Cover Image: Ruth Patrick, in her signature pith helmet, collecting organisms from a stream; circa 1970. Read about her in the obituary by David Hart. Image courtesy of the Academy of Natural Sciences Philadelphia

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Editors’ note: Scientific meetings can include events and adventures that have nothing to with the program. We were delighted to receive this ‘Meeting Tale’ from Clarice Yentsch (Nova Southeastern University) penned by the late Charles Yentsch (Bigelow Laboratory) and completed by Charles Goldman (University of California Davis). If you have a “meeting tale” you would like to share, please let us know!

**FLIGHT FROM PRAGUE**

**Charles S. Yentsch, Charles R. Goldman, with the participation of Clarice Yentsch**

**CONTEXT**

*This manuscript:* An unfinished draft of this story was found in the desk of Ocean Charlie, the late Charles S. Yentsch, 1927-2012, and was completed in 2013 by Lake Charley, Charles R. Goldman. The voice in the first person was intentionally retained. As Charley and Charlie agreed: “Oceanographers and Limnologists have lots in common and do know how to make the most of almost any situation!”

*The scientific meeting:* There was a technical meeting on the “Prediction and Measurement of Photosynthesis Production” organized by IBP/PP in Trebon, Czechoslovakia September 14-21, 1969. Just a year after Russia invaded the country.

*Historical Context:* Hitler made his forced entry into Prague on March 15, 1939. Throughout World War II Czechoslovakia was occupied by the Germans. After WWII, on June 29, 1945, Czechoslovakia signed a treaty with the Soviet Union (CSR) and also became a founding member of the United Nations. In 1948, the communist party with a strong backing from the Soviet Union won the elections followed by a loss of freedom, many people jailed, many trying to emigrate. In 1968, the country experienced a brief hope of things getting back to normal, but this “Prague Spring” ended abruptly in August 1968 by the invasion of Russian military forces. The Russian occupation lasted until November 1989; in 1993 Czechs and Slovaks split into independent Slovakia and Czech republic. Prague is the capital of Czech Republic with an estimated population of 1.27 million.

It probably would have been a routine run for the fast train between Prague and Vienna called the Sans Souci Express I not been aboard. I had made mistakes with regard to finances, or watched others make mistakes for me, which when summed up could make it extremely difficult to get out of the country.

The train rocked along. My compartment was cold. I lay bundled under a heavy but leaky quilt trying to sleep. My companion in the upper berth, Dr. Charles Goldman, University of California Davis, appeared to be sleeping peacefully. I tossed in my berth reviewing the events of the past week; events which led up to my present predicament. In a mood of self-criticism, I damned myself for being so careless. I had been behind the Iron Curtain before. I had spent two weeks in Moscow and was well aware of the difficulties one had in getting in and out of various countries. Why had I been so careless this time?

I arrived in Czechoslovakia to attend a scientific meeting concerning photosynthesis in marine and fresh waters. This was an international meeting yet the number of Americans attending was small. After a short one-night stay in Prague, we were transported by bus to the small town of Trebon where the meeting was held. Trebon had an important laboratory for the study of algae and primary productivity.

Shortly after I arrived, one of the members of the Czechoslovakian Academy of Science approached me. After some scientific talk, he advised me not to transfer more than a few dollars into Czech currency. “Transfer only what you need to take care of expenses.” He said that “they” needed dollars as well as other Western currency. He was so emphatic that I failed to ask who “they” were. Later I presumed “they” were the meeting’s organizing officials.

After dinner a number of us were sitting around enjoying conversation and the local beer. I asked if any of them had heard of the money pinch? We agreed that this was probably the one way this Eastern country could get Western currency. One fellow said that he had heard that they hoped we would spend at least $7.00 a day, in dollars, while we were in the country.

I thought little more of it. During the course of the meeting I found myself being paged by one of the Czechoslovakian conveners – “Oh, there you are Dr. Yentsch, I have something for you.” With these comments he handed me a gray envelop and proceeded to write something down in a small notebook. He looked up and said, “This is $95.00 to cover your expenses while in Czechoslovakia.” “Guests of the Czechoslovakian Academy of Sciences are entitled to this amount,” he said with a smile. I must say that I was quite pleased and honored to receive this money. The US National Academy of Sciences had given me some money to attend this meeting that was only intended to cover the tourist class airfare. It was true that I was a guest of the Czechoslovakian Academy of Science, but I had not expected to receive any additional funding.

Surprisingly the next day I found myself being paged once again by the same convener who dashed up to me with his eyes wide. His face was somewhat pale. Off hand I would have thought that he had recently emerged from a heated discussion with someone. His comments were: “Dr. Yentsch, I made a terrible mistake yesterday. I gave you the money in American dollars and it should have been in Czechoslovakian money.” I pulled out my wallet and retrieved the dollars and he carefully counted them and gave me Czechoslovakian money in return. He thanked me profusely and dashed off. This was my first big mistake.

After dinner, and again over their excellent beer, I recounted my monetary complexities with a colleague from England. His comments: “Well you might as well spend that money here because since the Russian arrival it is not traded outside the country; so spend it here.” From that point on, I endeavored to spend the money whenever invited to a dinner party at a Czech colleague’s home, I would attempt to buy the best bottle of wine or cognac for our very kind hosts.

During the meeting, Charley Goldman and I were invited by some Russian scientists for drinks. Although aquatic scientists tend to be apolitical, since the recent invasion the Russians

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were not as popular as they might otherwise have been. They plied us with the vodka and sausage that they had a large supply of. I heard them explaining to Charley that with the high fat content of the sausage they could safely consume more vodka. Cholesterol was obviously not considered a problem! During the meeting we made friends with many Czechs as well as with a charming English couple. The husband was working for the Battelle Institute in Geneva, Switzerland and had driven from Geneva to Trebon to attend the meeting. The four of us had decided that it would be nice to leave the meeting one day early since our sections, and therefore responsibilities, were completed and drive to Prague with our new friends. This would enable us to view the city in much more detail than time had permitted before the meeting. Our enthusiastic decision to leave was made on the spur of the moment.

I dashed around packing, and approached the administrators of the meeting in order to pay the expenses that I had encountered during the meeting. They asked for payment in American money. I hesitated and then declined and called upon the convener who had given me Czech money for the return of the American dollars. After some discussion, they accepted the Czech money. In the process, they requested my visa application and the attached small slip of paper that was intended to keep a running account of the monetary changes. Somewhat reluctantly I watched it go – they indicated that it must have some sort of official stamp that could only be found at a bank in Trebon. I left the office and rounded up the rest of my belongings and said goodbye to our many new friends. We packed our gear into the car for our trip to Prague. Both Charley and I were traveling light so we did not crowd our hosts in their small car.

After the car was readied, I went back to the administrative office to request my visa application and the attached slip. The fellow behind the desk informed me that it had not yet come back from the bank. I asked him when it was due back and he said sometime in the afternoon. I responded in as controlled a fashion as possible under the circumstances and asked why I had not been told about the timing beforehand. Another administrator of the meeting came over and said, “Don’t worry Dr. Yentsch, your passport has the visa stamp in it, the other attached document will be unnecessary.” At the time I faintly wondered if this was in fact correct, but thanked him and left. This is where I made my second big mistake.

The journey to Prague was bumpy, noisy but surprisingly fast. Arriving in Prague we immediately set out to site-see around this famous old city that had somehow survived the series of invasions. We had lunch in an elegant restaurant with our Czech currency. Lunch included several liters of their great beer and some excellent wine while we discussed what we might do for the remainder of the time we would be in Prague. Charley Goldman and I agreed that we would use up the rest of our local currency in Prague entertaining the kind English couple, as well as buying a few gifts.

A high priority on the agenda, of course, was to find a hotel room for the night and we began a serious search. After several hours of hunting with no success we were directed by a local innkeepers to a central booking agency for hotels in Prague. The local Czechs were always very courteous and the woman told us that there were simply no hotel rooms available at any price in all of Prague. She explained that there had been a loss of rooms in these hard times since the Russians had arrived and that every hotel room in the city was currently booked; however there was a type of student hostel that was some 10-15 kilometers from Prague and another near a reservoir still farther from the city. We considered these locations yet felt that they were too far away to be an effective location to tour this historic and beautiful city. The English couple became discouraged and decided that they would push on to the Austrian border and then take a leisurely drive back to Geneva.

After failing to find some sort of lodging for the night, Charley Goldman and I decided that we also should try to arrange flights for the next day out of Prague. In the course of looking for a hotel, and the Pan Am flight office, I did some window-shopping. The Czechs are famous for their glass and crystal. In one shop I stopped and selected a wine glass that I felt had an excellent shape for a claret. I told the shop attendant that I would like 12 of them. She shook her head ‘no’ and indicated that the two on the shelf were the only ones in the store. I tried other styles of wine glasses, and concluded that the few on the shelf were the only glasses available for purchase – the stores lack of stock was another example of the truly hard times the country was experiencing since the end of World War II.

It was obvious by now that there was not a single bed available in Prague. I suggested that we forgo further shopping and find the Pan Am office to book a flight for Vienna or Paris. The Czech Pan Am agent was also very courteous and tried to get us on any flight leaving the city that afternoon, evening or even the next day. All flights it turned out were fully booked. He explained that this was because there were currently so few flights. We explained our difficulty in finding a room. He explained that due to the two invasions first by the Germans and then by the Russians that no hotel improvements had been made since the end of the War II. He then shook his head and said, “Everything that has been happening recently in the country has only made things worse.”

I said: “Somewhere I have heard of a fast train between Prague and Vienna, the Sans Souci Express. Isn’t that what it is called?”

“Yes,” the Pan Am agent replied, “If you could get a sleeper for tonight, you would be in Vienna tomorrow morning. It should be easy to get a flight out from Vienna.”

With his careful directions, we hurried to the city’s central train depot to obtain tickets. On the way it became obvious how crowded the city was. This was in sharp contrast to the smaller outlying towns such as Trebon.

Behind a desk/counter at the train depot a matronly woman told us in well-spoken English, that we could buy tickets for the trip, but could not be guaranteed having a sleeping compartment. She said: “It is too late to make sleeping compartment reservations.” The time was about 5:00 PM. We were worn out carrying luggage and books and the thought of having no bed for the night was disheartening.

“Let’s call my close friend and colleague living in Prague who is the head of the Limnology Academy of Sciences” Charley said. I suggested that we try to arrange some sort of
dinner before the train was scheduled to leave the station. We found a friendly porter and after filling out the necessary papers and doing considerable sign language, we were able to check in our luggage at the depot.

Charley Goldman was able to get through to his colleague and arrange to be picked up in front of the railway station. At precisely 8 o’clock he drove up in his car – it apparently had some sort of two-cycle engine for it made a very loud roar while it idled fitfully. Our host explained that this car was purchased in Eastern Germany. He reported that its lightweight and fuel efficiency was due to the body being made of plastic. I carefully knocked around the hood and fenders and was amazed to find it was all plastic.

Charley’s colleague had made arrangements for a special dinner for us in one of the local restaurants. He was a particularly kind and thoughtful man. We piled into his car, which produced a remarkable and unforgettable sound as we headed for what must have been one of the best restaurants in Prague. I particularly remember the simple décor and the food was delicious, and excellently presented and served with a very good local wine. We were all having a very happy time as the frustrations of our hotel hunt faded from our minds.

The only thing that was unsettling during the dinner conversation was a comment made by our host, the Director of the Limnology Institute. He said that he had received a telegram concerning the availability of my visa document. The mere statement made my fears well up once again concerning my physical separation from my visa application and the attached accounting slip behind what was the iron curtain. My mistake of leaving my visa application in Trebon continued to haunt me. The administrators at the meeting were aware that Charley and I hoped to visit the Limnology Institute in Prague and as it turns out, they had kindly taken the initiative to forward my visa application to the Limnology Institute in Prague. Unfortunately it had not yet arrived. The director asked me what day I was planning to leave Prague and I told him that we had train reservations for late that evening. His eyebrows went up and he said, “Well two years ago it would have made no difference at all, today I just don’t know. Many problems are very severe in this country, as you know, the only source of hard, Western currency we have is through the tourists and international meetings such as the one you attended at Trebon. As a result the current government keeps very close and concise records on the flow of hard currency”.

After dinner, while riding back to tour the Limnology Institute, Charley asked his friend, the Director, if he would be so kind as to write a short note on his letterhead explaining my predicament, so that in case I did encounter trouble with the customs and immigration, I could show them his letter. He immediately agreed to do this and promptly stopped at his office to type a short letter in Czech concerning my visa dilemma on his official institute stationary.

By nightfall despite our relative youth we were both exhausted. The director drove us back to the train station where we learned our good fortune. We were now able to obtain a sleeping compartment on the Sans Souci Express. We said our thank-you and goodbyes to the director. He looked me in the eye and said, “Well, good luck Dr. Yentsch.” Again that tingling fear once again arose within me.

While undressing and getting into our bunks, Charley and I discussed the situation and how we might handle it. He was now as anxious concerning my visa issue as I was. We both hoped that the former days of outright execution or prison we had heard rumors of had now passed. However, I still imaged being pulled off a train in the middle of the night in some unknown part of Czechoslovakia; speaking no Czech; or being hauled back to Prague and trying to shift through the bureaucratic nonsense to try to explain what my situation was. At the moment my concerns were overwhelming me. Furthermore, we were both tired and so far we had had very good experiences in the country but were now anxious to get home. We both concurred that clearly the most devastating pattern in countries caught behind the iron curtain was the total lack of sensitivity or compassion towards the individual by their post war governing bodies and how the populations became numb as their life style was degraded by foreign occupation. That had slowed recovery of this once prosperous country.

So this is where I found myself cuddled up under an insufficient blanket, trying to sleep as the Sans Souci Express (ironically translated as “without worry”) bumped along towards our destination of what promised to be the relative freedom of Vienna.

Bump, clump –, we had stopped and could begin to hear compartment doors being opened and shut.

I distinctly heard the word passport.

The train was stopped as I was still trying to sleep.

I raised the shade in the compartment; were we at the border I wondered?

The station signs were still in Czech and that was not encouraging.

