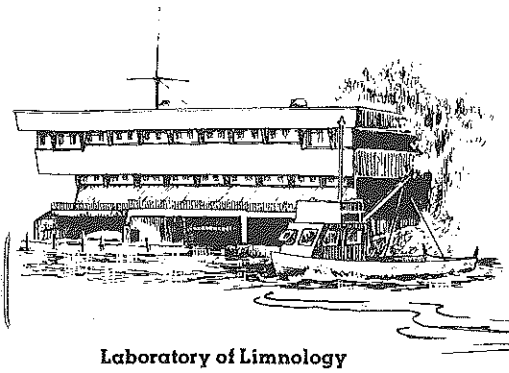
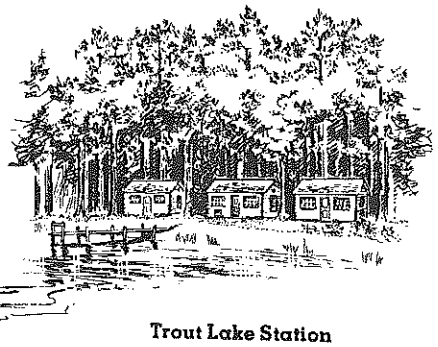


LIMNOLOGY NEWS

University of Wisconsin–Madison
College of Letters and Science



Laboratory of Limnology
Lake Mendota

Trout Lake Station
circa 1935

Number 9 **Spring-Summer 1999**

Lester V. Whitney: instrumentation pioneer

by Kenton M. Stewart (SUNY/Buffalo, NY; Ph.D. 1965, Hasler)

The history of science is often linked to the development of new instruments or equipment. Dr. Lester V. Whitney can be considered one of the instrumentation pioneers for the science of limnology. During the regular school year, he was a physics professor at the California Polytechnic Institute in San Luis Obispo, CA. However, during most summers, he traveled to the Limnology Lab at the University of Wisconsin and worked on instruments for use in lakes.

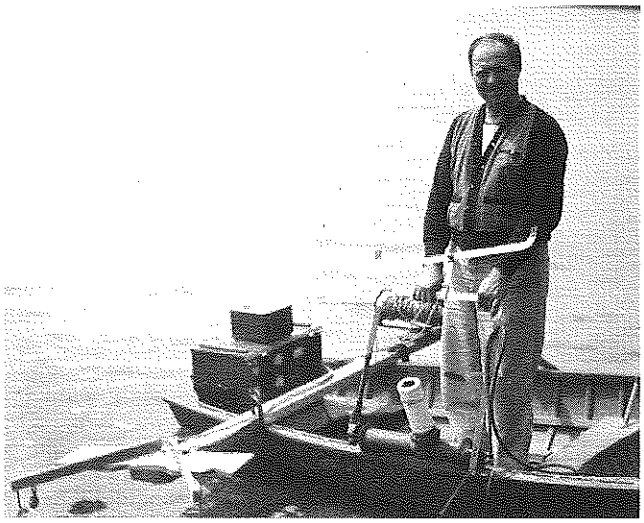
Lester Whitney worked with E.A. Birge and C. Juday, and many others at the University of Wisconsin, to help provide or repair field-capable instruments for limnological investigations. Of course, Birge, particularly after he became president of UW, had the power to call up the Physics Department and say that he would like someone to work on an instrument to measure light underwater through different filters...and it was eventually done. However, a key player in the development of some early electronic instrumentation for limnologists was Lester Whitney.

Temperature profiles tell much about mixing and stratification in lakes. The measurements of early temperature profiles were attempted with slow reversing thermometers, thermometers in bottles (which had to be kept at depth for an unknown period of time while waiting for the temperature inside the bottle to equal the temperature of the lake at that depth), and some thermophone devices (whereby the temperature was approximated by listening to the number of clicks at different temperatures). Whitney helped to speed lake profile measurements by leap-frogging those methods to the much more rapid thermistor thermometer and depth-calibrated cables. He built these thermistor thermometers. He customized the total range (usually 0-35° C) in shorter Celsius intervals (0-5, 5-10, 10-15...etc.) with individually-wound precision resistors. The subsequent well-known "Whitney Thermometer" was used to take innumerable temperature measurements in large numbers of lakes by many limnologists around USA and elsewhere. Of course, Whitney also designed underwater photometers, underwater transmissometers, and was among the first to develop an underwater conductivity meter.

