IAGLR
LAKES Letter

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This issue focuses on international collaboration and perspectives from around the globe

Toward a global, large lake network

by **Richard Ogutu-Ohwayo**

Since its formation, IAGLR has played a leading role in promoting research and communication to support policy for management of the world's large lakes. This has been done through its annual research conference, its *Journal of Great Lakes Research*, and regional meetings. Yet these efforts have mainly concentrated on the Laurentian Great Lakes of North America.

However, IAGLR has begun making efforts to strengthen its role internationally. A majority of its members—62%—support this focus of expanding the association's international engagement. This expanded focus is not simply an exercise in growth, but is, instead, an effort to enhance the global network of freshwater sciences so we can better address the challenges facing these critical, large, freshwater resources. By internationalizing IAGLR, we are broadening our perspectives, approaches, ideas, and knowledge for understanding these challenges. We are growing our networks and building trust for increased information exchange and the ability to work across borders on these inter-jurisdictional resources. This will require a shift in our collective mindset from one that focuses on the interests of our "own" lakes to one that visualizes all large lakes of the world as one global network with subnetworks at continental, regional, and national levels.

As one of the oldest associations of great lakes research, and due to its being from the developed north, IAGLR is well positioned to lead this shift by incrementally scaling its efforts to encompass other lake systems of the world. IAGLR has made some progress in strengthening its role internationally: it has conducted joint meetings with other organizations such as the European Large Lakes Symposium; it has published special sections in its journal on non-Laurentian large lakes such as Lake Baikal and the African Great Lakes; it has conducted sessions on other large lakes at its annual conferences; it has provided international student travel scholarships to attend its conferences; and, in 2018, it added a member from outside the United States and Canada to its board of directors.

At the board meeting last June, I was tasked as IAGLR's first international board member to engage other members in developing suggestions to further strengthen the association internationally. Working with IAGLR Secretary Jessica Ives to initiate consultations on the matter, we formed a committee with representatives from many lakes around the world. The committee has discussed an initial set of activities for IAGLR to consider undertaking. These activities include promoting the formation of networks at continental, regional, and national levels and identifying opportunities for collaboration among researchers and institutions studying different lakes. These efforts would ultimately lead to the formation of one global, large lake network through which IAGLR can, over time, strengthen its role internationally for the good of the world's large lakes. I encourage IAGLR members to provide any additional suggestions to help achieve this vision by contacting me at ogutuohwayo@yahoo.com.

A researcher on African lakes, Richard Ogutu-Ohwayo recently retired from the National Fisheries Resources Research Institute in Uganda after 42 years of service. He serves as IAGLR's first international board member, associate editor of the Journal of Great Lakes Research, *and chair of IAGLR's newly formed International Committee. He is forming the African Lakes Network to build capacity, mobilize, and share information and data for management of the resources of African lakes.*

EXPERT ROUNDUP

Thoughts on international collaboration

We asked three members with experiences from around the world to share their perspectives on international collaboration.

In what ways does international collaboration influence science?

CF: It brings perspectives and expertise from outside your local research community. Knowledge may exist elsewhere, and you can uncover it by engaging with colleagues globally. It also makes the science more robust because it brings the skills you need to the table and ensures that you're assembling the best team for the science challenge.

MM: International collaboration helps researchers to take a holistic view and to broaden our scientific vision. My love for international collaboration was influenced by working with great limnologists like Jacob Verduin, Richard Vollenweider, and Jack Vallentyne who all promoted an ecosystem-based approach and the application of holistic strategies globally. The ecosystem approach that emerged from the Laurentian Great Lakes inspired the creation of the AEHMS, which has gone on to spread this approach across the world via its conferences, journal, and Ecovision World Monograph Series. This is a power example of how international collaboration can spread ideas.

RS: International collaboration helps to bring the best and most suitable minds together to work on science's biggest challenges. In so doing, it can bring the right teams together to address problems no matter where on the globe they occur. Though we are a global scientific community, different countries or regions have their own scientific strengths. Some have exceptional infrastructure or do a better job supporting technical staff, while others are more comfortable with risk. Some have extraordinary natural resource assets. Science needs all of this.

How has working internationally changed your perspective?

CF: Working internationally is my norm. I grew up in the Great Lakes region, but I was not born here. I grew up speaking and hearing different languages and participating in different cultures. These experiences have enriched my work life as they've taught me there are many ways to see an issue and approach a solution. As a scientist, I've also always been trained through an interdisciplinary lens, and thus pursuing international literature and experts is simply a way to ensure that the best science is being delivered.

MM: Working internationally for 30 years has taught me to view the environment holistically and globally, to understand various problems from a top-down perspective, and to share solutions and assist in local capacity building. It also has made me question the practicality of applying western science to other parts of the world, especially to developing countries with limited facilities and resources.

RS: My graduate training included a semester-long tropical ecology course in Central America. Every temperate biologist needs to immerse themselves in the tropics at least once. My perspective also was shaped in important ways during my postdoctoral years when I worked for just over a year in a Max Planck Institute in Germany. The strengths

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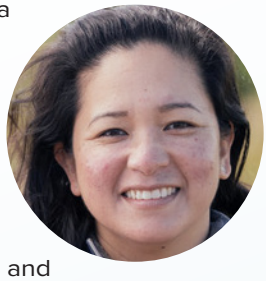
MEET THE EXPERTS



Catherine Febria is a Canada Research Chair in Freshwater Restoration Ecology at the University of Windsor's Great Lakes Institute for Environmental Research. She was previously a director and scientist with the Canterbury Waterway Rehabilitation Experiment in Canterbury, New Zealand. She is a nominated expert in the UN Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

Mohiuddin Munawar is a research scientist with Fisheries and Oceans Canada and is the only recipient of IAGLR's four professional awards. He is president of the Aquatic Ecosystem Health and Management Society and chief editor of the society's journal, *Aquatic Ecosystem Health and Management*, which fosters international and cross-sectorial communications. In this capacity with AEHMS, he has 30 years of international experience in approximately 30 countries on six continents.

Robert Sterner is the director of the Large Lakes Observatory at the University of Minnesota Duluth, which has as its mission to perform scientific studies on the large lakes of Earth. He has had experiences and collaborations with scientists in Canada, Costa Rica, Germany, Japan, Malawi, and Norway.

and ways of thinking I absorbed there complemented my graduate training and made me a much more well-rounded scientist. Later, work I did in collaboration with Jim Elser at the Experimental Lakes Area in Canada allowed us to pursue our interest in stoichiometry at the whole-lake level—work that would have been impossible at our home institutions, which lacked the "lakes as test tubes" facilities that ELA was and still is.

What advice do you have for those interested in collaborating internationally?

CF: Learn how to listen. Be open to learning new skills and taking risks, but learn from them, and move forward. I often ask myself and others: "Do I want to be right? Or do I want to learn, build a bridge, and/or solve the problem?" It's typically the latter of these two, which is why collaboration skills are so important.