Then suddenly there was a heavy pounding on our door. I rolled out of the lower bunk, flipped on the overhead light, and opened the door. “Pexport Knotrol” the officer announced. I touched Charley Goldman in the upper bunk on the arm and he handed me his passport – we had agreed to do this before-

Charlie Yentsch, Walter Munk, and Clarice Yentsch.
hand. I handed the passport to the officer and casually lifted mine from the inner pocket of my jacket that hung near the end of the bunk. Waiting for the officer to finish with Charley’s passport, I noted that the uniform he wore was typical of many of the Czech police that I had seen. He wore a khaki-colored uniform trimmed in red near the neck and sleeves, with some sort of markings and numbers on both lapels. He was a short stocky man about 5’6”. His face was ordinary and his hands were large. His hat with leather visor sat squarely on his head almost down to his ears. This coupled with a sharp nose and deep-set eyes gave him a humorous yet strangely threatening appearance to the two already worried travelers. In combination with wide flowing trousers tucked into high leather boots he reminded me of the type of fellow one might see taking tickets near the door of a night club. He also carried a curious leather box suspended on a strap that encircled his neck.

“Ver ist visa?” For a brief moment I sensed relief – I would have no problem with this fellow – but I was wrong. He quickly thumbed through Charley Goldman’s passport then retrieved a stamp from the box and in a deliberate manner stamped the document. Returning Charley’s passport, I then handed him mine. His fingers thumbed through the pages. Then, as though he was talking to himself, he began to shake his head. His two eyes locked on mine, “no enough” he said in a broken manner.

“Visa, ver ist visa?” I pointed to the Czech visa stamp in my passport acquired upon entry. He understood but he pointed to Charley’s visa application – what he wanted was the monetary statement. Not knowing what else to do, I made a gesture of not knowing. His palms were up and his lower lip protruded. He glared menacingly at me. His mouth had now dropped more open and his voice had hardened noticeably. “Ver ist visa? Must have visa.” Again I pointed to my passport with the red Czech stamp. “No, no, no enough.” His head was now shaking and bobbing and his ears almost seemed to wag. I looked at Charley and decided to play what I hoped would be “my ace in the hole”. I took out my letter from the Director of the Limnology Institute and handed it to the officer. I watched him as his eyes locked on mine, “no enough” he said in a broken manner.

He shut the door and disappeared. There seemed to be a major lull in the hallway as the border guard stepped off the train. Bumping, the train started off again. Neither of us could sleep. Frequent shouts by the passengers indicated discussion between he and the conductor since we were hold-up by what seemed to be about an hour.

The wide eyes of the officer blinked and the head wagging the ears shook. The passengers were complaining to the conductor and were demanding an explanation for the continued delay. Then there was a major hull in the hallway as the border guard stepped off the train again. We held our breath but the train did not start off and like some wounded metallic beast we could hear steam emission from the locomotive and the opening and closing of compartment doors plus angry sounding words throughout our car.

Suddenly and just as we were beginning to settle back in our bunks, the guard was back with machine gun and large police dog loosely leased. He repeated “No visa must leave train now” as he clearly readjusted the position of his gun. At that moment Charley on the top bunk had a stroke of luck and perhaps some hidden untapped imagination as he leaned over the bunk’s edge, with that bulging, wide-eye look, as if he had already been shot.
asked in a strong voice “are you a Russian?” It was exactly the right thing to have said as the guard literally lost an inch in height before our very eyes. He exhaled loudly and said no in almost a shout. “NO! Not Russian!” and without another word he turned on his heels and lead his furry friend out leaving our compartment for the third or fourth time. Another ten minutes of extremely anxious wait followed when suddenly he burst through our door yet again. He almost smiled and said: “OK, you go now.”

In a few moments the train started to move again. What a sense of joy and relief. Our adrenalin was at such a high pitch that we gave up getting any sleep, dressed and prepared for a celebration in Vienna.

When the train pulled into the station we could hear clapping in some of the compartments and we joined them. Charley said it reminded him of his departure from Moscow by train to Finland. Charley commented it was applause of the same sort as the train after a prolonged and very careful search by the Russian border guards finally made the crossing into Finland.

We were no longer tired or anxious and Charley lead us directly to a basement wine cellar bar that he had visited during his first International Society of Limnology meeting in 1959. Needless to say, the food, wine and the day and nightlife in Vienna were great.

AFTERWARDS
It is obvious that Oceanographers and Limnologists have lots in common and seem to know how to make the most of almost any situation. In the years that followed Clarice and I maintained our friendship with Lake Charley and despite our distant east west locations we met on several occasions. Charley visited us once in Key West and we regularly got together at ASLO or NATO sponsored meetings. As fond friends over drinks and dinner we always recounted to whoever was present and willing to listen, our exciting and memorable flight from Prague.

UNDERSTANDING
GEOSCIENCE STUDENT TRANSITIONS BETWEEN THE POSTSECONDARY DEGREE AND ENTRY INTO THE GEOSCIENCE WORKFORCE
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TRACKING GEOSCIENCE CAREERS
In 2012, the President’s Council of Advisors for Science and Technology (PCAST) issued a report focused on the national need for at least one million more science, technology, engineering, and math (STEM) professionals in order to stay globally competitive in the science and technology workforce (PCAST, 2012). Concern about the preparedness of the STEM workforce in the United States has been a major issue for the federal government for the past decade. However, the systemic change required to build the STEM workforce requires detailed information that can better connect STEM education with the creation of a larger and more effective pool of candidates for the STEM workforce. This is of particular concern for the geosciences because many of the current and future STEM jobs are in industries, such as energy, environmental services, government, and engineering, which will need geoscience professionals with strong skills and knowledge in STEM areas, such as critical thinking, quantitative ability, temporal and spatial reasoning, analyzing and interpreting incomplete datasets, and research skills (NRC, 2013). Within the limnology and oceanography disciplines, career opportunities commonly exist through industry, government, and academic fields as scientists and researchers, technicians, and educators, and in these careers, strong STEM skills are essential for success.

According to the U.S. Bureau of Labor Statistics, there will be a 14% increase in the total number of geoscience jobs in 2022, compared to the number of jobs in 2012 (Wilson, 2014). Also, within the next ten to fifteen years, approximately 48% of the current geoscience workforce will be either retired or approaching retirement (Wilson, 2014). While it appears that the majority of geoscience departments are reaching their maximum capacity of students that will eventually enter the workforce, there is no guarantee that these students will remain within the geoscience workforce within the first five years after graduation. In fact, it appears that historically approximately only 13% of undergraduates with a geoscience degree continue in the geoscience workforce beyond five years (Gonzales & Keane, 2011). However, there is some question about breadth of the geoscience workforce beyond the occupations that are considered traditional geoscience jobs.

While recent work at the Workforce Program at the American Geosciences Institute (http://www.americangeo-
was designed with six major objectives in mind:

- The discovery of the general pathway of geoscience graduates through their educational career, as well as their immediate professional plans upon graduation with their most recent postsecondary degree.
- The identification of student decision points for entering geoscience majors and reasons for any attrition from the geosciences after graduation.
- The identification of the various geoscience fields and co-curricular experiences that graduates pursued while working towards their degree.
- The identification of the preferred jobs and industries by graduating students, including those positions and careers that are not considered part of the traditional geoscience workforce.
- The demonstration of the value of a geoscience degree to future students, the institutions, and potential employers.
- The establishment of a benchmark leading to a longitudinal study of the geoscience workforce, in order to gain an understanding of geoscience graduates’ career pathways and the impacts of their educational experiences on their career decisions.

2013 SURVEY RESULTS

In the spring of 2013, 71 different geoscience departments distributed this survey to their students, and AGI received 429 responses from graduating students from various geoscience fields, such as geology, environmental science, geophysics, atmospheric sciences, geo-related engineering, geography, hydrology, and oceanography. Of these responses, 79% came from bachelor’s graduates, 15% came from master’s graduates, and 6% came from doctoral graduates, and these responses revealed a few interesting aspects related to their education experiences. Nearly half of the graduating students took a formal earth science course while in high school. However, most of them didn’t decide to major in the geosciences until after their first or second undergraduate year. There is also a growing community of geoscience majors that spend at least a semester at two-year college before transferring to a four-year institution for their degree.

While students are working on their postsecondary degrees, nearly all of them have some sort of field experience, but these varied from a summer field camp focused on mapping and skills development to a course with a field component taking up at least half of the course-time to a short field trip highlighting earth features or aspects related to different geoscience concepts. Research experiences were common at all degree levels as well with 61% of all graduates participating in faculty-directed research and 68% participating in self-directed research. The majority of undergraduate research focused on field and lab methods, whereas the majority of graduate research focused on literature, lab, and computer methods. However, when asked about internship experiences, 60% of bachelor’s graduates, 38% of master’s graduates, and 65% of doctoral graduates did not participate in an internship. This was surprising due to the known importance of internships for gaining work experience, skills development, and references for full-time jobs.

Who is the American Geosciences Institute?
The American Geosciences Institute, founded in 1948, is a federation of 50 different geoscience member societies and was created to serve these societies along with the geoscience community of more than 250,000 geologists, geophysicists, space scientists, geographers, soil scientists, hydrologists, paleobotanists, educators, geobiologists, oceanographers, and other earth and environmental scientists. AGI provides information services, serves as a voice of shared interests in the geosciences professions, plays a major role in strengthening geoscience education, and strives to increase public understanding of the vital role the geosciences play in society’s use of resources, resilience to natural hazards, and interaction with the environment. AGI offers a variety of resources related to public policy, earth science education, information science, and workforce development. These include students scholarships, internships and fellowships, the bibliographic database known as GeoRef, and a variety of publications, including the monthly newsmagazine, EARTH.

In 2004, the Association for the Sciences of Limnology and Oceanography (ASLO), became a part of the AGI federation of member societies. With the addition of ALSO and a few other organizations, AGI recognized the growing diversity of disciplines represented through all the member societies. In 2011, AGI officially changed its name from the American Geological Institute to the American Geosciences Institute to better represent the inclusive understanding of the many fields that make up the geosciences, as well as raise the awareness of the entire geosciences community of the existence of AGI as a resource. Please visit http://www.americangeosciences.org to learn more about AGI and browse the resources, publications, and information readily available for the geoscience community and the general public.
Fig 1: Industries where graduating students have accepted jobs in the geosciences.

Fig 2: Resources geoscience graduates found useful for finding jobs in the geoscience workforce.
When asked about their immediate plans after graduation, 38% of bachelor's graduates, 17% of master's graduates, and 15% of doctoral graduates planned to attend graduate school for another degree, whereas 15% of bachelor's graduates, 43% of master's graduates, and 54% of doctoral graduates had accepted a job within the geoscience workforce. Forty-three percent of bachelor's graduates, 40% of master's graduates, and 27% of doctoral graduates were still looking for a job within the geoscience workforce at time of graduation. Not surprisingly, the major industries hiring geoscience graduates are the petroleum industry, environmental services industry, federal government, and research institutes (Fig. 1). When asked how they found these jobs, the majority of students at all degree levels highlighted faculty referrals and networking through personal and professional contacts (Fig. 2). Campus recruitment events tended to benefit master's graduates more than bachelor's or doctoral graduates. This really highlights the importance of teaching professional skills such as networking and professional appearance to students and the importance of the mentoring relationship between students and professors.

The survey results presented here are only a small portion of the information collected from the Spring 2013 geoscience graduates. To view more of the results about the spring 2013 graduates, please view the Status of Recent Geoscience Graduates 2013 report at http://www.agiweb.org/workforce/StatusRecentGeoGraduates_2013.pdf.

2014 AND BEYOND: IMPROVING DATA ON LIMNOLOGY AND OCEANOGRAPHY GRADUATES

The data presented here and in the report combines all the graduates together as members of the geoscience community. Unfortunately, analysis of education and career pathways cannot be conducted based on geoscience degree fields yet, due to low participation rates from certain fields, including the oceanography community. As a matter of fact, only seventeen oceanography graduates took the survey in 2013. As AGI moves forward with this project, a major goal is to increase participation rates from the oceanography, atmospheric sciences, geography and planetary sciences community.

AGI's Geoscience Student Exit Survey will be available at the end of each semester to any department willing to distribute it to their students, and AGI offers departments incentives to encourage participation. Each department will receive the data related to their graduates in aggregate for their own assessment purposes. Department representatives have recognized the increased pressure from their institution's main administration office for more information related to the success of their alumni after graduation, and the responses from this survey will address this need for each department, as well as provide a national dataset for comparisons. Departments are also given the opportunity to add a few questions to the survey that are not already asked for their own assessment purposes.

The Workforce Program at AGI has been preparing for the 2014 spring and summer distribution of the survey. Please contact Carolyn Wilson (cwilson@agiweb.org) for more information about participating in this project.

REFERENCES


LETTERS TO THE EDITORS

PART-TIMERS: YOU THINK YOU DON’T MEASURE UP? YOU MAY JUST BE RIGHT

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If you are working part-time in science, you may be measuring your achievements by the wrong method. Recent papers in good journals have shown that tracking one’s scientific progress linearly against full-time milestones is mathematically flawed (O’Brien & Hapgood 2011, 2012). Critical measures such as the number of publications, grant successes and dollar amount of grant money per year have significant non-linear feedback on each other – i.e., not surprisingly, success builds rapidly on success. What is perhaps surprising is the apparent lack of understanding of this non-linear feedback by supervisors and managers, and critically, the part-time scientists themselves. Measuring themselves against a linear model (i.e., assuming that 4 years part-time work is equivalent to 2 years full time), scientists can undervalue their own performance and cling to unrealistic expectations of performance that keep them frantically overworked and critically stressed. These fundamentally unsound analyses can result in a sense of under-achievement and frustration for both scientist and supervisor. Furthermore, since part-time work is historically mostly women’s work (anonymous 1957,1959), women are still less likely to be heard in the science dialogue then similarly qualified men (anonymous 2012), and less likely to be considered competent by hiring committees (Moss-Racusin et al. 2012). Such uninformed application of metrics, common across the sciences (Cameron et al. 2013), reinforces the gender imbalance.

Perhaps, in professional life, all models are wrong, but some are downright dangerous.

PostScript: At ASLO we are striving to meet the challenge of supporting aquatic scientists of all flavours and across all job structures.
If you would like to comment on this article or discuss these and other professional issues with your colleagues, join us on the ASLO Forum for an informed debate on current challenges.