Although science marches on, and many fine solid state devices are now available, Whitney Thermometers and other Whitney instruments are still in use. I have a Whitney-Montedoro thermometer (only a slight modification of the original Whitney) and still use it for some of my limnological work on the Finger Lakes of New York.

Two appealing features of the Whitney instruments were their ease of use and ability (up to a point) to take a pounding in a bouncing boat. There are many fine lab bench instruments but few rugged enough for tough field work.

In addition to being



Early pioneer in limnological instrumentation, Lester Whitney

see Whitney on page 6

News from the Center

by John J. Magnuson, Director

I am looking out at the ice cover on Lake Mendota as I write my letter on this mid-March day. As is usual for this time of year, the lake is covered with bright white snow and looks secure.

Yet, Lake Mendota reminds us of the changes occurring around us. I marvel that a year ago, 1998, the ice went out on February 27. That was the earliest ice-out date recorded from 1855 to 1998, as well as the shortest duration of ice cover, 47 days. Last spring was influenced by El Niño, but the means have changed as well. The winters of 1855-56 to 1887-88 averaged 118 days of ice cover; 1888-89 to 1980-81 averaged 103 days; and 1981-82 to 1997-98 averaged only 92 days. The difference between the early records and the latest records constitute an average decrease of 26 days or almost a month. It has been a century and a half of warming.

An important change at the Center is the arrival of **Dr. Emily Stanley**, a faculty member in Zoology and a research scientist in river ecology at the Center for Limnology (see her article on page 4). This brings our faculty count at the Center to four. We are delighted with Emily and with the support of the University and the Bassett Foundation that made this possible. Special thanks go to **Alex Nagel** from the College of Letters and Sciences, **Reed Coleman** from the Bassett Foundation, and **Tim Mulcahy** from the Graduate School.

Art Hasler comes in each day; on page 10 you can find a picture of the new Limnology Garden, dedicated in Art's honor for his 90th birthday.

Another thing that seems never to change is the quality of the program and the people here that make it a Center for Limnology. **Steve Carpenter** was awarded the Hutchinson medal by the American Society of Limnology and Oceanography at its annual meeting in February 1999. His acceptance address is thoughtful and well worth the read (see page 8). We are very proud of Steve and his influence on the science, the students, and each of us.

We have included pictures of administrative staff of the Center for Limnology below. Many of you will know some of these important people who make the Center work, but most will note a big change since you were here.

Another change, **Glen Lee** has retired (see article on page 5). We are fortunate to have a new person, **David Harring**, maintaining our strength in the boat slip and surroundings at the Lake Mendota Laboratory.

I am sorry to relate that **Ed Schneberger** died in January 1999. Ed received his Ph.D. in 1935 and was mentored by Chancey Juday.

This year's *William V. Kaeser Visiting Scholar*, **Peter Moyle** from the University of California at Davis, is a leader in finding ways to preserve native species and biotic diversity of fish in California.

Our visiting researchers had an international flavor this year.

Lauri Arvola (Lammi Biological Station, Lammi Finland) hid out at Trout Lake to capture precious writing time.

David Hamilton (University of Western Australia) improved physical models of lake dynamics, especially for the ice-covered period.

Sture Hanson (Stockholm University, Sweden) studied complex food web models.

Robert Radke (Hydrobiology Institute, Dresden, Germany) conducted research on fish community ecology.

Doris Stelzer and **Suzi Snyder** (Limnological Field Station for the Technical University of Munich, Munich, Germany) studied macrophytes and sediment chemistry in Trout Lake.