MM: Be willing to help others, and treat international colleagues as equals. Share and exchange knowledge with scientists of different backgrounds, needs, and cultures. Invite local input, and do not impose your own ideas; instead, foster an exchange of ideas and approaches.

RS: Your approach to international work depends entirely on what part of the world we are talking about, but, no matter where you work, keep in the front of your mind that you are a guest in that country. Do your science, and take advantage of opportunities to advance your work, but also learn about cultures different from your own, and do your best to understand different perspectives than those you grew up with. On the flip side, represent your own culture well. You are serving as an example. Doing these things will make you a better global citizen and a better collaborator.

What personality traits and personal skills are best suited for international work?

CF: Everyone can and should work internationally, but effective international collaboration will require more than a set of personality traits such as being a good listener. It also will require a shift in our scientific community's values toward the creation of inclusive research environments that acknowledge privilege and inequities, involve local knowledge holders, and allow time for things to proceed meaningfully and effectively.

MM: Patience and a friendly disposition are personal assets well suited for international work. The ability to communicate simply and thoroughly so that local people can understand and respond is a fundamental skill. In addition, the ability to adapt a sharing, rather than teaching, approach is helpful in most situations. Yet being able to train others in how to prepare manuscripts and presentations is needed, too.

RS: Again, this depends very much on what part of the world we're discussing, but flexibility and a willingness to learn and sometimes look stupid are important assets.

What are some of the challenges you've found in collaborating outside of your home country?

CF: When it comes to science and research, the hardest challenges are perhaps the time zone changes and flips in seasons, but that's nothing that a good Doodle poll and platforms such as Zoom, Skype, FaceTime, Facebook Messenger, and Google Drive haven't been able to help solve.

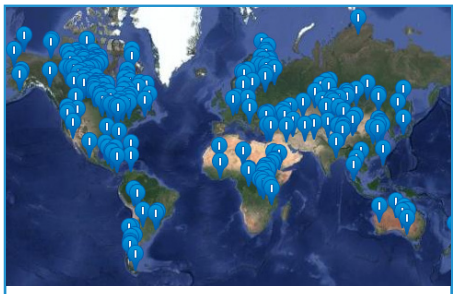
MM: Some of the challenges I've encountered include language barriers, a lack of time management skills, and the need to communicate on weekends with scientists located elsewhere who are more available to work at that time.

RS: Well, it is usually very difficult to synchronize funding across international borders. The political reality is that countries want, first and foremost, their resources to benefit themselves, and each country's funding apparatus is almost entirely built and run with an inward, not outward, perspective. There are some bodies that think and fund globally, but few of these have a basic science mission. So, assembling your dream team of international scientists will require creativity in funding. At a more pragmatic level, moving expensive or sensitive scientific instrumentation across borders can sometimes be a daunting and frustrating experience.

Anything else to add?

MM: Consider the planet as one large ecosystem for conservation. Do not assume the application of western science as a solution to all the world's problems. Learn and adopt techniques from other countries and cultures. Adopt a helpful, compassionate attitude of service to humanity.

RS: Working internationally is fun! It adds richness to your life, and you should take advantage of it.



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A SHARED LIFE
STEPHANIE GUILDFORD AND BOB HECKY

by **Paula McIntyre**

How did a boy from Akron, Ohio, and a girl from Halifax, Nova Scotia, grow up to meet, marry, and build shared careers focused on the African Great Lakes? Their story is one of formative years as children spent exploring the out-of-doors, the happenstance of an advisor to nudge the course of a career, and a habit of remaining open to the possibilities that life presents. Most of all, it's a story about relationships built along the way and the impact that ripples out from these connections—in the lives of their students around the world, and in the practice of lake science in North America and, especially, on a continent far away.

Photo by Piet Verburg

Hecky and Guildford in New Zealand

Bob Hecky grew up in the Cuyahoga River Valley where, by the time he was born, the river had already caught fire seven times. It would do so several more times on its way to becoming a poster child for industrial abuse of the nation's waters. But to a young boy, the mountains of detergent suds flowing down the river were a source of delight. Hecky, following the river's example, made his way to Lake Erie for his first encounter with the Great Lakes. He marveled at the fishing and the emergence of the mayflies known locally as *Canadian soldiers*. "Those experiences likely influenced me more than I appreciated at the time," he reflects.

Meanwhile, in Nova Scotia, Stephanie Guildford was spending her summers at the seaside. "I was fortunate to have parents that let me sail boats by myself," she recalls. "I loved being outside and preferably on large, remote waterbodies." She went on to study marine biology at Dalhousie University in Halifax, and upon graduation she took her first job at the Bedford Institute of Oceanography across the harbor in Dartmouth. But Guildford was keen to see the world, and when an opportunity opened for her to join the Department of Fisheries and Oceans' newly established Freshwater Institute in Winnipeg, she headed west, leaving the ocean behind. "The more I learned the more I wanted to understand how lake ecosystems functioned, and how we could prevent or remediate eutrophication," she says. "This motivated me to do my graduate degrees." Guildford enrolled at the University of Manitoba and went on to earn her Ph.D. in botany.

Hecky was also interested in a career of studying the sea. After graduating from Kent State University, he headed to graduate school at Duke University intent on becoming a marine biologist. Yet his plans changed under the influence of his advisor. "I was very fortunate to be assigned to Professor Dan Livingstone," Hecky says. "As a palynologist, he was studying the history of climate change in East Africa, and how it shaped the evolution of humans and their cultures." Hecky did his Ph.D. on paleolimnology of saline lakes in Tanzania and "became imprinted on Africa and its lakes." After a postdoc at Woods Hole Oceanographic Institution—where he studied lakes Kivu, Edward, and Albert—he joined the Freshwater Institute in Winnipeg.

It was there that Guildford and Hecky met and worked together for several years studying the impact of flooding on a large lake in northern Manitoba. They eventually married and have been working on large lakes in North America and Africa ever since. They are well known to the research communities on both continents. Hecky is an advisor for several groups in Africa and North America including the Great Lakes Fishery Commission for which he serves as a commissioner, and his work has been honored by multiple awards. Since 2012, Hecky and Guildford also have served as co-editors of IAGLR's *Journal of Great Lakes Research* (JGLR).

Hecky and Guildford each have a history of substantive research focused on large lakes, according to Jim Bence, chair of IAGLR's Publications Committee. "After extensive work on African large lakes, Bob started his Laurentian Great Lakes research by showing how invasive mussels were substantially altering phosphorus dynamics in the lakes through the now well-known nearshore phosphorus shunt. More generally, he has made many contributions to the understanding of nutrient cycling in large lakes and how the biota influences this cycling," Bence notes. "Stephanie has also conducted research on both African and Laurentian Great Lakes, and she has made major contributions to understanding the determinants of phytoplankton productivity and the role of nutrient regeneration in the lower food web."