REFERENCES

IMPROV TRAINING FOR SCIENTISTS
Brian Palermo, professional actor and Improv instructor, Redondo Beach, CA, pimo@verizon.net

In my experience working with scientists, they are dogged in their pursuit of the facts; testing theories, poring over the scientific literature, attending related talks at conferences... These are all part of the process of science. But something most probably have not considered, but perhaps should, is Improvisation. Improvisation, which is very creative, playful and sometimes even nonsensical tends to be a disconnect for those in the sciences. And I’ve seen it make a major difference for scientists in several ways.

I’m a professional actor. I have only a dilettante’s interest in the sciences. But I am passionate about helping others communicate their often fascinating subjects more effectively.

Improv can do that. And a whole lot more.

There’s a tiny wave of awareness for improv training for scientists building right now. Besides my own work with Randy Olson, there is the Alan Alda Center for Communicating Science at Stony University and an organization called Improvscience. Both offer improv training for scientists, as we do – albeit with slightly different agendas.

I’m sure all of our workshops have the goal of helping scientists become better communicators. And I’ve found the science world to be fairly accepting of the need for this.

But our improv training goes a step further by helping scientists collaborate with each other. And there is an increasing need for cooperative efforts now as there is definitely a trend moving more in the direction of team science.

Have you ever bristled at a partner’s insistence to do it their way, ignoring what you know would be a very solid contribution from you? Collaboration introduces more brainpower to your science. And the addition of another brain (or more than one) can produce creative ideas exponentially.

At its core, improv is about creating something completely new, together with another person or group. In improv, you must work WITH your partners. You MUST build on each other’s contributions or you do not have collaboration; you have one writer forcing the others to say his or her words.

The most elemental skill in improvisation is called “Yes, And.” This refers to the process of agreeing with whatever your partner says (very difficult for science types) and then adding to it.

Working together and supporting your partners’ ideas are the very fabric of improvisation. And that is why it can be so beneficial to scientists. Collaboration doesn’t go anywhere unless co-workers say “Yes, And.” It creates a vast approach to generating ideas.

There is a very simple improv game that teaches this skill called “Yes, And...”

If you’re interested, here’s a quick video example of “Yes, And” hosted online by Expert Village https://www.youtube.com/watch?v=Qe2a3ppacUk. Note: I don’t know these guys, I chose it because its only 90 seconds long.

Scientists are trained to negate. So by forcing them to reply in the affirmative (saying “Yes”) you automatically get them to shift gears into a more innovative way of thinking. This often yields more inspired hypotheses. And it generates actual teamwork. You can only progress the improvised story by adding to each other’s last statement. Saying “No” or “But” will derail any true allied effort. I’ve seen this uncomplicated exercise truly bring awareness to participants who had no idea they were sometimes not easy to work with. And that awareness brought about better communication and collaboration.

Another great exercise is called “Last Letter.” This forces the participants to actively listen to their partners before contributing any other thoughts. It’s a simple back and forth game where each player says a word that begins with the last letter of the preceding word. Here’s a link to another Expert Village teacher giving a bit more detailed example. https://www.youtube.com/watch?v=VifzHThoMKc

The requirement to determine the last letter of the current word prevents the other player from pre-planning their next word. You cannot tune out your partner and just wait for them to stop talking so you can add your next item. You MUST actively listen to them before you speak. This is a very simple exercise yet it resonates deeply with my science trainees. It teaches you to bring this sort of focus on the other to your collaborative work. And you see very quickly and clearly how the connection breaks down if the participants aren’t listening to each other.

These two exercises alone can bring great advancement to your cooperative endeavors making the work easier and more productive.

And there are many other improv exercises that can teach great benefits to everyone – especially those who may be somewhat introverted. I get that improvising may sound nerve-wracking. But I promise a big payoff!
MESSAGE FROM THE PRESIDENT
John Downing, Iowa State University, 251 Bessey Hall, Ames, IA 50011-1020, USA; downing@mail.iastate.edu

I have appreciated the opportunity over the past two years to serve the members of ASLO, the society that helped me build the foundations of my career. As I close out my last few months as president, I would like to thank all of the ASLO Board members, all committee members, all who edit and produce ASLO’s excellent publications, all who provide services under contract to ASLO, and all members of the association who help to make ASLO great. In a time when other societies are shrinking and contracting, ASLO is growing in size, vitality, and quality. This is due to all who contribute their time and effort and all who participate in the meetings, publications, and other activities that are the hallmark of this fine and efficient organization. I thank you all for your help in making this a fascinating and dynamic two years.

WHAT I HAD IN MIND
My official candidate statement was published in the Bulletin, early in 2010 (Limnology & Oceanography Bulletin 19(1):27-28). Here’s what I said I wanted to do and how it came out. I can take little credit for most of these, because these accomplishments were due to the cooperation of many dedicated people.

• Sustain the record of excellence in services and opportunities that members enjoy. This has been sustained by many others and several new opportunities have been added.
• Build a stronger recruitment and retention network to help members build long and rewarding careers. Our student and early career initiatives, as well as multi-cultural programs and mentoring activities are enhancing the supply and retention of young and diverse members.
• Maintain ASLO’s fiscal vitality and open access. We are financially sound and are making investments in a strong and sustainable future for the society. Open access to our journals and “back-list” is substantial and one of the best in the industry.
• Create an open file-sharing source exchanging lecture presentations among members. This idea ran into copyright concerns and became less important as the eLectures program has grown and strengthened. I encourage all ASLO members to participate.
• Strengthen live and virtual social networking for ASLO members. Our Facebook presence is strong and Twitter use, especially at meetings, is growing. Mentoring programs are building networks with substantial speed.
• Offer more resume enhancing recognitions for members. I am particularly pleased with the new Yentsch-Schindler Award recognizing excellence and balance in early career achievement. We have named some existing awards and have added emphasis to educational achievement via the Margalef Award. The Board is currently working on defining an ASLO Fellows program that will also add recognition for ASLO members, and should be achievable early in careers.

• Create a new definition of the ASLO acronym that is globally inclusive. This objective (“the name change”) was achieved before I was president (under Debbie Bronk) and its propagation through all our materials and communications is approaching completion. The last major step will be ratification of the updated bylaws that will hopefully occur later in 2014.

• Serve our scientists globally; strive to provide member benefits to all regions and needs. The internationalization of ASLO can be seen increasingly on the Board, on our committees, in policy reports, and in our meetings. Recent meeting venues are increasing our global reach at a critical point in history when our sciences are confronted with increasing global scale.

• Make board and administrative proceedings more transparent to members. As a non-profit, our records are open, although I have found few members are really interested in how ASLO does what it does. I have tried letting people know on Facebook and we tried a blog-like ASLO Forum, but the later was met by tepid interest.

• Assess members’ satisfaction and needs and respond with services and products. We performed a member survey and have used it to launch initiatives that members need and are further using the survey to sunset some they do not use.

WHAT I DIDN’T YET HAVE IN MIND

The objectives above are those that I foresaw. The many things that got done that I had never imagined made the job much more exciting! While I was president-elect, I supported the idea that we launch a professionally-guided assessment of our publication portfolio and other services. This initiative became known as the ASLO Comprehensive Evaluation (ACE) and brought the board to a new vision about how ASLO can be made stronger, more useful to members, and therefore more sustainable into the future. This vision was also informed by experiences of other non-profit societies, especially via CSSP and books by Coever & Byers (i.e., Race for Relevance and Road to Relevance). In a nutshell, the changing environment for scientific societies and changes in publication business models meant that the great structure created by ASLO volunteers over the decades would begin to fail shortly unless changes would be made in how ASLO does business.

This report has recently become available to all members and the ASLO Board is making substantial changes in response to this professional evaluation. As a result of ACE, the day-to-day and business-strategic decisions that the president and the board had been making, are now turned over to our Executive Director, Teresa Curto, who has the training, knowledge and experience to do this important work. This leaves the president and the board freer to “govern” the association, cutting the workload for volunteers, and leaving elected board members to the task of defining the future of the most important society concerned with the aquatic sciences.

ACE also described four major areas needing action by ASLO, all of which are under active governance by the ASLO Board: they are governance, management, website, and scale. Governance modifications are treated by a revision of our bylaws that will result in more efficient and leaner governance of the society. Management is being reevaluated by our new Executive Director and a new, more efficient management structure will likely be phased in over the coming 2–3 years. The website, our most public outward face is undergoing major revisions as it becomes a more important portal worldwide for information on limnology and oceanography. Although we are growing while other societies are contracting, our relatively small size makes us vulnerable to market pressures for publications and meetings so we are increasingly working with other societies to “stay small but act big”.

I have mentioned that Jim Elser (ASLO president-elect) is chairing a committee to forge our new strategic plan. ASLO creates a new plan every 5 years. So what happened to our last strategic plan? That plan was made to cover 2009–2014. At this writing, we have accomplished 95% of the 74 specific goals of that plan. Accomplishments under this plan include many of the new things you have seen as part of ASLO, e.g., increasing cultural, geographic, and disciplinary diversity throughout our programs and services; reducing membership fees for developing nations; diversification of meeting venues; assisting members with daycare needs; integrating diversity initiatives across all ASLO activities; offering funds to foster cross-cutting themes at meetings; launching the Consortium of Aquatic Science Societies; developing and strengthening student and early career activities and support; augmenting special public-outreach activities; enhancing the use of new media tools; creating the early career committee; creating a meeting mentoring plan; starting the eBooks program; launching the new LEO Fluids and Environments journal; creating the eLectures program; developing an early career award; surveying members for needs and interests; reviewing all ASLO publications; and developing a financial plan and rainy-day fund; among many others. At the Joint Aquatic Science Meeting in Portland, everyone will have a special chance to contribute to the 2014–2019 strategic plan by attending the “ASLO Expo” (see below).

WHAT I STILL WANT TO DO

In my candidate statement, I said, “I believe that offering synergies between marine and freshwater research in the future is a crucial responsibility (for ASLO) as limnology moves toward a more global approach (as oceanography has) and marine science deals with more anthropogenic impacts (as limnology has)”. If you have read my earlier Bulletin messages, you have heard me say that this is a special area of aquatic science that ASLO owns. A plenary talk (“Limnology & oceanography: two estranged...
twins reunited by global change”, http://www.youtube.com/ watch?v=PZSoRMrqozo) at SIL’s annual meeting and a flurry of discussions in this journal on a “Salty Divide” have focused my attention further on finding how to best enhance the multi-salinity, multi-scale nature of ASLO’s science. [Note to my oceanographic friends: if you stream this video, bear in mind that I was trying to get limnologists to feel pride in the strategic resource they study, not that there is competition between our fields] As past president, I hope to seek ways to bridge the salty divide and strengthen all of our science.

As I was returning from the Ocean Sciences Meeting in Honolulu, I used our ASLO-sponsored app designed by the Schneider Group to see what dominant problems and paradigms are being studied by the 5000+ scientists who attended. I used the dominant limnological and oceanographic terms from the YouTube video to count the number of presentations in which they occurred. The results for the top 20 terms are shown in Table 1. Limnologists will note many familiar terms and concepts in this list, illustrating the substantial amount of analysis to be enjoyed by limnologists at OSM meetings. In fact, phosphorus was a major topic in 129 talks, lakes in 109, and rivers in 438. Therefore, there is much overlap in studies already. Unfortunately, Chris Schneider had not yet programmed the “counter” into our app at New Orleans, so I cannot yet compare and contrast. I look forward to contrasting dominant research themes with those given at the JASM meeting in Portland!

A NEW EDITORIAL TEAM FOR LIMNOLOGY AND OCEANOGRAPHY
After 16 years of loyal service to ASLO, Everett Fee and Lucille Doucette are stepping down, effective February 2015, as editor-in-chief and managing editor, respectively. The work has been extremely rewarding personally and professionally for them but they have decided that it’s time for them to move on to another phase of their lives. ASLO owes so much to both Everett and Lucille for the wonderful work they have provided for ASLO. Also, I am pleased they gave us enough notice to ensure a smooth transition to our next L&O EIC. There will be no interruption in processing of papers or the receipt of new submissions.

The ASLO Board of Directors will be starting a search immediately for the position of Editor-in-Chief and plan to fill it during the summer of 2014. Any ASLO members with editorial experience interested in the exciting challenge of taking the helm of one of aquatic science’s premiere journals should answer the call for applications and nominations!

A NEW WAY TO HAVE A BUSINESS MEETING
Our annual business meeting was held at the OSM meeting in Honolulu this year so we are trying out what we hope will be a fun and informative way to hold a “business meeting” at the Joint Aquatic Sciences Meeting (JASM) in Portland. On the evening of Monday, May 19, we will be putting on an “ASLO Expo” designed to allow broader discussion of ASLO services, publications, programs, and upcoming initiatives. We plan to have the usual beverages available and a booth for each of several aspects of ASLO life – a representative from each booth will say a few words and then go to their booth to talk with anyone about how ASLO can help their working lives. We hope that it will be pleasant for all, increase transparency of the association, and give us useful feedback on making ASLO the greatest possible asset for our members.

HOW I WILL SERVE ASLO IN THE FUTURE
I will still be president for the meeting in Portland but will be replaced by long-time friend and colleague Jim Elser on July 1, 2014. Jim has been an outstanding president-elect, working on finances, helping to hire our executive director, and undertaking strategic planning, among other important duties. I know that he will be a creative, energetic, and forward-looking president. He will be greatly assisted by Teresa Curto, our ED, and will benefit from a hardworking board of directors as well as new bylaws and a ratified strategic plan for 2014-2019.