Cindy Paszkowski and **Bill Tonn** spent part of their sabbatical from the University of Alberta at Trout Lake while analyzing bird and fish communities associated with Alberta lakes.

Administrative staff at CFL includes Linda Holthaus, David Egger, Joe Mingle, Mindy Breunig, at the Limnology Lab in Madison, and Janet Blair at the Trout Lake Research Station.

Carpenter earns Hutchinson Award

by David Schindler (University of Alberta, Edmonton)

In recognition of his work in blending experiment, comparative study, modeling, and innovative statistical analysis to unravel the complex interactions among community characteristics and ecosystem functions and, in doing so, building important bridges between fundamental limnology and issues in lake management.

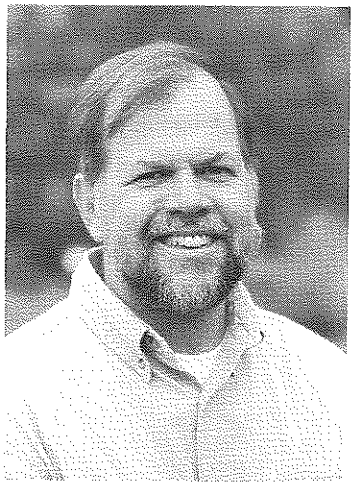
This mid-career award has been presented annually since 1982 to individuals who exemplify the standards of scholarship and creativity set by Professor Hutchinson's work in limnology and oceanography.

Steve was born in 1952 in Kansas City, Missouri. While an undergraduate at Amherst, he spent a summer working at Glacier National Park, discovering that people could actually get paid to do the sort of outdoor, scientific work that he enjoyed most. Science had always been an interest, but after taking courses from Stuart G. Fisher at Amherst, he was destined for a career in limnology. Steve graduated with a B.A. magna cum laude in biology in 1974, after completing a senior honors thesis with Fisher. With Michael S. Adams as a supervisor, Carpenter completed a M.S. (1976) and a Ph.D. (1979) at the University of Wisconsin at Madison. His Ph.D. dissertation was titled, "Submersed aquatic vegetation and the process of eutrophication."

Carpenter then joined the faculty at the University of Notre Dame, where he taught from 1979-1989. During this period, his research broadened to include pelagic communities and ecosystem processes, and his long association with James F. Kitchell of the University of Wisconsin began. Carpenter, Kitchell and their colleagues produced several papers summarizing the effects of "trophic cascading" on community structure and algal productivity, in *Bioscience* (1985 and 1988) and *Ecology* (1987). These set the stage for a series of whole-lake experiments at Notre Dame's northern research station, which have lasted until the present. The 1987 paper was cited as one of ten most-frequently-cited papers in ecology. In 1988, he edited the book "Complex Interactions in Lake Communities," a frequently used text and reference book in ecology and limnology.

In 1989, Steve joined the faculty of the University of Wisconsin's Center for Limnology, where he and Kitchell became the "dynamic duo" of whole-lake manipulation of communities and nutrient cycles. His first works on methods for statistical analyses of unreplicated experiments appeared in *Ecology* the same year. Carpenter and Kitchell's book "The Trophic Cascade in Lakes" summarized the first phase of their investigations on aquatic community structure. Carpenter's experimental and theoretical work has extended from lake primary producers and ecosystem modeling to developing new techniques for assessing food-web interactions. He has made seminal advances to our understanding of interactions among consumers, nutrients and physical processes in the dynamics of lake food webs. His whole-lake experiments have tested the ability of shifts in fish at the top of the food web to influence the primary-producer community in a series of cascading interactions. He has also developed new, creative, methodologies for the statistical analyses of whole-lake experiments.

Carpenter's work has also built important bridges between fundamental limnology and issues of lake management. In addition to his illustrious research career, Steve has contributed to ecology and limnology on many fronts. He has served on numerous science and policy committees for ASLO, the Ecological Society of America, the National Research Council and the National Academy of Sciences. After stints on the editorial boards of several prominent aquatic and ecological journals, including *Limnology and Oceanography*, in 1997 he become co-editor of the new journal, *Ecosystems*.