While some people marvel that spouses can work together, it has been a good life for Hecky and Guildford. "We have enjoyed truly rich, shared careers," Hecky says. "Working together has always seemed natural for us. We take our mutual trust and respect for granted."

Guildford also notes the benefits of shared careers. "You can always talk about your work, and you see a lot of each other," she says. On the other hand, "you

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can't use your spouse as a reference, and you see a lot of each other." Yet their biggest challenge was to find two professional positions together. "I hope it is better these days," she says, "but hiring spouses was not common in the past." In spite of this challenge, they went on to positions at the University of Waterloo and then at the University of Minnesota Duluth where each now has emeritus status.

Working together enabled Hecky and Guildford to share research journeys with their five sons. The two eldest spent several field seasons with them in northern Manitoba, while the younger three spent time at their field locations on Lake Malawi in Africa. "All five loved their experiences," Guildford says, "but, like most siblings, they continue to discuss who got the better deal."

The example the couple set raising five children while pursuing two busy academic careers was not lost on their students. "They served as fantastic role models of a healthy work-life balance," says Rebecca North, an assistant professor of limnology at the University of Missouri. "I had my first child while I was a Ph.D. student working with Stephanie. She was the most supportive advisor a student could have in that situation. At a point where many women leave academia due to the demands of young children, it was her support and encouragement that kept me going."

This family-friendly attitude shaped the couple's working style. "Perhaps it was the nature of their relationship being an academic couple," North says, "but, when you worked with one of them, you were working with both, and you weren't a colleague, you were a family member." This connection was on display at a recent African Great Lakes workshop in Entebbe, Uganda. "During introductions," co-organizer Jessica Ives recalls, "almost every other person was saying 'Hello, I'm so and so, and I'm an academic child or grandchild of Bob Hecky.'"

Such fondness is no surprise considering the couple's longtime commitment to the lakes and people of Africa. Over the years, Hecky and Guildford have identified and trained young African scientists with the potential to play leading roles in African lake science, says Richard Ogutu-Ohwayo, who recently retired from the National Fisheries Resources Research Institute in Uganda where Hecky started an analytical lab in the early '90s. Ogutu-Ohwayo credits the couple with helping him to attend the University of Manitoba for his Ph.D. and, more recently, to secure positions as IAGLR's first international board member and as an associate editor of the JGLR. "Bob is a black man in white skin," he says fondly when reflecting on Hecky's dedication to Africa.

Other students also comment on the couple's personal focus. "They have been successful in their international work because they have been able to establish strong partnerships with scientists in Africa, and those partnerships are built on mutual trust and respect," notes Harvey Bootsma who did his Ph.D. with Hecky and is now an associate professor at the University of Wisconsin–Milwaukee.

Despite their profound impact, when Guildford and Hecky are asked what makes them most proud, they readily say it's their students from around the world. "We were so fortunate to work with so many students who were so keen and dedicated and collegial," Guildford says. "They have done amazing work and have gone on to such important positions where now many are training their own students and advising policy makers on the health of freshwater and marine ecosystems around the world."

Hecky and Guildford were thought-provoking and respectful mentors, which endear them to their many students, Bootsma says. "Bob and Stephanie's sincere interest in the results of my research, no matter how trivial I thought they might be, was a great form of encouragement."

Guildford and Hecky at the *Freshwater Ecosystems–Key Problems* conference in Irkutsk, Russia, in September of 2018

I believe we will not really understand any great lake, or what is possible for it, until we understand all great lakes. — Bob Hecky

When North thinks back to her undergraduate years, she recalls that Guildford had a great reputation among students as being friendly and approachable. That support has continued. North says she can always run an idea by Guildford, even now, and receive an insightful and supportive response. "This type of lifelong coach is unusual in academia," she says. "I am extremely fortunate."

Hecky's students share similar stories. "As a supervisor, in spite of having many students, Bob was always accessible," recounts Piet Verburg, now a lake scientist in New Zealand. "He truly cares about people and feels responsible for the welfare of his charges more than just as a supervisor." Verburg also reflects on Hecky's passion for his work. "As a scientist, Bob is extremely conscientious, and very knowledgeable. He is very driven, and both the science and environmental problems affecting lake water quality are important to him."

Perhaps that is what led Hecky to once dive into Lake Simcoe after a sonde that had detached from its lowering line. "Undeterred, Bob jumped in to retrieve the sonde, now lying on the bottom," recounts former student David Depew, now a research scientist at Environment and Climate Change Canada. "Bob returned to the vessel, promptly plugged in the sonde, and marveled at the dissolved oxygen readings it had collected while sitting on the lake bottom."

Curiosity about how lakes work has kept him going, Hecky says. And it also likely explains the enjoyment he finds in editing the JGLR. During their tenure as editors, Hecky and Guildford have tirelessly promoted the journal, traveling to international conferences and facili-

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tating special sections highlighting large lake research outside of North America. According to Bence, the result has been an increase in both international submissions and published articles, an increase in the overall number of journal articles per year with the highest number of submissions ever in 2019, and a higher impact factor that reflects a growing reputation for the JGLR. At the same time, Bence says, the editors have insisted on keeping the journal accessible to those publishing good research focused on specific Laurentian Great Lakes issues.

"I am hopelessly biased toward international, collaborative research and very pleased that IAGLR has become more international over the last several years," reflects Guildford. "However, I want IAGLR to keep its core strengths—the conferences and JGLR—strong. IAGLR's leadership role in helping to keep North American Great Lakes research strong and healthy while fostering collaborative opportunities is the best way IAGLR can support global great lakes health."

Hecky notes that the association is the world's largest community of scientists, managers, and stakeholders concerned with large lakes. As such, it leads and sets the standard for appropriate research and management of these lakes, he says. Other large lakes, especially those shared internationally, can learn from and incorporate that experience.

"I encourage all IAGLR members to appreciate that role and become interested in the problems that other great lakes are suffering as well as how our collective and individual activities can have impact at that global scale," he says. "Lakes everywhere follow the same physical, chemical, and biological processes; but climate, geology, and evolution impose different expressions of those processes. I believe we will not really understand any great lake, or what is possible for it, until we understand all great lakes."

With climate change, eutrophication, invasive species, and habitat alteration threatening the world's lakes, such an understanding—and the international collaboration it requires—has never been more urgent. Hecky and Guildford have done their part to pave the way forward.

Paula McIntyre is a communications consultant and principal at Loracs Design LLC. She currently serves as IAGLR's communications director.