<table>
<thead>
<tr>
<th>Key Term</th>
<th>Frequency at OSM 2014</th>
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<tbody>
<tr>
<td>Model*</td>
<td>1879</td>
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<tr>
<td>Gene*</td>
<td>1074</td>
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<tr>
<td>Coastal</td>
<td>1022</td>
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<tr>
<td>Global</td>
<td>840</td>
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<td><em>DOM</em></td>
<td>747</td>
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<tr>
<td>Scale</td>
<td>722</td>
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<tr>
<td>Circulation</td>
<td>662</td>
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<tr>
<td>Nutrient*</td>
<td>595</td>
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<tr>
<td>Climate change</td>
<td>576</td>
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<tr>
<td>Phytoplankton</td>
<td>521</td>
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<tr>
<td>Fish*</td>
<td>468</td>
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<tr>
<td>River</td>
<td>438</td>
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<tr>
<td>Nitr*</td>
<td>415</td>
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<tr>
<td>Program</td>
<td>404</td>
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<tr>
<td>Southern ocean</td>
<td>395</td>
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<tr>
<td>Microb*</td>
<td>391</td>
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<td>Management</td>
<td>267</td>
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<tr>
<td>Hypoth*</td>
<td>256</td>
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<tr>
<td>Benth*</td>
<td>253</td>
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<tr>
<td>Acidification</td>
<td>228</td>
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Table 1. Counts of presentations, sessions, and workshops containing the key term in the first column. A “*” means a wildcard to capture all occurrences of variations of a term and a “_” a blank space was specified.
Traditionally, the past-president becomes chair of the nominations committee and the endowment committee and assists the new president in several other ways –Debbie Bronk has been my past-president and I am indebted to her for wise advice, support, and assistance. In addition to these roles, I will also be chair-elect and then chair of the Council of Scientific Society Presidents (CSSP), an organization assisting 65 science societies representing 1.4 million scientists. CSSP has been very beneficial to ASLO and as a representative of ASLO I will continue to act for the benefit of all ASLO members.

As indicated above, as past president, I hope to seek ways to bridge the salty divide and strengthen all of the aquatic sciences. I will also be making calls and analyzing data to determine how we can increase retention and repatriate former limnological ASLO members. Claudia Benitez-Nelson and I have also discovered that US limnologists are disproportionately white compared with oceanographers – I am hoping to find means to increase the diversity in the ranks of North American limnology. Finally, as ASLO president, I became aware that inland waters have no federal funding panel in several nations (including the US and Canada), despite general agreement that freshwater is one of Earth’s most strategic resources. I hope to use visits to Washington, DC, as chair of CSSP, to work for inland waters segments of major federal funding agencies. This, I believe, will strengthen the range of science done by ASLO members.

STAY IN TOUCH

If there are questions you have, suggestions you would like to make, or other ideas about how ASLO could work better for you, please do not hesitate to call or write. We will be having a meeting of the Board of Directors the weekend prior to the Portland JASM meeting, so if you have items to bring to the Board, please send them to me before then. As always, I would appreciate hearing from you about anything having to do with ASLO, ASLO publications, ASLO meetings, or anything else concerning our mutual society. Email me at president@aslo.org, Skype me at asloprez, phone me at +01 515 294 8880, or post a comment or question on the ASLO Facebook site http://www.facebook.com/groups/limnology.oceanography/ After June 30, 2014, you can reach me using downing@iastate.edu.

Sincerely,

John

MESSAGE FROM THE EXECUTIVE DIRECTOR

Teresa L. Curto, ASLO Executive Director, execdir@aslo.org

As I write this in the beginning of March, it has been an exciting first two weeks as ASLO’s Executive Director! While I learned a great deal about ASLO during the interview process, the 2014 Ocean Sciences Meeting in Honolulu was the perfect opportunity for a crash course in all things ASLO! From the two-day Board meeting, to engaging with the dedicated and talented Council of Editors, to the many impromptu conversations with members, to the early career student mixer and the Business Meeting — it is apparent what makes ASLO the vibrant and valued professional home for so many aquatic scientists. Despite the tremendous growth and diversification of products and services since its founding, ASLO has preserved its grassroots heritage, and continues to offer its members a collegial environment to share information and knowledge. And to continue friendships that, for some, now span more than four decades.

Through careful stewardship by its leadership, volunteers, and professional associates and contractors, ASLO has remained financially sound through volatile and turbulent economic times. And while other associations have faltered and delayed making necessary operational adjustments, ASLO has been proactive in both soliciting ACE (ASLO’s Comprehensive Evaluation), and in developing a new strategic plan.

Yet, as the ACE report reinforced, there are significant challenges to be addressed to ensure the viability and growth of ASLO. Foremost among these is the erosion of library subscriptions for association publishers. Library budgets have remained virtually flat or in decline for two decades. And small scholarly publishing programs are competing for a declining share of library dollars in a market now dominated by consortia deals. In addition, associations face enormous challenges to simply keep pace with the technology demands when self-hosting and displaying their content for a variety of audiences and devices, and in marketing to both members and potential members on a global scale. Finally, the desire and need for open access publishing must be carefully balanced with an effective business model to sustain the publishing program.

Like all associations, ASLO depends on revenue from publications, meetings, and membership dues to sustain not just those program areas, but to fund important and valued member services and benefits that do not generate revenue. And, as the ACE report suggested, for ASLO and other small associations, the issue of scale is central. We do not have unlimited resources, human or capital, to address these challenges. Solutions must take into account opportunities to achieve operational efficiencies internally, and to explore partnering with others to effectively address these challenges.
As I said during the Business Meeting in Honolulu, while I am confident that my experience will be valuable in meeting these challenges head-on, I did not come to ASLO with preconceived notions about the best solutions for ASLO. There is no one-size-fits-all prescription. As my initial focus at the direction of the ASLO Board, I am moving forward expeditiously to review information about our members’ needs, to assess our publishing program as a whole, to collaborate and work with the editorial teams and members of the Board, and ultimately to present a coherent plan for consideration by ASLO leadership.

I am extremely honored to join the ASLO family, and grateful for the very warm welcome I received in Hawaii. The challenges enumerated here are important. However, the success of ASLO has been and will always be the enthusiastic participation and engagement of its valued members in publishing with us, serving as peer reviewers and associate editors, coming to our meetings, working on the Board and on committees and, in general, continuing the grassroots spirit that gave birth to ASLO.

We need your energy and expertise, and your advocacy for ASLO, particularly with your librarians. Librarians are faced with difficult financial choices when selecting and renewing journal subscriptions. Your voice in support of ASLO’s journals can and does make a difference. And to our growing number of student and early career members, we welcome you to the professional association where your voices are heard and where you can engage not only your peers at the outset of their careers, but also tap into the global network of scientists to help inform your career decisions, your research objectives, and your important role in the study and preservation of our vital aquatic resources.

It is my privilege to serve all the members of ASLO, and to work on your behalf to ensure that ASLO continues to enrich your professional life and to provide the products and services you value most. I look forward to the Joint Aquatic Sciences meeting in Portland, and in particular to the opportunity to meet many of ASLO’s freshwater members.

MESSAGE FROM THE BUSINESS OFFICE

Helen Schneider Lemay, ASLO Business Office, 5400 Bosque Blvd., Suite 680, Waco, TX 76710-4446; Tel.: 254-399-9635 or 800-929-2756, Fax: 254-776-3767; business@aslo.org

Thank you to all who have joined or renewed ASLO membership for 2014! We are so glad to have you as members. It was great seeing so many of you at the Ocean Sciences Meeting in Honolulu — over 5500 aquatic scientists all gathered in one place. If you think we weren’t noticed, we certainly were.

We had media coverage on radio, television, and in the local newspapers. Above is a letter to the editor that appeared in one of the Honolulu newspapers.

Speaking of our environment, winter is almost over (hopefully), and that means snows will begin to melt. Cold and snow are critical to the world’s supply of water. They are essential to the Earth’s climatic balance. Cold regions are more sensitive to warming, making winter one of our endangered species.

One company that is trying to do its part is Puma. They actually do environmental profit and loss (EP&L) accounting using water use, greenhouse gases, land use, waste and air pollution as indicators. EP&L is a new tool that allows companies to determine a cost for their environmental footprint including evaluating their suppliers. Some might say of corporations, the best way to save the environment is to put a price tag on it.

Four businesses cited as taking social responsibility seriously are: Marks & Spencer, Mountain Equipment Co-op, Tridos Bank, and Kao Corporation. Watch for more companies to come forward with EP&L accounting.

Finally, we hope you will be attending the Joint Aquatic Sciences Meeting, 18 – 23 May, 2014, in Portland, Oregon.

Be sure to contact us at the ASLO Business Office if we can be of help!

Helen Schneider Lemay
ASLO Business Manager

“Conventioneers a good example”

“Kudos to the ocean scientist conventioneers who were in town last month.

I live in Waikiki, and every morning I saw attendees walking en masse from their hotels to the convention center to attend their meetings. By voting with their feet, they made the decision to avoid loud, traffic-generating, polluting mega-buses shuttling them a few blocks between destinations. Instead, they chose the healthful, environment-friendly and considerate mode of transportation.

These folks also volunteered their time at Magic Island to help clean up our reefs. What a wonderful example they set for their profession and for the community at large. Let’s seek out more conventioneers like this in the future. They are good for business and good for our environment.”
Part of ASLO’s mission is to “advance public awareness and education about aquatic resources and research, and promote scientific stewardship of aquatic resources for the public interest.” In addition to these being noble goals, public awareness benefits the science in the long run. Because our field is largely publicly funded, we have to have the support of policymakers and the public to do aquatic research. To make our research matter (in terms of influencing management of the habitats we study), that public support is even more critical.

In his plenary at the Ocean Sciences Meeting in Honolulu, Bob Richmond spoke to the power of children, noting that kids can “infect their parents with things other than colds and flu”, such as scientific knowledge and an environmental ethic. I’ve seen this play out several times as well. Most recently, a friend posted on Facebook about how her daughter had a life-changing experience at a school field trip to help restore dune vegetation. The daughter talked the parents’ ears off about habitat alteration, sea level rise, and an assortment of other environmental issues during the weeks before and after the trip.

The evidence for the ability of children to influence their parents goes beyond anecdotal. Researchers have found that environmental education programs for children often result in a change in parents’ – and even neighbors’ – attitudes towards the environment (cf. Rickinson 2001 and Vaughn et al 2003). Adults themselves are a challenging audience for environmental education as they are generally too busy (parents of young children likely to be more busy than others). Children on the other hand are incredibly eager for knowledge. Their curiosity has no limits… and neither does their ability to nag their parents about something!

Returning to my Facebook friend, I asked her many months later if she would advocate for the university program that coordinated the field excursion. (I intentionally waited awhile to ask her this to gauge the longer-term impact.) Her response was an emphatic “yes” and she noted that were it not for her daughter’s interaction, “I don’t think I ever would have been aware of it.” Further, if the program were de-funded, “I would definitely be writing some emails or making some phone calls.”

While such responses are certainly not guaranteed, children will eventually become voters themselves. Some will even become community or business leaders. Environmental education activities have been shown to have a lasting impact on an individual’s feeling of “connectedness” to the environment. Interestingly, the largest and most sustainable impacts on strengthened connectedness to nature are seen with children under the age of 11 (Liefländer et al 2012). This is an important finding, as we tend to think of younger kids as not being as ready for science as middle or high school aged children. By restricting our interactions to those older children who are able to master the technical content, we may be losing a golden window of opportunity to “promote scientific stewardship of aquatic resources for the public interest.”

I hear all too often that the public doesn’t care about or understand science. Having witnessed mob scenes at three USA Science & Engineering Festivals, where hundreds of thousands of people converged to learn more about science, I strongly disagree. The interest is there; we are failing to capitalize on it. Perhaps it is time to do something more than express disgust at politicians who “don’t get it” and think longer term. Share your knowledge of, and more importantly your enthusiasm for, science with a child. Listen to their ideas and observations. You may be surprised by what they have to say (and remember to “Yes, And…” when you talk to them – see Brian Palermo’s letter to the editor on p. 33).

Note: As I write this column, I am putting the finishing touches on the Science, Technology, Engineering and Mathematics (STEM) Night program for my son’s school (600 students) and planning for the 3rd USA Science and Engineering Festival (expected attendance 300,000 students, teachers, parents and science fans), where ASLO will exhibit along with our Consortium of Aquatic Science Society partners. I will report back on both events in the next issue of the Bulletin. I will also be preparing a guide for interacting with children that includes ideas for hands-on activities and other helpful resources.

REFERENCES

OUTSTANDING L&O REVIEWERS
Everett Fee, Limnology & Oceanography Editorial Office, 343 Lady MacDonald Crescent, Canmore, AB T1W 1H5, Canada; lo-editor@aslo.org

Peer review is a crucial component of modern science. The fact that L&O is able to utilize the services of the best scientists as reviewers allows it to be a leading journal in the aquatic sciences. However, these individuals seldom get the recognition they deserve for this selfless work. Therefore, the Bulletin cites outstanding reviewers that Everett Fee, L&O Editor, feels
Suze Strom is a Senior Marine Scientist at Western Washington University’s Shannon Point Marine Center in Anacortes, Washington. With her able lab group and great colleagues, she works in the laboratory and at sea studying plankton ecology and its relationships to oceanographic processes. Her research encompasses predator-prey interactions among microorganisms, chemical signaling and defense in the plankton, and biological oceanographic processes in the Salish Sea and Gulf of Alaska. Equally compelling but (possibly) less fundable are research interests in the origins of creative thought and the history of tap dance. She has been a member of ASLO continuously since beginning graduate school in the early 1980s.

David Livingstone is a senior research scientist at Eawag, the Swiss Federal Institute of Aquatic Science and Technology, and is currently an executive vice-president of SIL (the International Society of Limnology). After postgraduate studies in oceanography in Alaska and limnology in Switzerland, he began working in the then relatively young field of climate impact studies. A major focus of his work has been the use of historical time-series data to link fluctuations and changes in the physical behavior of lakes, rivers and groundwater to climatic forcing and climate change over a range of time-scales. While his main interest remains the climatic forcing of inland waters, his research also encompasses spectral analysis applications, ice phenology, air-water gas exchange, and the modeling of water temperatures and oxygen concentrations.

NEW DEVELOPMENTS AT L&O: FLUIDS & ENVIRONMENTS AS WE BEGIN PUBLISHING VOLUME 4

Joe Ackerman, Editor in Chief, Limnology and Oceanography: Fluids and Environments, Integrative Biology, University of Guelph, lo-fe-editor@aslo.org

We have been busy at Limnology & Oceanography: Fluids & Environments (L&O:F&E) over the past year with 20 great papers published and two exciting new developments launched for ASLO members. I would like to extend thanks to our authors, reviewers, Associate Editors, and the many people behind the scenes involved in this exciting publication.

Our first new development is the opportunity to propose and publish special themes within L&O:F&E. Special themes provide an opportunity to highlight subjects and/or approaches not currently featured in the journal, which are within the scope of L&O:F&E and of interest to the scientific community. Unlike special issues, special themes include papers that are published as they are produced, so the themes can be timely and span several volumes. As with any L&O:F&E contribution, manuscripts are provided a rapid, rigorous peer-review process by a highly respected, international Editorial Board and are published in color at no extra cost in HTML and PDF formats.