Steve Carpenter

This will be a busy year for Steve. In addition to receiving the Hutchinson Medal, he was elected president of the Ecological Society of America, assuming these duties in August 1999.

In summary, Steve Carpenter's creativity, productivity and energy make him one of the world's leading limnologists and aquatic ecologists. His penetrating ecosystem experiments and incisive mathematical analyses have significantly changed the way that we think about aquatic communities and ecosystems. He has inspired students and colleagues for two decades and will undoubtedly do so for two more. He is a most deserving recipient of this year's Hutchinson Award.

The text of Steven Carpenter's acceptance speech appears on page 8.

Emily Stanley joins CFL faculty

by Emily Stanley, Robert Bock Professor of River Ecology

After a year of anticipation and planning, I am extremely happy to be settling in to my new home at the Center for Limnology and the Department of Zoology. The path to Wisconsin has been a hop-scotching journey that started in Connecticut, and passed through New York, Texas, Arizona, Alabama, and Oklahoma, but the trip was worth it.

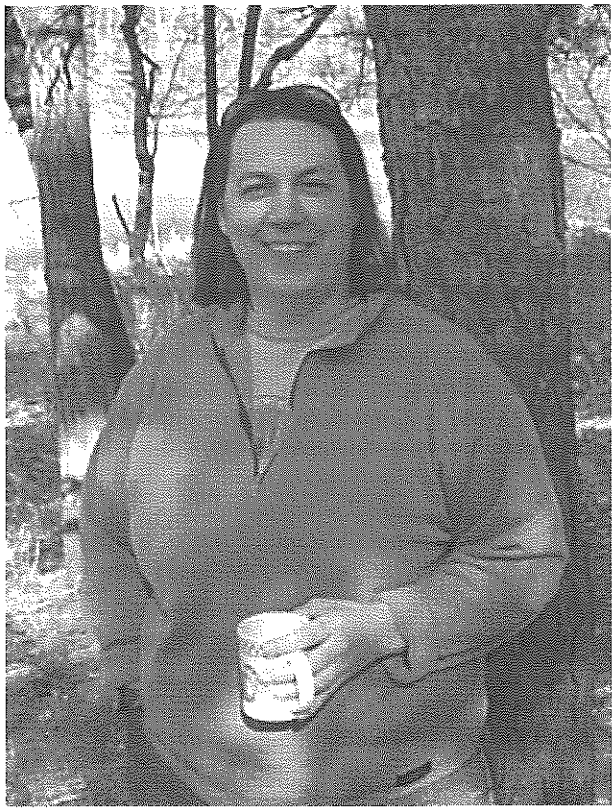
I completed my Ph.D. at Arizona State University with Stuart Fisher and Nancy Grimm, studying the effects of water loss on desert streams. This time at ASU was critical in shaping my thinking and approach to scientific problems. I gained a firm grounding in ecosystem ecology and an appreciation for multi-disciplinary, collaborative research. I was fortunate to be there during a particularly busy and productive time, and I continue to collaborate with many of my former ASU co-workers, including Andrew Boulton (now at University of New England in Australia), Jay Jones (now at University of Nevada Las Vegas), and Maury Valett (Virginia Tech).

I moved on to a post-doctoral position at the University of Alabama, where I joined a large group of researchers, led by Robert Wetzel, who were initiating a new project in wetland ecology; I worked with Amy Ward, studying microbial and nutrient dynamics. In addition to adjusting to an abundance of "y'alls" in my co-workers' vocabulary, the obvious differences between desert streams and southeastern wetlands challenged my scientific skills and thinking. The opportunity to work in contrasting ecosystems has proven to be an extremely valuable experience.