ELLS-IAGLR 2021

by **George Bullerjahn**

Photo by Igor Georgievski

Kivach Falls in Karelia's Kivach Nature Reserve

Following the 2018 ELLS-IAGLR symposium in Evian, France, the next joint meeting of the IAGLR and ELLS scientific communities will be held September 13-19, 2021, in Petrozavodsk, Republic of Karelia, Russia. The 2021 ELLS-IAGLR symposium will be hosted by the Karelian Research Centre of the Russian Academy of Sciences, with Nikolai Filatov, director of the Northern Water Problems Institute, serving as chair of the organizing committee. The symposium's theme of *Implications of Climate Change and Human Impact on Large Lakes* will cover several topics that include seasonality in large lakes, long-term trends in water quality and aquatic communities, and the interplay among sediment, microbiota, and macrobiota in benthic landscapes. The theme also will encompass sessions addressing topics such as responses to stressors and climate change, emerging tools for prediction and modeling, and current research on Lake Baikal.

Petrozavodsk is an attractive resort town on the shores of Lake Onego, one of European Russia's two great lakes, the other being nearby Lake Ladoga. Lodging is available at numerous four-star, lakeside hotels including the Cosmos Petrozavodsk Hotel and the SPA Hotel Karelia. Excursions during the symposium will explore the unique culture of the region, and they include a trip to the UNESCO World Heritage Site on Lake Onego's Kizhi Island. Attendees can also explore the unique environment of Karelia at the Kivach Nature Reserve and on beautiful Valaam Island in Lake Ladoga. Additionally, the lovely Solovetsky Islands in the neighboring White Sea can be accessed through the Belomorsky-Baltiisky Canal.

On a personal note, back in 2013 I spent a week in Petrozavodsk studying Lake Onego's winter plankton, and the city's accommodations, food, and cultural museums made my visit a great research and educational experience. I look forward to visiting Petrozavodsk once again, and I look forward to seeing everyone in Karelia in September 2021!

George Bullerjahn is a professor of biological sciences at Bowling Green State University and the chair of the IAGLR Organizing Committee for the upcoming ELLS-IAGLR symposium. For more information on the event, send inquiries to bullerj@bgsu.edu or visit the conference website.

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LAKES AROUND THE WORLD

JGLR GOES GLOBAL IN 2020 SPECIAL SECTIONS

This year the *Journal of Great Lakes Research* will highlight different aspects of large lake research in three special sections which arose from conferences in France, Russia, and Uganda in 2018. These and other special sections can be found online via ScienceDirect. For more information about how to propose a special section in the *Journal of Great Lakes Research* contact the editorial office at editor@iaglr.org.

ELLS–IAGLR 2018: *Big Lakes–Small World*

This special section features presentations from the *Big Lakes–Small World* conference held in Evian, France. The conference developed from a shared interest among the IAGLR and European large lake scientific communities in expanding beyond their regular conferences to engage with the international community and build connections between researchers and managers. The collaboration between IAGLR and the 5th European Large Lakes Symposium (ELLS) produced this first ELLS–IAGLR joint meeting for sharing experiences and discussing issues and challenges facing the world's large lakes. ELLS–IAGLR 2018 was hosted by the Alpine Center for Research on Trophic Networks and Limnic Ecosystems and was co-funded by private companies, stakeholders, and both governmental and academic institutes, all from areas surrounding Lake Geneva. The special section opens with a paper co-written by conference attendees in response to the second "Warning to Humanity" by Ripple et al. (2017); following that are papers on the functioning, management, and modeling of large lakes, their long-term changes and ecosystem services, and data acquisition to better understand them.

Photo by Visée.A

The ELLS–IAGLR2018 group photo in front of Palais Lumiere, Evian, France

Lake Baikal 2018: *Freshwater Ecosystems–Key Problems*

This special section originates from the *Freshwater Ecosystems–Key Problems* conference in Irkutsk, Russia, which focused on recent research on Lake Baikal. This international conference was organized by the Limnological Institute of the Siberian Branch of the Russian Academy of Sciences to celebrate its 90th anniversary. Lake Baikal has long been considered one of the world's most pristine freshwater ecosystems; however, modern investigations show evidence of a progressing "ecocrisis" characterized by a greening and "blue-greening" of the coastal zone, wash-ups of rotten algae, degradation of biological communities, mass mortality of endemic taxa, and pollution of tributaries and the shallows. So far there are no commonly accepted causes of these processes, and therefore broad exchanges of ideas and international interdisciplinary collaborations are needed to address these problems. The articles in this special section are devoted to the mechanisms of the formation of freshwater ecosystem biodiversity and sustainability, the molecular ecology of aquatic organisms, and the study of various communities of aquatic organisms.

Photo by Oleg Timoshkin

Lake Baikal

Speciation in Ancient Lakes 8: *Celebrating 25 Years and Moving Towards the Future*

This special section is a result of the international conference *Speciation in Ancient Lakes 8*, organized by Christian Albrecht and Björn Stelbrink of Justus Liebig University in Giessen, Germany, and Casim U. Tolo of Mbarara University of Science and Technology in Mbarara, Uganda. This conference celebrated its 25th anniversary in 2018 and, for the first time, was hosted in Africa, on the shore of Lake Victoria in Entebbe, Uganda. The main goal of this conference and its eponymous society is to bring together scientists from different fields that deal with speciation processes in so-called "ancient lakes," that is those that have consistently carried water for more than a million years. This special section covers a range of topics including, among others, biodiversity patterns and population genetics of extant and extinct invertebrates, systemic and anthropogenic impacts on ancient lake biota, and conservation issues. Some included topics, such as parasitology and public health concerns, are relatively new in ancient lake research, and almost all ancient lake systems of the world are covered within this section in a truly interdisciplinary context that bridges the past and present to the future.

Photo by Christian Albrecht

SIAL 2018 participants take an excursion on Lake Victoria on the NaFIRRI RV *Hammerkop*

Building strong international scientific networks in the African Great Lakes

by Jessica Ives and Ted Lawrence

Last November, nearly 100 freshwater experts from 18 countries gathered in Entebbe, Uganda. Their purpose? To answer the call for more collaborative research in understanding the African Great Lakes (AGL). Unlike the North American Great Lakes, these large lakes in East Africa each lack long-term, comparable, peer-reviewed data.

For decades, international researchers have been calling for more collaborative work in the AGL region. During the past five years, several undertakings have highlighted these calls to action: the Great Lakes to Great Lakes Initiative, spearheaded by Russell Feingold, former U.S. senator and special envoy to the Great Lakes region of Africa (2015); the Global Conference on Inland Fisheries in Rome, sponsored by the United Nations' Food and Agriculture Organization and Michigan State University, which resulted in 10 consensus-based steps toward achieving responsible inland fisheries (2016); and the African Great Lakes Conference in Entebbe, Uganda, led by The Nature Conservancy with funding from the MacArthur Foundation (2017). Additionally, in 2017, the African Center for Aquatic Research and Education (ACARE) was formed by freshwater experts from Africa and North America. Its goal is to better address the challenges facing the AGL by strengthening collaboration among freshwater experts both worldwide and specifically within the AGL riparian countries.