To propose a special theme, you should provide me (lo-fe-editor@aslo.org) with a brief proposal (2–4 pages) that includes: (1) a brief working title for the theme; (2) a brief description of the aims and scope of the theme and why it is appropriate for L&O:F&E; (3) a preliminary list of authors and titles and an estimate of the number of articles to be submitted; (4) a proposed timeline (within 12 months) for submission of manuscripts to be included in a call for papers, which will be used to invite contributions from the general public. Proponent(s) will be invited to write a brief introduction for the theme once four papers have been accepted. We anticipate that L&O:F&E special focus–oriented themes will elevate visibility for papers, authors, and proponents. For additional information, please see L&O: F&E Special themes (http://lofe.dukejournals.org/site/misc/specialthemes.xhtml).

Our second new development is a print-on-demand service, which may sound strange for an on-line journal, but it is a nice way to hold on to published volumes. The cost is very reasonable for color printing and the publication quality is very nice as many people noted at the Ocean Sciences Meeting in February (please visit us at the ASLO booth at the Joint Aquatic Sciences Meeting in May to see for yourself). You can order the volumes by clicking on the order print volumes button on the right side of the L&O:F&E webpage (http://www.dukeupress.edu/lofe#backissues).

Lastly, I would like to remind you that L&O:F&E seeks manuscripts (original articles, brief reviews, and comments/ replies) treating research on any aspect of limnology and oceanography where advection and/or diffusion or the mechanics of the medium drive biological, chemical, or geological processes from molecular to global scales. We publish a variety of approaches, including modeling, theory, and empiricism to provide an exciting forum for interdisciplinary research on processes in aquatic environments (oceans, coastal seas, estuaries, rivers, streams, lakes, ponds, reservoirs, groundwater, and wetlands, as well as sediments, rocks, and other materials that underlie these waters and the atmosphere immediately above them). The interactions of physics with biology, chemistry, geology, or any combination of these are essential to L&O:F&E papers and define the uniqueness of the journal.
ASLO RETURNS TO EUROPE
for the 2015 Aquatic Sciences Meeting in Granada, Spain. The 2015 meeting will contribute to the ongoing international development of ASLO by bringing together a diverse group of participants at a site where many cultures have engaged throughout the centuries. Located in the South of Spain, Granada is anchored by the Sierra Nevada Mountains, the highest mountain range of the Iberian Peninsula and the tropical coast of the Mediterranean Sea. With a history deep in diversity, to a present rich in culture, vitality, and acceptance, Granada is the perfect setting to bring together scientists, engineers, students, educators, policy makers and other stakeholders to engage in an international dialogue.

Plenary talks and special sessions will emphasize similarities and differences among global and regional patterns of aquatic systems in diverse northern and southern inland water biomes and oceanographic provinces. The meeting’s theme addresses a critical scientific challenge as our disciplines continue to work toward understanding and confronting human-accelerated environmental change.

IMPORTANT DATES:
March 2014: Call for Session Proposals
April 2014: Deadline for Submitting Session Proposals
August 2014: Call for Abstracts Posted
October 2014: Abstract Submission Deadline
November 2014: Presenters Notified of Acceptance, Student Travel and Early Career Travel Grant Recipients Notified

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2015 Aquatic Sciences Meeting
AQUATIC SCIENCES: GLOBAL AND REGIONAL PERSPECTIVES – NORTH MEETS SOUTH
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Association for the Sciences of Limnology and Oceanography
2014 ASLO AWARDS

The 2014 Awards Committee is proud to announce the names of those distinguished members of ASLO who have been selected as honorees for our seven awards. Over 150 ASLO members participated in the process as nominators, authors of supporting letters, members of Award Subcommittees, and chairs of the Award Subcommittees. These people deserve the Society’s appreciation for helping us highlight the extraordinary accomplishments of our members. For every award, the high caliber of all the nominees made selection of a single winner very difficult but fortunately due to the hard work of every committee, we have a full slate of superb awardees.

We encourage all members to participate in the awards program by taking time to make nominations for 2015 award cycle. Awards are available for all career stages and types of research, so we strongly encourage you to identify and nominate your colleagues!

Nominations for the 2015 awards can be made at any time until 15 October 2014. All nominations are evaluated for three consecutive years, as long as the nominee remains eligible for the award. As several of the award criteria have changed over the past 2 years, we encourage potential nominators to look at the latest requirements on our Awards webpage (http://www.aslo.org/information/awards.html).

Once again, many thanks to all those who participated in this year’s awards process. We look forward to working with you all again later this year.

2014 Awards Committee: Peter Leavitt (Chair), Antje Boetius, Ken Furuya, Roxane Maranger, George Matsumoto, Curtis Suttle, Lars Tranvik

G. Evelyn Hutchinson Award: Gerhard Herndl  
Cited by: Josep M. Gasol, Thomas Reinthaler, Javier Aristegui

Raymond L. Lindeman Award: Daniel J. Madigan  
Cited by: Brian N. Popp, Fiorenza Micheli

Citation for Scientific Excellence: Victoria J. Bertics  
Cited by: Peter R. Girguis

A.C. Redfield Lifetime Achievement Award: Gene E. Likens  
Cited by: Jon Cole, Michael L. Pace

Ruth Patrick Award: Daniel J. Conley  
Cited by: Jacob Carstensen

John Martin Award: William K. W. Li  

Ramón Margalef Excellence in Education Award: Stanley I Dodson  
Cited by: Barbara L. Peckarsky, John Magnuson, John Havel, Susan Will-Wolf, Robert Bohanen, Grace Wyngaard

Yentsch-Schindler Early Career Award: Andrew J. Pershing  
Cited by: Frédéric Maps
Prof. Gerhard J. Herndl is recognized for his contributions to the development of oceanography and aquatic microbial ecology, for broadening our understanding of the interactions between microbes and marine biogeochemical cycles, for spearheading the exploration of the dark ocean, and for his excellence and dedication to training and community service.

Gerhard’s scientific production is remarkable, with ~200 papers in top journals of our field, many contributions to books and a research program that has consistently been innovative, cutting-edge and highly influential. Gerhard started his research career in Vienna studying the interactions between sea anemones and bacteria. Soon thereafter he focused his interests on the ecology and biogeochemistry of microbes in amorphous aggregates and marine snow, particularly in the Adriatic Sea. This category of organic matter and its role in structuring the ocean were relatively new to science, and most of his papers on this topic set the stage for later research. He later turned his interests to the interactions between bacteria and solar radiation, where he was among the first to unambiguously show a negative impact of ultraviolet radiation on marine bacteria. These studies in the mid 90s were accompanied by a whole series of influential papers that explored various aspects of the impact of radiation on microbes. Around this time he also started to work on the characterization of marine organic matter and its interactions with bacteria, with several visionary papers that again would become some of the main areas of marine research in the coming years.

In the past 10 years, Gerhard has been one of the driving forces in the exploration of microbial and biogeochemical processes and their interplay in the dark ocean, one of the last frontiers of human exploration. He has led several research expeditions specifically targeting the relationship of dark ocean water masses and microbial ecology. Gerhard explored the link between bacterial community structure and the physico-chemical environment in the ocean. He has also made significant contributions to the study of viral diversity and the influence of viruses on bacterial diversity and functioning. His group developed microautoradiographic approaches, linked to phylogenetic identification, that allowed demonstrating that deep-ocean Archaea take up bicarbonate exhibiting a chemolithoautotrophic lifestyle in oxygenated waters. His work on dark ocean biogeography of microbial diversity and archaeal nitrification using state of the art sequencing technologies and gene quantification tools represents yet another example of groundbreaking research.

A common thread among these various research topics is that they were all ahead of their time, conceptually and technically risky, addressing major scientific issues and questions. Moreover, the research that came out of his multifaceted interests has consistently been of the highest quality. This was the basis for Gerhard to receive the highly endowed Austrian Wittgenstein prize and an ERC advanced grant.

Another remarkable aspect of Gerhard’s career is his role as educator and mentor. He has supervised over 40 PhD students, and a similar number of Masters students, many of them from international origin. He also supervised 16 postdoctoral fellows, most of them recipients of the very competitive Marie–Curie European fellowship. We have witnessed first hand the dedication, respect and work that he devotes to each and every person in his group, and the mutual respect and admiration that his students profess towards him. Gerhard has also played a leading role in organizing international meetings, workshops, and collaborative international projects. He was one of the founding members of the Symposium of Aquatic Microbial Ecology (SAME), and has been involved in organizing several NATO, ISME, EUROCEANS and ASLO meetings. He is currently associate editor of 5 major scientific journals (Aquatic Microbial Ecology, Marine Ecology, Limnology & Oceanography: Methods, Biogeosciences and ISME Journal), and serves in numerous international panels and committees, including the ASLO board in the recent past.

While Gerhard invests greatly in training and education for the future generation of scientists, he does so in a spirit of humility and enjoyment, representing an outstanding role model to our community. Gerhard therefore embodies, like few, the spirit of innovation, excellence, and dedication to science that the Hutchinson Award celebrates.
The winner of the 2014 Lindeman award is Daniel J. Madigan. Dr. Madigan is currently a National Science Foundation postdoctoral scholar at Stony Brook University. The research discussed in his paper: Madigan, D.J., Z. Baumann and N.S. Fisher, Pacific bluefin tuna transport Fukushima-derived radionuclides from Japan to California, *Proceedings of the National Academy of Sciences* 109(24):9483-9486 was completed as part of Dan’s PhD at Stanford University’s Hopkins Marine Laboratory.

Dan’s recognition that juvenile bluefin tuna that feed in waters off Japan before migrating to the eastern Pacific might contain radionuclides released from the Fukushima Dai-ichi power plant following the March 11, 2011 earthquake and subsequent tsunami served as the basis of this paper. These results provided unequivocal evidence from all samples analyzed that bluefin tuna transported Fukushima-derived radionuclides ($^{134}$Cs and $^{137}$Cs) across the Pacific Ocean.

Pacific bluefin tuna spawn in the western Pacific Ocean off Japan and spend the first year of their life foraging in those waters. Subsequently, an unknown fraction of bluefin migrates eastward to waters off California whereas others remain in the western Pacific Ocean. Although migration of adult tuna can be traced using various electronic tagging methods, tagging juvenile tunas has proven to be more problematic and we lack important details of their early-life migrations. Further, unlike the radioactive tracers, electronic tagging does not provide a retrospective evaluation of where the fish had been prior to tagging. Madigan et al. reported elevated levels of $^{134}$Cs and $^{137}$Cs in bluefin tuna caught in August 2011 off the coast of San Diego, California. In contrast, no $^{134}$Cs and only trace levels of nuclear fallout $^{137}$Cs from weapons testing were found in Pacific bluefin tuna that migrated from Japan to California before the Fukushima disaster and in yellowfin tuna also caught off the coast of California in August 2011 and which are residential species that do not cross the Pacific Ocean. Both $^{134}$Cs and $^{137}$Cs are important components of the radionuclide mix that was released during the Fukushima Dai-ichi power plant accident. Dan and his colleagues showed convincingly that the source of radioactivity in the post Fukushima bluefin tuna off the California coast originated from the Dai-ichi power plant.

This is the first documented transoceanic transport of radioactive material through biological migration. This discovery lays the groundwork not only to use these isotopes as transient tracers for quantitative estimates of fish and marine mammal migration but also allows calibration of other potential migration tracers that are not subject to radioactive decay and that can be used ad infinitum. Consequently Dan has given the community the means to elucidate migration patterns in a host of marine animals and to establish natural variations in, for example, the $\delta^{15}$N and $\delta^{13}$C values of animals as quantitative retrospective measures of marine animal migrations. Dan and others will be able to use the radiocesium tracer to ground-truth interpretation of variations in tracer values of Pacific bluefin tuna and other marine animals, which will be effective long after dispersal and dilution of $^{134}$Cs, have rendered the Fukushima signal ineffective as a marker of a relatively confined geographic region. The significance of these results is exemplified by considering Pacific bluefin tuna. Until recently, this species was considered the last remaining healthy population of bluefin tunas globally. They spawn in the western Pacific, and unknown proportions migrate eastward to the California Current Large Marine Ecosystem. Pacific bluefin are overexploited on both sides of the Pacific, and understanding transoceanic movements and residency is critical to improving bluefin tuna management models, particularly urgent since it was recognized in December 2012 that the wild population is about 96% depleted. Chemical tracers provide the retrospective tools needed to elucidate the origin and timing of migrations by these and other large predators. This paper combined a novel approach that used a tragic accident to exploit the release of radionuclides to better manage an iconic fishery. It provided human health assessments and used fundamental ecological and oceanographic principles to better understand the implications of these findings. Finally, this paper served as the basis for subsequent publications that validated radiocesium as an unequivocal tracer in Pacific bluefin tuna (Madigan et al. 2013, *ES&T* 47:2287-2294), that further evaluated the radioactive doses of Fukushima radionuclides to marine animals and human seafood consumers (Fisher et al. 2013, *PNAS* 110:10670-10675), and that used radiocesium to validate the use of $\delta^{15}$N values as a tracer of trans-Pacific migrations in a larger dataset of Pacific bluefin tuna (Madigan et al., *Ecology* in press).
Dr. Victoria “Vicky” Bertics was born on July 1st, 1982 and passed away on September 28th, 2013 after a lengthy struggle with cancer.

The decision to nominate Vicky for this award was an easy one, as she was one of the most productive and admired members of her peer group. Vicky’s research focused on sediment biogeochemistry, in particular the interactions among animals, sediment, and microbes and the resulting impact on biogeochemical cycles. She was especially interested in sulfur and nitrogen cycling, and how these two cycles are linked in shallow and deep-sea environments. During her brief academic career, her research led to eleven publications, including publications in both the International Society of Microbial Ecology (ISME) and Environmental Microbiology. She received over a dozen awards during her nine years of post-baccalaureate research, including the 2004 Gompertz award for biological research, a 2007 AGU Biogeosciences Outstanding Student Presentation Award, 2008 membership into the Phi Beta Kappa Society, and the Alexander Von Humboldt postdoctoral fellowship. She accomplished all this before she turned 30, and while contending with cancer.