I was able to make the successful transition from post-doc to faculty member with a move to Oklahoma State University in 1995. I returned to my stream-oriented ways, focusing on nutrient cycling in prairie watersheds. The stay in Oklahoma was short, however, as I officially moved to Wisconsin in July, 1998. Now that I'm here, I look forward to shifting gears again, and studying the ecology of large rivers and their floodplains.

This coming year, I hope to divide my time between three burgeoning projects.

- Working with Monica Turner (Zoology) to develop and test ecological indicators for a large river-floodplain system and to evaluate their ability to detect functional changes in response to modifications of the natural flow regime and land use patterns.
- Studying the processes that control the transport of nutrients (particularly nitrogen) from streams and rivers to the ocean, and how nutrient transport can be reduced. Nitrogen from mid-western farms is finding its way to the Gulf of Mexico and causing eutrophication, much like excess phosphorus has over-enriched Lake Mendota.
- Working with colleagues at the Department of Natural Resources and the Sand County Foundation to understand the physical, chemical, and biological changes that occur following dam removal. Over the next several years, many aging dams will be removed from rivers across the state. Despite frequent removals in the past five years, there is little documentation of environmental changes that occur when impoundments are eliminated.



Emily Stanley

It is truly exciting to be here at Limnology, to work with colleagues who define and lead the field of limnology, and who have been tremendously supportive in helping me get my research program up and running. Already I enjoy interacting with the bright and diverse group of students and researchers at Wisconsin, and look forward to many productive years in Wisconsin!

Glen Lee: Skilled instrument maker

By: David L. Egger, Research Program Manager

The Center's Laboratory of Limnology, located on the shoreline of Lake Mendota, provides boat access to the Madison chain of lakes for University-sponsored research and teaching programs. Center boat facility manager and instrument maker, Glen Lee, retired in February 1998 after 22 years of service. Those who made use of the Center's fleet of boats, ranging from canoes to the 30 foot inboard R/V Limnos, during Glen's tenure are keenly aware of his attention to detail and help in boat maintenance and operation. In addition to the Center's fleet of boats Glen was responsible for vehicles, motors, trailers, ice augers, refrigerators, freezers and assorted esoteric limnological sampling gear.

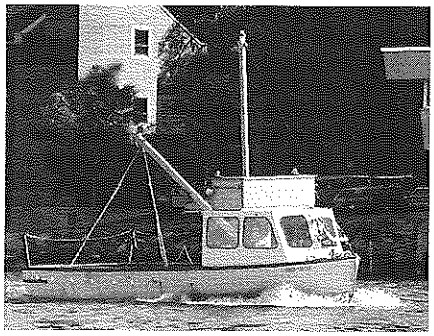
Glen Lee

Glen, a Wisconsin native originally from Black Earth, spent eight years of enlisted service in the Navy specializing as crew member on nuclear powered vessels. He served on the U.S.S. Enterprise, the world's first nuclear-powered aircraft carrier, known also as the Big E. After military service and acting on his desire to return to Wisconsin he started his University career in 1963 at the UW Primate Center transferring to the Laboratory of Limnology job as a Mechanician I in August of 1975. Glen's University career spans 34 years. He possesses fine-tuned skills, many of which remained hidden until the need arose. He is an excellent welder and skilled machinist. Among the variety of items which Glen was asked to construct over the years at the Center those which stand out and remain in use are Schindler-Patalas plankton traps, Ekman dredges, Sedgwick-Rafter counting cells for plankton enumeration, sediment traps and stainless steel bottom corers. In building the laboratory's ground-floor machine shop into a professional center for construction and maintenance Glen acquired vertical and horizontal milling machines, metal turning lathes and welding equipment from surplus, military and University inventories which he used to great advantage for Center research and teaching needs.

