote an article on [teaching and advising students] that strongly influenced me, ‘Science, a Modern Fountain for Youth’ (Dodd, 1953). I have tried to incorporate Dodd’s ideas in my teaching approach.”

Among the questions Dodd asks about the metaphoric fountain:

- Is the water always clear and sparkling? Do students become thirsty just watching it?
- Are you patient with the eager ones who always manage to fall into the fountain?
- Can you recognize the timid ones who are desperately thirsty but are unable to crowd around a busy fountain?

Lastly, Lowe is smitten with algae. He says, “Looking through the microscope, you enter a world that very few people see – a world with fantastic organisms, beautiful organisms that are doing special things. Inviting students into the microbial world is almost like visiting another planet. I’d like to teach the whole world about what they can see looking through a microscope.”

This passion is contagious. “Rex is not just knowledgeable, he also adores the subject matter,” says former UMBS student Julianne Heinlein (’93). “His excitement inspires students to stay observant and ask questions.”

Lowe’s enthusiasm has affected many of his students. Some, such as Kociolek and Heinlein became phycologists themselves. Others revised career plans to science or teaching generally. Hunter Carrick (’82), a biology professor at Central Michigan University, says, “Some of my teaching style I patterned after him. He approached algae as a treasure hunt. We were looking for gems in the lesser known corners of nature.”

Even students whose professional paths weren’t altered by an encounter with Lowe are likely to have a sharp memory or two of him. Take the UMBS Stream Biology class that received a shock when their nighttime sampling was interrupted by one of Lowe’s pranks. While unwitting students collected water from the Maple River below, Lowe and some cronies stopped a car on the bridge above and pretended to have an argument. It culminated with sounds of a fight and then the firing of a (cap) gun. After that, the pranksters threw a dummy – clothes stuffed with rags – over the bridge and into the water. “The students went scrambling up the embankments like cockroaches,” Lowe recalls, a gleam still in his eye.
Aerosols, from front page

can policies begin to effectively address the problem of urban pollution in remote areas.

A shared interest in understanding rural air quality brought Pratt, Ault and Kort together. All three are atmospheric chemists. Pratt and Ault study aerosols, the tiny solid particles or liquid droplets suspended in the air. Kort studies atmospheric trace gases.

Their team worked at the Biological Station’s Program for Research on Oxidants: Photochemistry, Emissions, and Transport (PROPHET) tower and lab. PROPHET was built for measuring forest-atmosphere interactions. Previously, PROPHET researchers focused on trace gas chemistry of biogenic emissions from the forest. The Pratt-Ault-Kort project marked the first detailed study of aerosol chemistry at the site. They worked in collaboration with investigators Tim VanReken and Shelley Pressley from Washington State University’s Laboratory for Atmospheric Research, who were measuring isoprene (gas) fluxes. Pratt says the two groups’ projects complimented each other. “Their work is helping us understand our data.”

The research group – which included 1 postdoctoral researcher, 4 graduate students, and 3 undergraduates (including 1 UMBS REU student) – collected air samples and took real-time measurements. The live assessments used a special mass spectrometer that could measure one tiny atmospheric particle (between 400 nm and 2 µm in diameter) at a time. It was so refined it could differentiate between particles that originated from wood combustion, automobile fuel or even discharge from Great Lakes ships. “We detected [particles from] wildfires in Canada and the Upper Peninsula. We had influences from Chicago,” says Pratt.

Although the researchers are still finishing tests to confirm the composition and origins of the aerosols they collected at UMBS, Ault shared their preliminary findings at the MCubed Symposium on October 9, 2014. They expect to submit an article on this research early next year.

MCubed is a two-year, seed-funding program. It was designed to quickly give startup funds to interdisciplinary teams of University of Michigan faculty whose research promises major societal impacts.

Alumnus Stanley Pollack (’76) says, “Rex is the master at instilling the ethic of working hard and playing hard. Most of the time I couldn’t tell the difference between the two.”

Though Lowe’s enthusiasm hasn’t waned over the years, other aspects of teaching and living at the station have changed. The single most dramatic change Lowe has seen is the arrival of zebra mussels to the area. He says his first lab for Algae students used to be sampling in Douglas Lake. “Students could have a very rich, very diverse diatom experience,” he laments. “Now when we arrive in the spring, about all that’s here is *Microcystis*.”

This summer marked not only Lowe’s 40th anniversary of teaching at UMBS. It was also the 50th anniversary of his marriage to wife and long-time UMBS camp nurse, Sheryn. They celebrated the event on Douglas Lake rather than at their residence in Wisconsin because, Lowe says, “this is home to us. Our best friends are here. I’ve recruited about 30 of my 70 graduate students from here – many of whom became my friends. I’ve taught at 8 different field stations, including in New Zealand, India and across North America, but UMBS is the only place that has a family-community feeling.”

Lowe retired from his faculty position at Bowling Green State University in 2012. He has no immediate plans to stop teaching at the Station. “I’ll know I’m done when I’m not excited about coming back,” he says. Until then, he will continue to take students to the marshes and fens of northern Michigan and introduce them to “frog spit” and *Micrasterias*. As he says, “This is the way teaching should be. Period.”
New UM President Visits the Biological Station

Even before he was sworn in as the University of Michigan’s Fourteenth President, Mark Schlissel made it a priority to visit the Biological Station. Schlissel and wife, Monica Schwebs, took a 2-week trip around Michigan as an unofficial introduction to their new home state.

They visited several Michigan landmarks: Detroit’s Motown Museum, the UP’s Pictured Rocks National Lakeshore, Sleeping Bear Dunes and the State Capitol Building in Lansing. The only university property they visited was UMBS.

Schlissel and Schwebs arrived just before noon on July 8. Speaking off the cuff during lunch, Schlissel told the dining hall crowd that few research universities had field stations with the breadth and depth of the University of Michigan’s Biological Station. He said the students probably didn’t realize how lucky they were to be at UMBS.

After lunch, Schlissel braved off-and-on rain to see as much of the Station as possible. Knute Nadelhoffer served as guide, highlighting sites such as:

- The piping plover captive rearing facility, with head of the Great Lakes Piping Plover Restoration Program Francie Cuthbert;
- Field Mammalogy lab with instructor Phil Myers and students;
- Elevated CO₂ array where Professor Mark Hunter and three graduate students talked about their insect-plant research; and
- The PROPHET lab and tower and the Ameriflux tower, along with researchers Kerri Pratt, Andrew Ault, Chris Vogel and Paul Drevnick.

Schlissel began his tenure as University president on July 14, 2014.