Vicky’s interest in science was lifelong, but she began her formal pursuit while she was an undergraduate at the University of California Berkeley, working with Prof. Jere Lipps on foraminiferal distribution within the Monterey Bay Canyon. She had known for some time that she wanted to pursue a career in academia. Being interested in the interplay between biology and geochemistry, she was keenly interested in working with the geobiology group at the University of Southern California. She was admitted into Prof. Wiebke Ziebis’ lab, where she focused her efforts on the role of bioturbation in nitrogen and sulfur cycling in coastal marine sediments, methane seeps, and hydrothermal vents. She was also an active participant in multiple deep-sea cruises, and played a pivotal role in collaborative research involving scientists at USC, Scripps, Washington State and Auburn. Moreover, she taught courses related to geobiology and, in her fourth year, co-organized the 5th annual Southern California Geobiology Symposium.

As a graduate student, she produced four publications and did so while she was undergoing chemotherapy treatments. Despite that, she remained dedicated to her family, friends and research, and did so with grace, efficacy and tenacity. Indeed, her research was so well regarded that she was the recipient of the prestigious Alexander von Humboldt Fellowship to work with Prof. Tina Treude in Germany on the coupling of nitrogen and sulfur cycling in global marine oxygen minimum zones. As her cancer was in remission, Vicky pursued her science with even greater vigor, participating in numerous expeditions that led to four publications during her short postdoctoral fellowship. When this fellowship came to an end, she went to Harvard University to work with Prof. Peter Girguis on carbon and nitrogen cycling in the deep subsurface biosphere, and after less than a year she had contributed significantly to two publications and was awarded yet another competitive postdoctoral fellowship, this time from C-DEBI, an NSF Science and Technology Center that focuses on advancing our understanding of the deep subsurface biosphere. Sadly, her cancer returned and after nearly a year of fighting she succumbed just one month after starting her C-DEBI postdoctoral fellowship.

Vicky’s passing was devastating to those with whom she worked and interacted, as she was one of our community’s brightest rising stars. More importantly, she was a person of great character, who touched so many lives, in so many ways. Ralph Waldo Emerson, in preparing for a lecture once said, “People of character are the conscience of the society to which they belong.” During her last weeks, numerous e-mails and letters of support were sent to her lab at Harvard and her family, all of which were replete with stories of how she inspired students to achieve, helped friends in need, and brought light into their darkness.

Through this award, we laud Vicky’s intellectual contributions, and honor her actions and character. Vicky had no interest in being aggrandized, and prior to her passing said she simply wants to be remembered as someone who did her best to advance science, and who tried to stand by her family and friends. It is for all these reasons—from her intellect to her compassion—that we see fit to recognize the significant contributions she made to science and the community during far too short a life.
Without doubt, Dr. Gene Likens “…has made extraordinary, long-term contributions to the fields of limnology and oceanography, including research, education, and service within and beyond the aquatic sciences community.”

Gene’s research has had remarkable breadth and scope and we only mention here a few highlights. Gene was among the very first limnologists to work on the Dry Valley Lakes of Antarctica (Likens 1964). Gene, and his colleagues, were the first scientists to recognize the presence of acid rain in North America (Likens and Bormann 1974) and studied both its causes and its effects on both lakes and streams, including the first addition of acid to a stream to simulate acid rain (Hall et al. 1980). Gene is probably best known for making the ecosystem concept both useful and rigorous, and he applied this approach to streams (Fisher and Likens 1973), lakes (Likens 1985), and watersheds (Likens et al. 1967). While it is the watershed work that has occupied most of Gene’s research time in the past few decades, his approach has been to use the aquatic systems (streams) that drain the watershed to infer the processes that take place in the watershed. We see this as a most productive extension of limnology.

Gene has produced an impressive body of scholarly work. He is the author of over 500 papers and book chapters as well as the editor or author of 20 books. His publishing career began in the early 1960’s with several papers on lake mixing, including work using the experimental addition of radioisotopes to lakes in both North America and Antarctica. His most recent book (Winter and Likens (eds) 2010) is about ground water inputs into Mirror Lake – representing scholarship that takes him back to his limnological roots.

As an educator, Gene has done several important things. First, he trained a large number of Ph.D. students. A list of just a few of the other well-known limnologists whom he trained include: Dr. Emily Bernhardt (Professor, Duke University), Dr. Stuart Fisher (Professor, ASU), Dr. David L. Strayer (Senior Scientist, Cary Institute), Dr. Judy Meyer (Professor, UGA), Dr. Lars O. Hedin (Professor, Princeton University), Dr. Charles Driscoll (Syracuse University), and Dr. Jonathan Cole (Senior Scientist, Cary Institute). Second, he has been on the forefront of educating the general public, including the US Congress about environmental issues and was a member of several key committees in Washington, including one that led to the Clean Water Act. For Gene’s tireless work on the environment, particularly water issues, he was awarded the National Medal of Science in 2001. Finally, he taught both limnology and ecosystem science for years, first at Dartmouth and then at Cornell to undergraduate and graduate students. The Encyclopedia of Inland Waters that he conceived with Robert Wetzel and fully edited after Wetzel’s death (Likens (ed) 2009) has become a valuable resource for those teaching limnology courses all over the world.

In terms of service to the field, we would point to three categories. First, Gene served as President of four scientific societies including: ASLO; the Ecological Society of America; The American Institute of Biological Sciences; and the International Society of Limnology. A second major service contribution is represented by Gene’s building of two major endeavors, the Hubbard Brook Ecosystem Study and the Cary Institute of Ecosystem Studies. Hubbard Brook is a site that was operated by the US Forest Service. However the research program, its structure, its infrastructure, its people and the research ideas come from Likens and his colleagues (Herb Bormann, Bob Pierce, Noye Johnson, and others) actually created de novo. Gene was the founding Director of what was originally called the Institute of Ecosystem Studies (now the Cary Institute of Ecosystem Studies, where Cole works, and Pace used to work) and he built Cary into a world-class ecological institution over the course of about 20 years. The third category of service contributions would be Gene’s translation of sound environmental science for policy makers and legislators. In addition to influencing legislation on acid rain, Gene also served on the Environmental Defense Fund as both a Trustee and as Chair of their Scientific Advisory Board.
RUTH PATRICK AWARD
DANIEL J. CONLEY

Professor Daniel Conley has been a leading figure in bridging aquatic science and ecosystem management. He has devoted his scientific career to identification, analysis and solution of the most significant problems in aquatic environments: nutrient enrichment, eutrophication and the drastic expansion of hypoxia in coastal waters during the 20th century. Over the last four decades Daniel has been a strong proponent for nutrient management. Without his active involvement in scientific and public discussions, current management plans may have been less effective. In particular, he has been active in the discussion of nitrogen versus phosphorus limitation in coastal environments, stressing the importance of controlling both to reduce eutrophication.

Daniel has studied many lakes and coastal ecosystems in North America and Europe. Daniel received his Ph.D. in 1987 from the University of Michigan and worked at Horn Point Laboratory, University of Maryland and Stockholm University before moving to Denmark in 1995 for a position as senior scientist at the National Environmental Research Institute. In 2007 Daniel was appointed professor in the Dept. of Geology, Lund University in Sweden. After moving to Northern Europe he has become one of the leading environmental scientists in the Baltic Sea region. His 2009 review of hypoxia and consequences for the biogeochemical cycles in the bottom waters of the Baltic Sea has been widely cited; not only among Baltic Sea scientists but worldwide. Daniel has been a key person in understanding effects of climate and the human footprint in the Baltic Sea region from the beginning of the Holocene to the Anthropocene.

Daniel has stood firm in his science and interpretation of the scientific literature that the Baltic Sea, while conducive to hypoxia, has a record of worsening hypoxia as a result of past and continuing human activities in the watershed. Daniel has used his scientific insight and reputation to strongly argue against “quick fixes” (e.g., bubbling or mixing of the deep waters) as a solution to the hypoxia problem. Daniel has persistently argued that the only long-term and persistent measure to improve the health of the Baltic Sea is to reduce nutrient inputs. These arguments have been successful in preventing ineffective large-scale geoengineering approaches, despite strong economic interests from various entrepreneurs. Daniel has actively participated in the public debate on measures to improve the Baltic Sea environment and his commitment to conveying scientific evidence to policy makers and the general public has been successful. In October 2013 the ministers of the Baltic Sea countries adopted an action plan for reducing both nitrogen and phosphorus inputs from land and atmosphere (http://www.helcom.fi/BSAP).

Daniel has always had a strong interest in making science ‘matter,’ with the aim to improve the scientific foundations for environmental policy decisions.

Daniel has always had a strong interest in making science ‘matter,’ and he has addressed policy-relevant issues such as eutrophication and climate change with the aim to improve the scientific foundations for environmental policy decisions. Although not being native to the Baltic Sea region, he has actively engaged the media when issues of concern came to his mind. Bridging the gap between scientists and the public has always been a priority for Daniel and recently, he started the VEGA Fellows—an initiative among Baltic Sea scientists to improve public outreach and make the voices of scientists heard. With the VEGA Fellows, Daniel is becoming a leader among an outstanding cadre of scientists who want to make science understandable to all levels of society. Part of this work he has accomplished as part of his Pew Fellowship, to transfer science knowledge of water quality to policy makers and the public. Further, he has taken it upon himself to develop a key program that trains graduate students and postdoctoral associates many of the key skills in transferring the information from science to information that is understandable to others and better ensures their environmental and ocean literacy. He has engaged the U.S. COMPASS program, a team of science-based communication professionals who help his program train scientists to develop the skills they need to engage journalists, policymakers and other non-scientist audiences. This fledgling program of few years has become popular, useful and tangible evidence of Daniel’s commitment to putting his science to work for the betterment of the environment and the society that depends on it.

Daniel Conley is an international leader in the field of environmental science, and he is an excellent mentor of applied aquatic science to the next generation of scientists. His work has profoundly impacted our conceptual and technical understanding of biogeochemical cycling in freshwater, estuarine and coastal environments. Just like Ruth Patrick, his commitment to linking science and society is exemplary.
Today, it is hard to imagine a biological oceanography text or statement about primary production in the ocean that does not make reference to the importance of picophytoplankton, such as *Synechococcus* and *Prochlorococcus*. Essential to this now-established paradigm is three decades of research inspired by the landmark paper “Autotrophic Picoplankton in the Sea” by Li and coworkers that conclusively demonstrated that photoautotrophs in the <2 micron size fraction were responsible for a majority of primary production at model sites representing much of the tropical ocean.

Described by one nominator as “a game changer,” the paper firmly established an alternative to food web models based on primary production by net phytoplankton to one in which small photoautotrophs were important. Published only a few years after the first reports that phycoerythrin-containing *Synechococcus* were abundant in the ocean, five years before the discovery of *Prochlorococcus*, and at a time when some authors suggested most material flux in the small size fraction was due to bacterial heterotrophy, it laid to rest suggestions that chlorophyll-containing particles in the picoplankton size range were dead cell fragments and/or plastids from larger cells, or otherwise unimportant.

One reason “Autotrophic Picophytoplankton in the Sea” was so scientifically convincing was the careful use of multiple lines of inquiry in the paper. It remains a model of the application of ‘Strong Inference’ (sensu Platt, 1984; Science, 146:347–53) and experimental hypothesis testing in oceanography. Central to the work were experiments showing that a significant fraction of ^14^C bicarbonate wound up in the <2 micron size fraction after bottle incubation. Additionally, more than 70% of ribulose bis-phosphate carboxylase activity was associated with the picoplankton size-fraction at both sites, a result that was consistent with biomass distribution was seen in size-fractionated chlorophyll data and epifluorescence-based counts of picophytoplankton. Paired light-dark experiments ruled out dark-fixation by bacteria by showing the light-dependence of radiolabel accumulation in the <2 micron fraction. However, as explained eloquently in the paper, this result alone did not prove the picoplankton were photoautotrophs. If larger phytoplankton released labeled organic matter during photosynthesis, heterotrophic uptake of the labeled organic matter by the picoplankton size fraction would occur primarily under lighted conditions, but not be light-dependent itself. This possibility was eliminated by an elegant experiment in which larger cells were removed by filtration before the isotope was added. When the same light-dependent rates of ^14^C accumulation by small cells were observed in absence of large phytoplankton, the authors were able to ascribe the result to photoautotrophy by cells in the <2 micron fraction.

Li et al’s 1983 *Science* paper established that photoautotrophs in the <2 micron size fraction were responsible for a majority of primary production at model sites representing much of the tropical ocean.

Li et al’s 1983 *Science* paper established, for the first time, that picophytoplankton definitely fix carbon at significant rates. Confidence in the importance of picophytoplankton engendered by this work led to a pivotal NATO Advanced Study Institute in 1985 (organized by Platt and Li) and triggered widespread interest in both prokaryotic and eukaryotic picophytoplankton, a field that has subsequently emerged as a new and vibrant sub-discipline of biological oceanography. Cited nearly 500 times, Li et al (1983) remains one of the ‘go to’ papers for rates of productivity by picophytoplankton and a seminal paper in biological oceanography.
This award is a fitting tribute to Stanley Dodson’s many contributions as a teacher and mentor. He was an imaginative, creative and gentle teacher, with an ever-present smile and easy laugh. He taught not only subject matter but also respect and awe for natural surroundings, the importance of observation, and appreciation for the process of learning. He was a life-long mentor to many of us and fundamentally shaped our approaches to teaching, science and life. He enriched the lives of his students at the University of Madison where he taught for over 40 years and at the Rocky Mountain Biological Laboratory, the Experimental Lake Area, and Flathead Lake Biological Station.

Stanley was a gifted and innovative classroom teacher, having written or edited three textbooks on limnology and general ecology. His textbook “Introduction to Limnology,” was written with the clarity and simplicity of a scientist who knew the material and a communicator who knew the audience. He gave unusually strong attention to the societal issues pertaining to freshwater systems, and conveyed his love of the discipline to his readers. He sought creative ways of teaching and experimented with different teaching techniques. He absorbed research showing that students retain a distressingly small proportion of information delivered in fact-laden lectures, and alternatively allocated time for routine interactive learning exercises. Famously, in preparing General Ecology students for a field trip to the International Crane Foundation, Stanley invited a Tai Chi instructor to class, and coached 100 students plus staff onto the lawn outside Birge Hall at UW to practice crane movements. This example epitomizes a mainstay of Stanley’s teaching philosophy – one should involve the whole person, not just the intellect, in science; and science should intersect with our daily lives. He thereby broadened the lives of a whole generation of students at UW.