Perhaps his greatest acquisition for the Center evolved from a relationship developed with an undergraduate who served as apprentice with him ten years ago. David Gussert was graduated in Engineering after several years of working with Glen in the operation of the boat facility and went on to work as an experimental production engineer for the Mercury Marine Corporation. This Fond du Lac company builds high quality outboard engines. Glen and David collaborated in the University sanctioned testing of Mercury motors by Center boat and motor users. It is a deal made in heaven; Mercury Marine has the advantage of regular use records and critiques for experimental motors and the Center receives outboard motors with high quality engineering overview. These motors in 70 to 100 horsepower range have saved the Center and University many thousands of dollars in acquisition and maintenance costs.

Retiring from active service with the University has allowed Glen to pursue his interest in camping, backpacking, and canoeing and to participate as a volunteer for his church and, most recently, in the construction of park recreational facilities for his home community of Monona. He is an avid sports fan and long time season ticket holder for Badger football, basketball and hockey. Along with his wife Sally and two daughters, Nadia and Anna, Glen also enjoys – what else – boating on the Madison lakes. Continuing his ties to the University Glen serves as a board member for the Lutheran Campus Ministry.

Glen, who has spent time teaching and advising his replacement, David Harring, will be missed. He has graciously agreed to act in an advisory capacity to Center staff on issues of boat facility use.


The Limnos

Whitney ***continued from page 1***

a builder and supplier of limnological instruments, Dr. Whitney was a highly respected scientist. His paper (Whitney 1938) in the Wisconsin Academy of Science, in which he illustrated the remarkable microstratification present in some lakes (as measured with his own custom-built transmissometer), was truly a classic. Two other papers by Whitney (1941a and 1941b), describing the general law of diminution of light intensity and the angular distribution of characteristic diffuse light in natural water, were also classics and clearly ahead of their time...as the following quote from Duntley (1963) indicates:

*"This behavior of daylight in water, a subject of conjecture for more than 30 years, was probably first definitely postulated by Whitney (1941a, 1941b) in brilliant speculations based neither upon adequate radiance distribution data nor upon a valid theoretical analysis but chiefly upon insightful interpretations of irradiance measurements. Whitney's hypothesis could not be confirmed until 1957, when an eight-year experimental program, initiated by the author (*Duntley*) and conducted in its later stages chiefly by several of his colleagues, culminated in the definitive radiance distribution data of Tyler. These data were obtained with superlative equipment representing nearly a decade of apparatus development."*

My personal experiences with Lester Whitney.

- During the summer of 1961 while I was a graduate student at the UW, Dr. Whitney and I attempted to develop an instrument for taking rapid profiles of dissolved oxygen through the use of a device known as a "dropping mercury electrode." Such a device had seen some limited experimental use in marine waters in Europe. Unfortunately, to calibrate the dropping mercury electrode, I had to simultaneously collect regular water samples from many depths and run Winkler's on them to make sure the micro-ampmeter readings generated by the dropping mercury electrode were giving translatable oxygen profiles. After numerous hours of experimentation over many weeks in many lakes and in the lab, Dr. Whitney and I concluded that it was simpler and more reliable to run Winkler's alone.
- Another project was to test the reliability of some newly marketed devices (oxygen membranes) from at least three different companies. None of these early membrane sensor instruments tested gave reliable results in waters that were cold or had low concentrations of dissolved oxygen. Obviously, that wiped out half the year for temperate lakes and the lower half of most eutrophic lakes. That was a frustrating but informative summer for Whitney and me. Fortunately, the technology of membrane electrodes improved significantly since then.
- Although most of my limnological measurements were in the Madison lakes, one summer I drove up to the old northern Wisconsin Trout Lake station for a couple of days. Dr. Whitney and family were there at that time also. I planned to go out on Trout Lake, anchor, and take a detailed set of temperature profiles from one spot to record standing internal waves.

Lester and Helen Whitney at Trout Lake in 1959

Dr. Whitney wanted to go along, but we couldn't find anchors in any of the buildings. We finally found an old bomb-shaped lead weight, used to act as a depressor for Clarke-

Bumpus tows, and some other piece of metal. We tied them together on the end of a rope and took the combination along to act as the anchor.

We went out, anchored in place, and had been taking temperature profiles every few minutes for a couple of hours when the westerly sky suddenly got very dark and a dangerous storm approached rapidly.