"Strengthening collaboration and communication is critical for a resilient scientific and management community that effectively makes use of their limited resources," says Robert Hecky, ACARE board member and editor of IAGLR's *Journal of Great Lakes Research*. "IAGLR is mostly familiar with this in the North American Great Lakes, where cross-jurisdictional collaboration is well established. Thus, we look forward to strengthening the interaction of the global freshwater communities surrounding these large lake systems at IAGLR 2020."

ACARE convened a workshop in November 2019 in Entebbe, Uganda, centered around establishing a network of collaboration and information exchange on the AGL. This network is loosely based on the successful lake committee model that administers the *Joint Strategic Plan for Management of Great Lakes Fisheries for the Laurentian Great Lakes*. However, for it to succeed, this AGL network and the processes around it must be designed by African experts to fit African contexts and goals. The workshop was co-hosted by ACARE, the Lake Victoria Fisheries Organization (part of the East African Community, a regional intergovernmental organization), and the National Fisheries Resources Research Institute (one of Uganda's public research institutes), and it included participants from all 10 of the riparian AGL countries.

Using a mixed plenary–breakout format, the workshop established six multi-jurisdictional, lake-specific advisory groups comprised of participants from the AGL riparian countries to help address the gaps in knowledge about each AGL. Each advisory group had the same basic structure and overall goals, but had the freedom to develop specifics independently within the context of its lake(s). These groups are the Lake Edward/Albert Advisory Group, the Lake Kivu Advisory Group, the Lake Malawi/Niassa/Nyasa Basin Fisheries & Aquaculture Network, the Lake Tanganyika-Scientific Advisory Group, the Lake Turkana Advisory Group, and the Lake Victoria Advisory Group.

Participants of the November 2019 ACARE workshop in Uganda

Each group created a purpose statement, identified missing key participants, designed group structure and processes, and developed next steps, which included a commitment to meet at least annually. At these annual meetings, each advisory group will prioritize research needs and harmonize both research approaches and data collection efforts among their riparian counterparts. Details of the workshop outcomes are available in a workshop report.

"The purpose of this process is so that each lake can produce long-term, comparable, and peer-reviewed data that can eventually be used to positively influence policy and management," explains Kevin Obiero, director of the Kenya Marine Fisheries Research Institute's Sagana Research Centre and member of both the ACARE board and IAGLR. "Additionally, we intend that each group not only harmonizes research on its specific lake, but among the other lakes through larger, inter-basin meetings. We hope that we will be better equipped to direct financial and research resources where they are needed most and allow for more efficient information and data exchange."

We view international collaboration as essential to IAGLR's interest in the global advancement of large lake science. While the AGL are fascinating from a scientific viewpoint, they historically have been studied in disparate and piecemeal ways. Critical outcomes of the AGL collaborative process can improve upon that history by influencing research to be useful to the local communities and by creating clear lines of communication both among AGL research communities and between the African researchers and the global freshwater community. In that spirit, more than 20 African freshwater scientists will attend the IAGLR conference in Winnipeg this June to engage with IAGLR members. Seek them out to help strengthen the global freshwater community.

If you are interested in becoming involved with ACARE or following our efforts, please reach out to Ted Lawrence (ted@agl-acare.org).

Jessica Ives and Ted Lawrence are co-founders of ACARE. Ives serves as its director of operations, and Lawrence its executive director. Ives is also secretary of the IAGLR Board of Directors.

63rd annual Conference on Great Lakes Research

Photo Courtesy Zyron Paul Felix

IAGLR20: Putting the *international* in International Association for Great Lakes Research

International networking opportunities

- Meet representatives from newly formed African Great Lake Advisory Groups
- Join us at a focused networking event to connect with 10+ early career researchers attending as part of the African Women in Science Initiative

AquaHacking competition

- Witness the semifinal of this tech competition, where young innovators team up to develop solutions to freshwater issues affecting large lakes around the world

International sessions and speakers

- Attend presentations by scientists from Austria, Finland, Iran, Kenya, Malawi, Nepal, New Zealand, Taiwan, Uganda, and Vietnam
- Learn about the seven African Great Lakes at a session devoted to the state of the world's large lakes

IISD Experimental Lakes Area

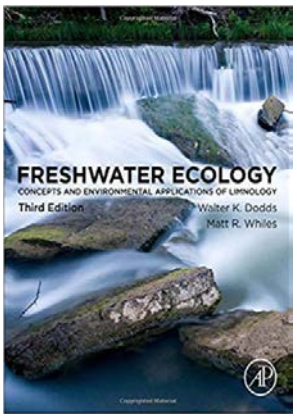
- Visit and learn about the IISD-ELA, our conference host and one of the world's most influential freshwater research facilities

iaglr.org/iaglr2020

BOOK REVIEW

A freshwater science refresher

by **Bopaiah Biddanda**



Elsevier/Academic Press, April 2019

In the end, if we can't save our increasingly threatened freshwater resources, nothing else will really matter. Now, a recently published textbook by two researcher–educators provides a timely refresher on both the basic and applied aspects of freshwater ecology. The book is written both as a textbook for undergraduate and graduate students and as a reference manual for practicing scientists and managers in the fields of water resources, limnology, and freshwater science.

Freshwater Ecology: Concepts and Environmental Applications of Limnology, 3rd Edition by Walter Dodds and Matt Whiles claims to be "a thoroughly updated revision of the classic textbook on limnology and freshwater ecology," and it does not disappoint. In addition to the traditional topics, this edition includes useful, new sections on toxins, pollutants, molecular biology, large-scale ecosystem ecology, and even endearing personal biographies of some leading researchers in limnology. Its 26 chapters and appendix consider topics including nutrient cycling, trophic relations, community interactions, scaling across landscapes, and experimental design. Each chapter ends with a list of take-home points and follow-up questions. It is a well-referenced book, and the citations and index sections are helpful. However, one way by which the book could be improved is moving its introduction of key concepts such as nutrient limitation, the river continuum, and the biome gradient from its final chapters to much earlier ones.

I successfully used the book as the main framework for teaching a graduate course on advanced aquatic ecology in the fall of 2019. I complemented each book chapter with a student-led discussion of one or two related recent articles from journals such as *Limnology and Oceanography* and the *Journal of Great Lakes Research*. I found this hybrid strategy to be effective for communicating concepts and advances within each topic.

On the whole, the arrival of this updated reference book could not be timelier, having come out when humanity is at a crossroads with regard to the world's freshwater resources. The book ends with this personal call to action: "Please take time to reflect on what you have learned from this text, and take with you the valuable parts and make the world a better place. Get your feet wet, enjoy the water." I can't think of a better note on which to end a resourceful, student-oriented textbook on freshwater ecology.

Bopaiah Biddanda is a professor of water resources at Grand Valley State University's Annis Water Resources Institute.