Stanley was ahead of his time in implementing “citizen science”, “service learning” and “beyond the classroom” before those concepts were entrenched in undergraduate education. For example, he developed Ecology Internships whereby students worked with local environmental organizations to learn how to apply their knowledge and skills. He also contributed to “Water For Everyone,” a program including training materials for leaders of citizen science volunteer stream monitors. He worked with staff at UW extension and the Wisconsin Department of Natural Resources to improve the quality of data collected by volunteers and help local communities use their own data to improve water resources. Stanley also worked with Robert Bohanen to develop a graduate level course for K-12 science teachers that adapted his ecology and limnology materials to studies of local watersheds.

Stanley was an extraordinary mentor who was respected and loved by graduate and undergraduate research students. D. Carolina Peñalva-Arana and Kenneth J. Forshay write in an obituary published in the Journal of Limnology; “From the moment you entered his life, you realized Stanley would help you reach your potential, and would allow you to follow your passion without ever imposing his own. He treated our ideas with respect and helped us clarify our goals, in and outside the laboratory.” He was so much more than an advisor to his 22 PhD and 24 Masters students and countless undergraduates; he was a trusted friend, well beyond our years in his laboratory.

Stanley’s style of mentoring graduate and undergraduate student researchers was primarily by example, and he was a phenomenal role model. He taught us to use simple methods to resolve complex questions, to keep our minds open to new ideas and trust our observations even if they ran counter accepted dogma. He insisted that famous scientists have no more claim to great ideas than beginning graduate or undergraduate students. He encouraged us to embrace the challenge of interpreting counterintuitive or unexpected results, because that is how science moves forward, we learn, grow and create new ideas. He was adamant that one should not ignore negative results, even if they are difficult to publish, because “NO” is a better answer than “maybe”, “perhaps” or “sometimes.” He taught us that the benefits of coming closer to the truth outweigh the costs of taking too much time to get there. Finally, he taught us to lie on our bellies beside a pond and stand on our heads on the tops of mountains, which reminds us to maintain balance between personal and professional lives, work hard and play hard, and be open to new perspectives. Stanley Dodson was an extraordinary educator, the likes of which we may never see again in our lifetimes.
Andy was born in Nebraska, not so far from the North American geographical point farthest from any ocean. He somehow overcame his inlander's prejudice, and since his PhD graduation in 2001 he has maintained a remarkably well-funded and productive research program in marine science. Andy developed an interdisciplinary ecosystem-based approach to understanding and managing our oceans. His expertise meets the daunting requirements of modern environmental science: integrating biology, ecology, physics, mathematics and computer science. For each scientific question he addresses – whether regarding the influence of climate variability on marine systems, the development of predictive capabilities, or the ecosystem-based management of endangered species – Andy uses a balanced mix of fundamental and applied projects, of in situ and in silico experiments, with a perspective ranging from the individual organism to the global scale.

Andy's research essentially explores the mechanisms underlying spatio-temporal variability in marine ecosystems and the consequences of this variability for marine life. He quantitatively addresses non-linear and non-intuitive issues such as the response of marine ecosystems to climate forcing, the relative importance of local oceanographic condition and remote teleconnections to ecosystems, and ecosystem regime shifts. Ever since his years as a graduate student, Andy has been writing important synthesis papers that fundamentally advance our understanding of climate impacts on North Atlantic ecosystems. As a researcher from the GLOBEC generation, he has explored the critical role played by plankton, and especially copepods, in translating environmental variability throughout marine ecosystems.

Applied to the management of the endangered right whales from the Northwest Atlantic, this approach placed Andy at the forefront of Conservation Oceanography. Andy's research eventually moved toward ecological forecasting, a novel domain in marine ecology of which he is a pioneer. Meanwhile, his last streak of successful funding allowed him and his students and post-docs to lay down the basis for new numerical and theoretical approaches to understanding pelagic ecosystems, by using fundamental principles of physiology and ecology, of evolutionary modeling and of emergence in complex systems.

While there are many early career scientists with outstanding publication records comparable to Andy’s, what sets him apart from the others is his leadership abilities. Even as a graduate student, Andy did not hesitate when a chance arose to lead a working group or prepare the working draft for a review paper. As a young professor, he has continued to organize a large number of research workshops and symposia. Andy's publications are also unusually synthetic for such a young scientist. He has always been a synthetic thinker, and that is why his papers have been so influential. He grasps the important concepts very quickly and then brings his formidable quantitative skills to bear on the key issues. According to his seasoned close collaborators, this kind of synthetic thinking usually takes years to develop; to Andy, it comes naturally.

It would be remiss to describe Andy merely in terms of his exceptional scientific achievements. Among his colleagues and students he is known for his contagious enthusiasm, selflessness and sense of humour. His commitment to teaching has drawn in close to thirty summer interns, graduate students and post-docs eager to share his approach to marine sciences. Beyond the rigorous scientific training they received, many were offered life-changing research opportunities that they shared happily with the world on the lab's blog. Communicating science is another distinctive trait of Andy's personality. For instance, he testified in 2012 before the U.S. Congress with a compelling argument for why we must consider climate impacts in fisheries management. He definitely enjoys educating and informing the general public, and for that he is particularly well situated at the Gulf of Maine Research Institute, where almost 90% of Maine's fifth and sixth graders visit for a comprehensive, modern and exciting vision of marine ecosystems. He never misses the chance to tell them about why cool things, such as copepod poop, matters to all of us!

On behalf of all my fellow early career scientists who had the immense chance to experience life in Andy's Lab, I have to conclude that we could not have wished for a better role model and mentor. For all these reasons and many others, I am very pleased to congratulate Prof. Andrew J. Pershing for receiving the 2014 Yentsch-Schindler Early Career Award. Andy, you deserved it.
Humans rely on water, for our well-being, our livelihoods, our recreation. With increasing human population and accelerating climate change, social and scientific concerns over sustainable water resources are growing.

Scientists strive to understand how natural biological and chemical processes support the health and integrity of aquatic ecosystems. But to be effective, knowledge must be communicated in a clear and understandable fashion with the public and policy makers.

In response to emerging water-related challenges, a ground-breaking meeting of four aquatic science societies will be convened in Portland Oregon on 18-23 May, 2014. The first ever, Joint Aquatic Science Meeting (JASM), has the theme “Bridging Genes to Ecosystems: Aquatic Science in a time of Rapid Change.”

This meeting will foster integrative understanding and collaborations to advance scientific discovery and enhance communication in many interlinked areas:

• Genetic diversity and ecosystem function
• Recycling nutrients and carbon
• Understanding landscape connections to aquatic ecosystems
• Conservation and sustainability of freshwater ecosystems
• Communicating science to managers, policy makers and the public

FOR MORE INFORMATION, PLEASE CONTACT THE CONFERENCE MANAGEMENT OFFICE: JASM14@SGMEET.COM OR VISIT THE MEETING WEB SITE: WWW.SGMEET.COM/JASM14
MEETING HIGHLIGHTS

MICROBIAL ECOLOGY AND BIOGEOCHEMISTRY OF OXYGEN-DEFICIENT MARINE WATERS, SANTA CRUZ, CHILE, MARCH 18–22, 2013

David M. Karl, University of Hawaii, Honolulu, Hawaii, USA; dkarl@hawaii.edu; Jonathan Z. Kaye, Gordon and Betty Moore Foundation, Palo Alto, California, USA; jon.kaye@moore.org

Oxygen (O₂) minimum zones (OMZs), defined here as waters with dissolved O₂ concentrations < 20 μmol kg⁻¹, host unique microbial assemblages and play key roles in global biogeochemistry and ecology, including the production of greenhouse gases. Low O₂ systems are diverse, ranging from permanently or seasonally anoxic to suboxic and hypoxic zones in both coastal and open ocean regions. Furthermore, marine OMZs are becoming more common as a result of human-induced nutrient loading of coastal habitats and global warming-induced deoxygenation of the open ocean. An inter-disciplinary, international symposium was recently convened to provide a forum for the comparative analysis of the microbial ecology and biogeochemistry of OMZs, to compare model projections of OMZ expansion and its impact on biogeochemical cycles, to exchange information on cutting-edge field and laboratory protocols, and to build new partnerships, training opportunities, and collaborations for future OMZ research.

The symposium was organized to maximize interactions among the participants and included: (1) a broad range of authoritative presentations on OMZ ecosystem structure and function, prediction of OMZ changes and impacts, as well as pressing scientific questions and technological needs, (2) breakout groups to address key scientific questions, identify critical knowledge gaps, and propose new research directions, (3) plenary discussions, (4) interactive poster sessions, and (5) group meals.

The symposium participants concluded that there was an urgent need to develop coordinated research efforts to characterize the microbial metabolic networks underlying nutrient and energy transformation in OMZs. Significant knowledge gaps remain in our understanding of feedback mechanisms between microbial processes, biogeochemical cycles, and the climate system. These include, but are not limited to, the balance between nitrogen fixation and loss, the roles of protists and viruses, and the role of particles in sustaining microbial diversity and function. Finally, planning was initiated for an international research expedition to study the microbial community structure and biogeochemistry within a mesoscale eddy off Mauritania in August, 2014.

The resort-style venue, the Hotel Santa Cruz in Chile’s wine region, provided excellent facilities and a casual atmosphere that encouraged interactions throughout the four-day symposium. The intense focus on OMZs was only briefly interrupted by an enjoyable tour of the Viña MontGras winery, complete with a tasting of some of Chile’s iconic wines. The symposium was deemed productive and successful with over 50 participants from nine countries, including graduate students and early-career scientists. Attendees included microbial ecologists, physical oceanographers, marine biogeochemists, computational modelers, macrofauna ecologists, and more.

A thorough symposium proceedings is available at: http://www.moore.org/programs/science/marine-microbiology-initiative/workshops-and-convenings/omz-symposium. The symposium activities have already led to several major outcomes, including: (1) a special session on oxygen-deficient waters at the recent Ocean Sciences Meeting in Honolulu (http://www.sgmeet.com/osm2014/sessionschedule.asp?SessionID=111), (2) a successful proposal to the Scientific Committee on Ocean Research (SCOR) to establish a new SCOR Working Group on the microbial responses to ocean deoxygenation (http://www.moore.org/docs/default-source/Grantee-Resources/scor-wg-proposal-microbial-communities-responses-to-deoxygenation.pdf?sfvrsn=0); co-chairs Bess Ward, Sean Crowe, and Steven Hallam), and (3) helping to shape a Liège colloquium that will take place in May 2014 (http://modb.oege.ulg.ac.be/colloquium/). By any measure, this was a successful symposium that will stand as a benchmark in this important and timely discipline.

ACKNOWLEDGMENTS

We thank the additional members of the symposium steering committee for their efforts: Osvaldo Ulloa (Universidad de Concepción), Ricardo Letelier (Oregon State University), Steven Hallam (University of British Columbia; UBC), Bess Ward (Princeton University), Phyllis Lam (University of Southampton), and Wajih Naqvi (National Institute of Oceanography). We are grateful to the dedicated energies of Mónica Sorondo (Universidad de Concepción) for meeting logistics and Jody Wright (UBC) as meeting rapporteur and lead author on the symposium proceedings. Financial support was provided by the Agouron Institute and the Gordon and Betty Moore Foundation through grant GBMF3802.

ASLO is seeking partners in outreach and education projects. Do you have educational materials you’d like help distributing on-line? Contact the ASLO Public Affairs Office.
MEMBER NEWS

DAVID KARL CHOSEN FOR REVELLE LECTURE

Dave Karl’s talk, “The contemporary challenge of the Sea: Science, Society and Sustainability,” was this year’s Roger Revelle Commemorative Lecture in the Baird Auditorium of the Smithsonian on March 13th. The annual lecture, organized by the Ocean Studies Board of the National Academy of Sciences (US), in honor of Roger Revelle’s efforts in publicising climate change, highlights the intersection of education, science and public policy. In recent years lecturers have included John Walsh (2013), Eddie Bernard (2012), Nancy Rabalais (2011), Jane Lubchenco (2010) and Paul Falkowski (2009). Dave is director of the C-MORE center at the University of Hawaii.

DANIEL CONLEY ELECTED TO ROYAL SWEDISH ACADEMY OF SCIENCES

The academy is formed 450 Swedish members and 175 foreign members in ten classes or subject areas. Dan Conley, one of 6 new members, joins the Geosciences class. His research at the University of Lund is focused on nutrient pathways, specifically silicate. The academy, among many other activities, is responsible for awarding the Nobel Prizes in chemistry and physics.

JULES BLAIS, JOHN SMOL AWARDED NSERC BROCKHOUSE CANADA PRIZE

Collaborators and brothers John Smol and Jules Blais have received the NSERC Brockhouse Canada Prize for their efforts to unravel the legacy of toxic chemicals in the environment. The Brockhouse Canada Prize for Interdisciplinary Research in Science and Engineering recognizes outstanding Canadian teams of researchers from different disciplines who came together to engage in research drawing on their combined knowledge and skills, and produced a record of excellent achievements in the natural sciences and engineering in the last six years.

Have you or a colleague recently received an award or prestigious appointment? Send your news to bulletin-editors@aslo.org

OBITUARY

RUTH PATRICK, 1907 – 2013

Contributed by David Hart, Senator George J. Mitchell Center for Sustainability Solutions, University of Maine Orono, Orono, Maine 04469; David_Hart@umit.maine.edu

They just don’t make ’em like Ruth Patrick anymore. Equally at home advising United States presidents about complex environmental issues, wading in countless rivers to monitor their health, serving on boards of global corporations, and peering through her microscope at the exquisite glass jewels known as diatoms, she was among the greatest of her generation at blazing new trails to connect the worlds of science and environmental decision-making.

Like many, Ruth caught the “science bug” at a young age, while growing up in Kansas. She spoke fondly of nature walks with her father and sister, during which they collected water samples that they later examined with microscopes in her father’s den. A lawyer by day, her father, Frank Patrick, was also a naturalist at heart, and, as such, had an enormous impact on her outlook. Not only did she fall in love with aquatic systems and microscopy under his wing, she made a life-long commitment to live her life according to one of his central tenets: “Leave the world a better place for having passed through it.”