MEMBER PROFILE

ALFRED OTIENO ACHIENG'

Ph.D. Candidate in Veterinary Medicine and Science, University of Nottingham, UK

I currently mentor students and teach at the University of Eldoret in Eldoret, Kenya. I also conduct research in Lake Victoria's Winam Gulf and catchment. There, I investigate anthropogenic activities and their impact on water quality and the invertebrate and fish communities within the major rivers originating from the Kenyan side of Lake Victoria. My Ph.D. research will assess various components of Lake Victoria's cage culture; these include the lake's ecological carrying capacity for cage aquaculture, surveillance and modeling of bacterial communities and nutrient cycling linked to cage culture, and paleolimnological comparisons via sediment core analysis of modern and prior lake conditions.

What inspired you to enter this work?

The need for conservation and management of our natural resources is a fundamental concern, given the rapidly increasing rates of their overexploitation and degradation. Population growth and settlement, unsustainable use of natural resources, pollution of water bodies, industrialization, infrastructure development, deforestation, and agricultural activities have led to, among other things, a drastic decline in renewable water resources, a drying of river channels, a decline in fish catches, and challenges in food and nutritional security. In addition, management limitations are numerous and include lack of skilled personnel plus inadequate and/or inaccessible research data for historic and current trends to be determined and evaluated. Yet proper conservation and management through well-informed policy making and sustainable resource use require credible research and reliable, long-term data.

Without proper management, projections indicate worsening future conditions. The United Nations predicts that Kenya, currently a water-scarce country, will plunge into absolute water scarcity while continuing to experience rapid population growth and exploitation of natural resources. Notwithstanding, some efforts have been made toward finding solutions to these challenges. These include funding from national and international efforts, regionally collaborative research endeavors, and, recently, the internationalization of research within the great lakes of the world through the African Center for Aquatic Research and Education (ACARE).

In my career as an aquatic scientist, I am motivated to be involved in and contribute to the current efforts to provide tangible and transformative solutions to the multifaceted problems of Lake Victoria through mitigation measures, conservation, and sustainable use of its resources.

What body of knowledge would you like to build on?

The mapping and modeling of aquatic ecosystems and catchment activities for use in sustainable management practice development.

If you could change something about how science is done, what would it be?

Since most of the quality research on ecosystems is multidisciplinary, it is important that the concepts, theories, and guiding principles of the various disciplines involved in the research are discussed and understood before the research proceeds. Understanding our terminologies and frameworks can improve the approach to solving ecosystem problems holistically.

What might be surprising about research or lakes in your area?

Lake Victoria is the largest tropical freshwater lake and the second largest freshwater lake by area in the world. It is the source of the world's longest river, the Nile. The lake's catchment unifies five East African countries, with 44% of the catchment being in Tanzania, 22% in Kenya, 16% in Uganda, 11% in Rwanda, and 7% in Burundi. The basin is recognized for its exceptionally high diversity and endemism of freshwater species. The stressors and impacts noted previously combined with factors hampering reliable research within the region have drawn regional and international interest as the changed lake ecology and ecosystem services threaten its sustainble use by the basin's community.

How long have you been an IAGLR member and why did you join?

I joined two years ago, when I attended the annual conference for a session facilitated by ACARE on the African Great Lakes. ACARE introduced me to the annual conferences and facilitated my travel to attend. IAGLR provides a wealth of knowledge from researchers studying aquatic ecosystems and their catchments. I'm privileged to be a member, interact with the association, and learn from members' experience and expertise.

MEMBER PROFILE

SAVITRI JETOO

Postdoctoral Scholar and Adjunct Professor, Åbo Akademi University, Turku, Finland

I am most interested in what "good governance" is in the contexts of water protection and wicked problems such as eutrophication and climate change. My research has focused on multilevel systems of water governance in which different stakeholders exercise different levels of power and authority to determine who gets to participate in the decision making and problem solving for complex challenges. I have taken this research further by focusing on comparative water governance studies among the Baltic Sea, Chesapeake Bay, and now, other regions of the world.

What inspired you to enter this work?
My natural curiosity and passion for science led me into this field. My motivations have been strictly personal as I am most myself when I am in nature. As such, I want to understand it better and be able to leave a positive footprint. I am also inspired by experts in this field such as Gail Krantzberg, Isobel Heathcote, Marko Joas, Nina Tynkkyen, Erik Bonsdorff, Paul Sibley, Chandra Madramootoo, Velma Grover, Dustin Garrick, and Carolyn Johns, all of whom exhibit great passion for science and scholarship.

What body of knowledge would you like to build on?
Effective water governance will continue to be one of the key challenges of the 21st century. In the past, water governance focused on the decision-making processes and actors involved in the delivery of water-related services and the protection of water resources. However, the field needs to expand to include connections with, for example, climate change and energy governance. Therefore, I would like to expand my research beyond its focus on water to engage in multidisciplinary investigations about broader natural resources governance and the many societal issues linked to that wide-scale governance. This expanded breadth includes climate change concerns, multilevel energy governance, sustainability issues, and the implementation of the United Nations Sustainable Development Goals. I would also like to work more closely with the wider community on these issues.

If you could change something about how science is done, what would it be?
Because scientific questions are so complex and interconnected, our strict disciplinary walls need to be demolished. We also need to re-examine the policies that guide science and change the way we communicate science to make it more accessible to the public. A lot of research funding decisions are based on academic articles that only a limited number of academics read. Quality academic research is important, but it is equally important to disseminate these findings beyond academia to the wider society.

What might be surprising about research or lakes in your area?
The governance of the Baltic Sea was evolving around the same period as that of the North American Great Lakes but there were key differences. The Great Lakes Water Quality Agreement (GLWQA) was signed in 1972 after public outcry and scientific investigations into the pollution of the waters of the Great Lakes. However, the Convention on the Protection of the Marine Environment of the Baltic Sea Area (the Helsinki Convention) was signed in 1974 and arose from diplomacy during the Cold War period. The International Joint Commission was given oversight for the GLWQA, and, similarly, the Helsinki Commission became the governing body for the Helsinki Convention. However, there is a further layer of governance for the Helsinki Convention—that of the European Union (EU). Eight out of the nine Baltic Sea coastal countries (all but Russia) are members of the EU and hence are subject to EU environmental frameworks and directives. This has led to a network-based governance for the Baltic Sea with high degrees of coordination, but it has also led to difficulties in vertical collaboration across governance levels, particularly on the subnational level.

How long have you been an IAGLR member and why did you join?
I joined IAGLR as a doctoral student about five years ago to attend an IAGLR conference and meet like-minded researchers, scientists, and practitioners. I remember that meeting well. I was excited and stimulated by all the scientific sessions on multiple stressors to the Great Lakes ecosystem. It was inspiring for me as an early career researcher to be among some of the greatest experts in the field, listening to their presentations and interacting with them in person. These conferences are important in helping us to step outside of our subject silos to examine problems through different disciplinary lenses.