Ruth received her Ph.D. from the University of Virginia in 1934, where she conducted research on the ecology and systematics of diatoms. At that time, science was very much a man’s world, and when she sought a job that same year at the Academy of Natural Sciences in Philadelphia, she was told she...
would not be paid. Nonetheless, she volunteered for nearly a
decade in a number of roles, including as curator of the Leidy
Microscopical Collections (named after the paleontologist
Joseph Leidy, who discovered some of the earliest dinosaur
fossils). During this time, Ruth began to expand the Academy's
Diatom Herbarium, which is today among the largest and most
important in the world.

It was in the 1940s that Ruth developed and implemented
her revolutionary approach for using biological diversity to assess
the condition of aquatic ecosystems. One of Ruth's favorite
stories concerned the unlikely circumstances leading to the
award of her first major grant that helped launch this work. She
had given a presentation on the environmental factors affecting
the distribution of freshwater diatoms at the 1946 meeting of
American Association for the Advancement of Science. One
member of the audience, William Hart (no relation to this
writer), took a particular interest in her findings. An executive
in the petroleum refining industry, he was intrigued by the
potential for using her research to make inferences about water
quality based on the species composition of aquatic biota. At
the end of her presentation, he spoke with Ruth about her
novel work, but she knew nothing of what lay ahead.

Nearly a year passed before Hart reconnected with Patrick.
In the meantime, he had raised over $50,000 (equivalent to
more than $500,000 today) from the state government and
industries in Pennsylvania to support the development of her
innovative approach to the biological assessment of water
quality. But he encountered an unexpected problem when he
approached the Academy's President, Charles Meigs Biddle
Cadwalader, to make arrangements for the grant. Cadwalader,
the scion of a prominent family that arrived in America the
century before the Revolutionary War, told Hart that Patrick
could not lead such a complex research project and manage
the large grant because she was “…only a girl.” In response,
Hart insisted that the project would not be funded “…unless
Dr. Patrick is in charge!” Fortunately, Cadwalader relented, and
Ruth forged ahead. (For the record, Ruth always told this story
with a smile, but I often saw tears streaming down the faces of
those who listened.)

Supported by this major grant and in collaboration with
a large team of colleagues, Ruth launched one of the world's
most ambitious research projects to assess the condition of
freshwater ecosystems. At a time when dissolved oxygen and
coliform bacteria were typically used to measure water quality,
Ruth developed her “biological measure of stream conditions”
on a multidisciplinary survey of streams in the Pennsylvania's
Conestoga Creek watershed. Her research team included
experts in geology, hydrology, chemistry, bacteria, protozoa, algae,
invertebrates, and fish. What emerged was a comprehensive
analysis demonstrating that the number, relative abundance,
and identity of species in a stream or river can serve as power-
ful indicators of its condition. While simple in hindsight, her
research revolutionized the way we think about and quantify the
effects of natural factors and human activities on aquatic systems.
Referred to as the Patrick Principle by some leading scholars,
she created a conceptually rigorous, highly sensitive, and often
diagnostic method for assessing the health of aquatic systems.
The enormous strides that have been made in biological moni-
toring and environmental assessment in the last half century are
due in part to her pioneering work, and her influence has spread
far beyond freshwaters to both marine and terrestrial systems.

During the next few decades, Ruth completed scores of
scientific papers refining her approach based on a strategically
mutualistic combination of basic and applied research. For
example, she published papers in some of the world’s premier
journals, including Science, Proceedings of the National
Academy of Sciences, Limnology and Oceanography, and
American Naturalist. But she was equally dedicated to
publishing in such journals as Sewage and Industrial Wastes, the
Journal of the Water Pollution Control Federation, and Water
and Sewage Works. This rare ability to span the chasm that
all-too-often separates the worlds of basic and applied research
is exactly why her approach was adopted by industry, as well as
government agencies, to tackle real-world problems. Indeed, her
close colleague and friend Evelyn Hutchinson, another member
of the limnological pantheon, had this to say about Ruth:

“Her
energy, sincerity and knowledge has earned her a reputation of
being the only person who can talk and be listened to about river
pollution equally well … by both scientists and industrialists.”

In the 1970s, Ruth began to receive widespread recogni-
tion for her extraordinary contributions to science and society.
Over the next three decades, she was elected to the National
Academy of Sciences and received numerous awards, includ-
ing the National Medal of Science from President Clinton,
ASLO’s Lifetime Achievement Award, the Ecological Society of
America’s Eminent Ecologist Award, and 25 honorary degrees.
Eventually, there was a shift from giving Ruth awards to naming
awards after her. For example, ASLO initiated the Ruth Patrick
Award in 1998 for “…the application of basic aquatic science
principles to the identification, analysis and/or solution of
important environmental problems.”

Ruth’s scientific interests went far beyond the world of en-
vironmental assessment to include major research in such fields

Ruth Patrick examining diatoms at the Academy of Natural
Sciences in the 1940s. Image courtesy of the Academy of
Natural Sciences Philadelphia
as diatom taxonomy and systematics, environmental toxicology, and groundwater contamination. Indeed, she published a 1970 paper on the ecological functions of tidal wetlands that anticipated by several decades the concept of ecosystem services. She also published a 1961 paper with the title “Use without abuse of our water resources,” long before this became a fundamental tenet underlying the concept of sustainable development. Despite this breadth of interests, Ruth always considered herself a limnologist. A lifelong ASLO member, she founded the Academy’s Limnology Department in 1947, served as its chair until 1973, and held the Francis Boyer Chair of Limnology for more than 40 years. Fittingly, this Limnology Department was renamed the Patrick Center for Environmental Research in 1983 to honor her remarkable career.

Just what was it that allowed Ruth to blaze so many new trails for so many years, all the while facing the kind of “woman-in-a-man’s-world” head winds that are almost impossible to imagine today? Given that she went to work at the Academy nearly every day for 65 years, it goes without saying that she had unparalleled drive and stamina. Much more than this, she possessed an enormous passion for science and an unwavering resolve to strengthen the scientific basis for environmental decision-making. As if that weren’t enough, her warm personality and extraordinary people skills allowed her to build lasting relationships with the chief executive officers of some of the world’s largest industrial corporations just as easily as with her academic colleagues.

When Ruth died in 2013, praise-filled obituaries appeared in the New York Times (“Pioneer in Science and Pollution Control Efforts”), the Wall Street Journal (“Pioneer of Environmental Movement Had Ear of Presidents”), and the Washington Post. It is hard to think of another limnologist who was held in such high regard inside as well as beyond the world of academia. In illuminating the path by which societal action can be guided by scientific research, Ruth Patrick’s career also offers enduring lessons that will help researchers accelerate the transition to a sustainable world.

**BOOK REVIEW**

**JILL LANCASTER AND BARBARA J. DOWNES.**

2013. *Aquatic Entomology.* Oxford University Press, UK.


Reviewed by William O. Lamp, Department of Entomology, University of Maryland, College Park, MD; lamp@umd.edu

There was a time when many biological disciplines were founded in a taxon-based field of science, and researchers built from that foundation by adding techniques and knowledge to classic areas of organismal biology. Through it all, the taxon was the basis for scientific training and advancement. Thus, in the past, textbooks on aquatic entomology were written by classically-trained entomologists and organized with chapters focused on the individual orders of aquatic insects.

In *Aquatic Entomology,* Drs. Jill Lancaster and Barbara Downes break from the past and, as aquatic ecologists, present a fresh and detailed treatment of topics concerning aquatic insects. Upon first seeing the title, I expected this book to be a reversal of a trend towards interdisciplinary, issue-based books back to using the taxonomy of aquatic insects as an outline (as in Merritt et al., *An Introduction to Aquatic Insects of North America*; McCafferty, *Aquatic Entomology*). Lancaster and Downes did not, however, develop a traditional text based on insect taxonomy. In the preface, they observe that aquatic insects are used for basic and applied scientific research in a wide range of disciplines, and that many non-entomologists have difficulty obtaining the knowledge about insects needed for their studies. Texts written.
for entomologists typically exclude broader topics in aquatic ecology, and texts written for aquatic ecologists typically exclude basic biological information about aquatic insects. Lancaster and Downes addressed this gap by writing their book to provide biological and ecological contexts to those students and researchers who need an understanding of insects living in aquatic habitats.

As an aquatic entomologist, I am endlessly fascinated by the diversity of form and function in insects that have an intimate connection to one or more types of aquatic habitat. As described in the introduction, these habitats range from intermittent streams to the confluence of major rivers, from temporary wetlands to the large lakes, and from trees holes to the surface of the ocean. Through evolutionary time, the Class Insecta has invaded aquatic habitats multiple times – in some cases multiple times within an insect order – and each time they have adapted to constraints associated with life underwater. Thirteen orders of hexapods include species that are considered aquatic or semi-aquatic, yet these represent just 2-3% of all hexapod species. One may ask, why focus on insects, among all organisms associated with freshwaters? One reason is a defining characteristic of aquatic insects: with very few exceptions, all have at least one developmental stage associated with terrestrial habitats outside the water. As a result, aquatic insect species have evolved unique abilities for dispersal and behavior, physiological constraints, and trophic interactions within both wet and dry environments. Aquatic Entomology recognizes that diversity, and provides an understanding of the ecology and evolution of aquatic insects by focusing not on taxonomy, but on broader fields of biology relevant to all aquatic organisms.

Although I compliment Lancaster and Downes for their integrated approach for biological topics across all aquatic insect taxa, the standard college course in aquatic entomology spends a lot of time collecting, observing, and identifying aquatic insects. Aquatic Entomology does not provide any keys, adequate descriptions, or even illustrations of taxa to help with identifications. Thus, if used as a textbook, Aquatic Entomology would need to be supplemented with keys or morphological descriptions. With a global perspective on the biology of aquatic insects, I can understand the lack of keys, although providing sources of such information would have been helpful. In addition, I was disappointed with the lack of biogeographical information on current distributions of orders and families across the continents.

Aquatic Entomology is arranged in five parts with 14 chapters. In Part 1, “Introduction to Aquatic Insects,” Lancaster and Downes describe general insect structure, provide a brief introduction to the aquatic insect orders, evolutionary history and historical biogeography of the taxa, and describe the diversity of environments that are inhabited by aquatic insects. Part 2, “Environmental Constraints on Distribution,” begins the detailed assessment of the biology of aquatic insects and their adaptations for life in and on water. Three chapters cover mechanisms for gas exchange (especially for obtaining oxygen), physiological adaptations for withstanding gradients and extremes of temperatures and osmotic pressures, and biomechanical issues associated with living on top of and the physics of movement through water. The description of the physics of flowing water and filter-feeding was especially insightful. Part 3, “Sensory Systems, Movement, and Dispersal,” includes four chapters on photoreception, mechanoreception, locomotion in and on water, and dispersal in the terrestrial environment. The sensory system chapters provide a novel approach in comparison to similar textbooks. The locomotion chapter builds on the biomechanism chapter from the previous part by providing details of the variety of locomotory mechanisms in/on water, while the dispersal chapter prepares the reader for Part 4, “Population Dynamics and Population Persistence.” Part 4 includes 3 chapters on subjects that are normally treated within specific orders of insects: reproduction and mating, oviposition and eggs, and development. Rather than describing each subject for each order, the authors summarize biological points for each subject and provide case histories from appropriate orders. The last part, Part 5, “Trophic Relationships” has two chapters that describe functional feeding groups of aquatic insects and details of gut structure and function.

I found that the chapters end suddenly, and without conclusion. Although each chapter and topic is introduced brilliantly by stating the importance of the topic, providing a chapter outline, and explaining its relationship to other chapters and sections, the end of individual chapters and the book as a whole leaves the reader feeling a bit lost. Each chapter would be improved with a concluding paragraph that summarizes the chapter and links it to the next topic. Providing a set of discussion questions also would be helpful, if the book is to be used as a text for a course. What is noticeably missing from the individual chapters is a discussion of human impacts to aquatic insects and habitats. The preface describes the importance of aquatic insects to applications such as monitoring and assessment, yet the implications of global issues such as climate change, water quality impairment, and habitat loss on the biology of aquatic insects is rarely mentioned. The variation in species’ responses to anthropogenic impacts is key to understanding tolerances exhibited by individual species. Standard toxicological terms and approaches for assessing acute and chronic effects of industrial and agricultural pollution are needed. I suspect space was a consideration for all of these issues, but if they cannot discuss anthropogenic impacts on aquatic insects, then they should suggest sources to find such information.

Overall, I was pleased and surprised with the detailed content of the book, designed for the non-entomologist reader. I enjoyed the authors’ alternative approach of describing aquatic insects not from a focus on systematics and taxonomy, but rather from a focus on form and function. Readers who approach the book from applied perspectives such as fly-fishing, water quality assessment, or pest management, may not be immediately satisfied. However, readers desiring a fundamental understanding of the biology of aquatic insects, with the goal of using that understanding to add depth and breadth to any of the above applied purposes, will be rewarded with detailed answers to diverse and complex questions. After all, it is the abundance and diversity of aquatic insects in freshwater habitats that make them ideal instruments for understanding the fundamental ecological interactions as well as the ecosystem functions and services associated with freshwater systems. Aquatic Entomology can serve as a new foundation for future scientific endeavors grounded in an understanding of the complex biology of aquatic insects.
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Josef Daniel Ackerman, editor-in-chief

a new publication from L&O e-Books

Parsing the Oceanic Calcium Carbonate Cycle: A Net Atmospheric Carbon Dioxide Source, or a Sink?

by Stephen V. Smith
Emeritus Professor of Oceanography, University of Hawaii

Stephen V. Smith’s new eBook provides a synthesis of our current understanding of the calcium carbonate biogeochemistry and its role in mediating carbon dioxide fluxes between the ocean and the atmosphere, set in the historic context of oceanographic studies from the 1940s to the present day. In particular, it emphasizes the limitations of the “standard” equation for precipitation-dissolution reactions and the consequences for calculation of global carbon dioxide fluxes. This review is particularly timely given the increasing evidence for anthropogenically driven changes in the global carbon cycle and the ensuing ecological ramifications.

This book will be of interest to oceanographers, climate change scientists and those who study global carbon cycles. It is also intended for graduate students and senior undergraduates as a supplementary text for general and chemical oceanography courses. The book will also appeal to teachers, researchers and historians interested in the evolution of oceanographic research in this area.

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