MEMBER PROFILE

ANIKA KUCZYNSKI

Water Quality Modeler, National Institute of Water and Atmospheric Research, Christchurch, New Zealand

My research focuses on monitoring and modeling nuisance benthic algae. Most of my past work and some of my ongoing work involves modeling the growth of Cladophora*, a nuisance filamentous green alga, in the Laurentian Great Lakes. I use mechanistic modeling approaches supported by field and experimental data. In New Zealand, I am currently involved in developing new monitoring and modeling methods for stream periphyton. To monitor periphyton cover and biomass, we are using aerial (drone) and stationary imagery, which shows promise for increasing the spatial and temporal resolution. To support periphyton modeling, I am leading experimental work using respirometers (benthic chambers) to measure periphyton metabolism and nutrient uptake rates and thus help define model parameters.*

What inspired you to enter this work?
My high school physics teacher encouraged me to consider studying engineering, and water as the source of life has always fascinated me spiritually and scientifically. When I researched different engineering disciplines, I realized I wanted to become an environmental engineer. But how did I get into algae? My Ph.D. advisor, Dr. Marty Auer, drew me in with his work on real-life problems and his solution-driven research. I was also inspired by his passion for teaching and community outreach. Generally, I am driven by a desire to contribute to the enhancement of surface water quality, sustainability, and the protection of human and ecosystem health.

What body of knowledge would you like to build on?
My professional goal is to help improve water quality modeling, especially to develop appropriate growth models that may be used to predict blooms and thus inform environmental management. I see a need for improvements in linking hydrodynamic, hydrologic, and water quality models from the *mountains to the sea* (or *ki uta ki tai* in New Zealand's native Māori language) so that managers can be informed with better predictions of the likely environmental responses to various scenarios such as changes in land use, point source discharges, urban development, and climate. Why? Because I would like future generations to be able to enjoy our planet's fresh waters, and I think t*e mana o te wai* (Māori for the *well-being of the water*) is best realized and protected by making water management decisions based on sound science and traditional ecological knowledge.

If you could change something about how science is done, what would it be?
I think we need to improve our communication skills and increase transdisciplinary research. This is not a new thought, but it is a widely discussed topic that I think merits further attention. Though using scientific jargon may make us feel like intellectuals, it can obscure our messages and delay or impede management and research. When I speak or write, I try to remember KISS—Keep It Simple, Stupid. I strive to break down barriers in language use, overcome my fears of appearing ignorant, and work up the courage to ask more questions, listen, simplify my language, and ask for help.

What might be surprising about research or lakes in your area?
New Zealand does not boast lakes of comparable size to the Laurentian Great Lakes, but its deepest lake, Lake Hauroko (462 m), is deeper than Lake Superior (406 m). New Zealand also is home to the world's clearest lake, Blue Lake, also known as *Rotomairewhenua*. Hydroelectric schemes supply more than half of New Zealand's electricity, and water abstraction supports New Zealand's agriculture, especially its dairy industry. But alongside the economic benefits come eutrophication problems as river flows decrease and nutrient loads increase. Further contributors to environmental issues are invasive algal species, such as *Lindavia* and *Didymosphenia* and toxic *Phormidium* and *Microcoleus* blooms.

How long have you been an IAGLR member? Why did you join?
I joined IAGLR as a student in 2012. I was eager to meet members of the academic Great Lakes community, to reach beyond my home research institution, and to meet leaders in my field.

MEMBER PROFILE

PIERRE-DENIS PLISNIER

Ph.D. (Université Catholique de Louvain, Belgium), GL Eco consulting

My research mainly deals with climate impacts on the limnology of the African Great Lakes. This may be applied to various fields, including fisheries, paleoclimatology, and health (the latter via a possible plankton-cholera relationship). I am particularly interested in helping to set up long-term, continuous environmental monitoring of the African Great Lakes to better understand their functioning. Those lakes and their ecosystem services are facing serious threats, including oil exploitation.

On Lake Tanganyika

What inspired you to enter this work?

For my thesis, I worked on lakes Ihema and Muhazi in Rwanda in the 1980s. I enjoyed the extraordinary lacustrine environment and the work in Central Africa, a region with historical links to my family. (My grandfather lived in the Congo from 1910 to 1925 and my parents from 1952 to 1963, in addition to other members of my family in other periods. I was born along the Congo River.) Several more years spent in Africa working on Lake Tanganyika on a project for the Food and Agriculture Organization of the United Nations confirmed my interest in this work.

What body of knowledge would you like to build on?

Great lakes such as the African Rift Valley lakes are extraordinarily climate sensitive. The abundance of pelagic fishes in Lake Tanganyika, for example, has been well correlated to oceanic anomalies such as El Niño through climate teleconnections. This could allow for possible forecasting about future catches and could also help our interpretation of the paleoclimate signals in this ancient lake (>10 million years old). I also find hydrodynamics to be of considerable interest. Upwelling, internal waves, surges, turbulence, and other limnological events can reach considerable amplitudes, strongly impacting lake organisms and ultimately the human population. These aspects make up the pieces of some kind of puzzle that researchers enjoy trying to put together. If my work can help to assemble even some parts of this puzzle, that would make me happy.

If you could change something about the way science is done, what would it be?

Multidisciplinary projects should be much more encouraged. Topics are varied, and so they need broader teams of both specialists and generalists to work on them in a coordinated way.

The timeframes of projects on the African Great Lakes need to be longer: at least five to six years instead of the approximately four years that is often the case today. For some lakes, there is a great challenge to build networks, prepare material, implement training, etc., before the monitoring program becomes fully operational. Once the program is launched, having several years of observations rather than just a few can allow for the acquisition of knowledge in a much better, more cost-effective way.

There should be baseline continuous monitoring of each great lake. At some great lakes, several parameters are not being measured (including temperature profiles and other essential parameters) when no short-term projects are taking place. An international consortium linking local authorities and research institutions could be developed for each great lake to help ensure such a continuous collection of basic but essential parameters. For African Great Lakes investigation, it is also important that the continuous monitoring stations be situated at some key sites (in particular, the north and south ends), while lakewide cruises would be more useful for additional specific studies.

How long have you been an IAGLR member and why did you join?

I joined IAGLR three years ago when I realized how urgently necessary it is to develop long-term monitoring of the African Great Lakes presently threatened by oil exploitation. A better knowledge of the environmental monitoring taking place in the North American lakes is useful for this development, as is access to the *Journal of Great Lakes Research*.

Donors & Sponsors

Your donations to the International Association for Great Lakes Research provide scholarships for students to attend college; support opportunities to gather at two annual conferences, learn from one another, and connect for the good of the lakes; and help us to continue in and strengthen our role as the voice for large lakes science. The following individuals and organizations made gifts to IAGLR in 2019. Thank you for your support as we carry on with the important work of advancing understanding of the world's large lake ecosystems.

Individuals

The Norine Dobiesz Revocable Living Trust

Randy Eshenroder

Nicholas Fisch

Dean and Wendy Foster

Robin and John Francis

Mary Ginnebaugh

Mariane Kasza

John Kennedy

Barry Lesht

A. Scott McNaught

Sharon Reasoner

Dolores Sakowski

Michael Wilberg

and our anonymous donors

Organizations

Aquatic Ecosystem Health and Management Society

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Brockport Foundation, The College at Brockport, State University of New York

City of Houghton

Clarkson Institute for a Sustainable Environment

Community Foundation for Southeast Michigan

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International Joint Commission

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Michigan Office of the Great Lakes

New York Department of Environmental Conservation

New York Sea Grant

Saginaw Bay Environmental Science Institute

Turner Designs

U.S. Environmental Protection Agency

KUDOS

Congratulations to the following IAGLR members on their accomplishments.

CORY BRANT for publishing his book *Great Lakes Sea Lamprey: The 70 year War on a Biological Invader* with the University of Michigan Press.

MICHAEL HANSEN on his retirement after dedicating four decades toward native fish restoration and invasive species control in the Great Lakes region and western United States. Handsen worked for EA Engineering, Wisconsin DNR, the (now) USGS Great Lakes Science Center, and the University of Wisconsin–Steven's Point before ultimately retiring from a supervisory position with the USGS Great Lakes Science Center at Hammond Bay Biological Station. Hansen also established an extensive service record that included serving as an editor of the *North American Journal of Fisheries Management*, a commissioner and chair of the Great Lakes Fishery Commission (GLFC), and chair and member of the GLFC's Sea Lamprey Control Board. He mentored hundreds of students and staff members throughout his career, received numerous awards, and grew to be recognized widely as a scholar and leader in the field of fisheries.

JOHN HARTIG (Great Lakes Institute for Environmental Research, University of Windsor) for being selected to participate at the Winter Writers Retreat 2020 at the Banff Centre for Arts and Creativity.

ROBERT HECKY, along with co-author Ray Hesslein, for receiving the 2020 John H. Martin Award from the Association for the Sciences of Limnology and Oceanography for their paper "Contributions of benthic algae to lake food webs as revealed by stable isotope analysis." The award recognizes one paper each year that has led to fundamental shifts in research focus and interpretation of a large body of previous observations.

MICHAEL TWISS for being promoted to chair of Clarkson University's Department of Biology.

CHRIS WEISENER (GLIER) for securing a 2020 *Stand Up for Great Lakes* Graduate Fellowship from the Cooperative Institute for Great Lakes Research to support graduate research for student Chelsea Salter.

Science policy update

Through its membership in the Consortium of Aquatic Science Societies, IAGLR participated in the following actions:

- Filed an amici curiae brief for a case heard by the Supreme Court in November. The brief argued that the Clean Water Act mandate to restore and maintain healthy waters can be met only if lawmakers and government agencies take into account the scientific reality of connections between point sources and surface waters through groundwater.
- Issued a press release addressing concerns that the new WOTUS rule ignores sound science on the importance of small streams and wetlands to maintaining healthy waters.
- Requested an extended 120-day comment period before the Whitehouse Council on Environmental Quality enacts changes to the National Environmental Policy Act, an environmental law that promotes the enhancement of the environment and is the basis for permit applications, land management actions, and highway construction.

In addition, IAGLR will participate in the June 2022 Joint Aquatic Sciences Meeting in Grand Rapids, Michigan.

WELCOME NEW MEMBERS

The following members joined IAGLR between November 2019 and January 2020.

Jordyn Atkins
Alicia Banwell
Scott Bergson
Tyler Black
Brian Bodenbender
Tirupati Bolisetti
Kennedy Bucci
Siyu Chen
Alicia DiCarlo
John Dony
Alexander Duncan
Emilie Ferguson
Edgar Ferguson
Anthony Gidudu
Taylor Hanson
Rachel Henderson
John Higley
Audrey Huff
Gladys Kangi
Geoff Klein
Jacquie Lang
Yu Lin
Megan Mader
Stella Mbabazi
Christine Owino
McKenzie Perry
Purnank Shah
Bryanna Sherbo
Sawyer Stoyanovich
Lamalani Suarez
Lauren Timlick
Tamara Van Staden
Bas Vriens
Elizabeth Wanderi
Yekaterina Yezhova
Daniel Zielinski

Lakes Letter is published quarterly by the International Association for Great Lakes Research, a scientific organization made up of researchers studying the Laurentian Great Lakes, other large lakes of the world, and their watersheds, as well as those with an interest in such research.

Edited by Paula McIntyre, IAGLR Communications Director, with copy editing assistance from Heather Siersma

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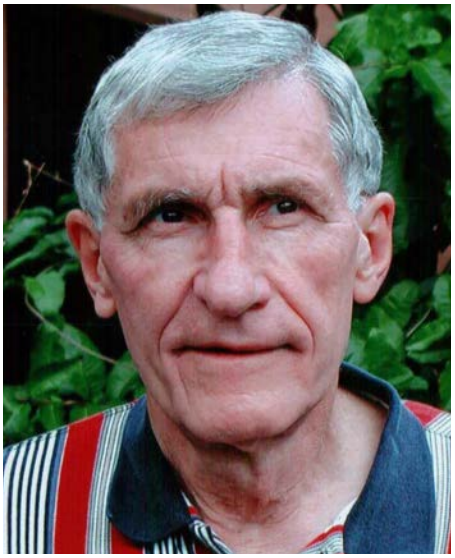
iaglr.org

IN MEMORIAM: CLAIRE L. SCHELSKE (1932-2019)

The Great Lakes science and management community lost a prominent scholar and researcher with the passing of Claire L. Schelske on August 20, 2019. Claire graduated with a B.A. in 1955 and an M.S. in 1956 from Kansas State Teachers College in Emporia, Kansas (now known as Emporia State University). Claire first worked with David Chandler at the University of Michigan in 1960, where he completed his Ph.D. research on the availability of iron as a factor limiting primary productivity in a marl lake; this was subsequently published in *Science* in 1962. His research forms a 40-year body of work elucidating the relationship between phosphorus enrichment and algal production in large lakes, as well as secondary limitation of other nutrients, particularly silica. His work is a comprehensive treatise based on several lines of complimentary research (mechanistic experimentation, mass-balance compilation, paleolimnological inquiry, and synthesis of comparative limnology). As such, Claire's research helped to build a sophisticated understanding of the eutrophication process in large lakes in North America.



However, what was equally impressive to Claire's scientific accomplishments is the manner with which he has achieved these successes. The same values that guided his research—honesty, integrity, rigor, and commitment—also translated to his professional relationships and service. Claire formed long-lasting relationships with all of his key colleagues—these remain viable to this day.

Hunter J. Carrick, Central Michigan University, and Gary L. Fahnenstiel, Michigan Technological University

For more on Claire, please visit bit.ly/cschelske.