Dr. Whitney said that lightning is very dangerous for limnologists and that, "WE NEED TO GET OFF THE LAKE NOW!" The trouble was that our rigged anchor had gotten caught between rocks or something hard on the bottom and, even with both of us pulling with all our might, we couldn't dislodge the anchor. Consequently, we either cut or untied the anchor rope and raced for shore while high winds and waves, heavy rain, lightning and thunder seemed to be everywhere. The Clarke-Bumpus weight was lost, but we made it to shore. Everyone on shore had taken shelter in the cabins. The winds intensified and not only shook the big old pines around the cabins, but also shook the cabins. After an hour or two, the storm passed, everything calmed, and the lake seemed unrealistically sublime.

Dr. Whitney and I went back out on the lake and took a temperature profile. We expected a change...but not as much as the unusually sharp one we measured. The epilimnetic temperature was uniform for several meters down but suddenly dropped 10° C in 30 cm. We repeated the measurements and looked at each other in amazement. It is interesting how scientific findings can somehow interpose themselves between sheer terror and sublimity.

• At one or more parties or picnics during the summers I knew him, I learned that he was a good piano player. He, as I, enjoyed the poetry of Robert Service, and he had a few selected lines memorized. He and his wife attended plays at the Wisconsin Union during the summer. He had an infectious smile and loved a good joke.

While teaching physics back in San Luis Obispo, CA, he had a heart attack and died very shortly thereafter. His physics colleagues were impressed at how widely known and respected he was in a world about which they knew little.

Dr. Whitney's pioneering work in limnology enlightened many underwater mysteries. His stimulating discussions, warm personal friendship, and help in instrumentation helped make the lives of those who knew him much richer.

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Text of Steve Carpenter's Hutchinson Award acceptance speech

I am delighted to accept this award. When Tom Malone called with the news, I was incredulous that my name had been linked with such celestial limnologists and oceanographers as the former Hutchinson medalists. Although I never had the privilege of meeting Professor Hutchinson, I have read many of his books and papers. I am awed by the breadth of his knowledge, his integrative skills, and his affinity for diverse approaches to scientific learning. It is a great honor to receive this award named for Professor Hutchinson, and also a great source of inspiration.

I would like to thank a few of the people who have taught and counseled me over the years. My father is a scientist who spent most of his career working in environmental chemistry. My career choices were strongly influenced by his example and his enthusiasm for science.

At Amherst College, Stuart Fisher (now of Arizona State University) taught superb courses in Limnology and in Ecosystem Biology. I well remember Gene Likens' guest lecture on the exciting idea of using whole intact ecosystems as experimental units. Stuart had a remarkable knack for engaging young scientists in research and encouraging creative approaches. Bob Howarth and Jon Cole worked in Stuart's lab at the same time I was there. That small community of aquatic ecosystem ecologists set my career vector for at least the next 25 years. In graduate school at the University of Wisconsin, I was influenced by several leaders of the Lake Wingra program. As a young faculty member at the University of Notre Dame, I learned from Bob McIntosh just how much history matters.

I've been fortunate to collaborate with some remarkable scientists. First and foremost, Jim Kitchell has been a generous and brilliant collaborator. Jim has taught me to understand fish in an ecosystem context. Most importantly, the whole process has been fun. I'm looking forward to the next 20 years.

Mike Pace and Jon Cole have taught me microbial ecology. They are pillars of our team of whole-lake experimenters. I've been fortunate to work with many gifted students and postdocs. Several forward-looking managers in Wisconsin have helped me understand how agencies work, and the role of science in decision making. I particularly thank Jim Addis and the manager-students he has sponsored at the Center for Limnology.

Good team science requires great institutions and I have been fortunate to work at some of the best in the business. John Magnuson's vision of a learning organization makes the Center for Limnology a superb place to work. Tom Frost of Trout Lake Station, and Ron Hellenthal of University of Notre Dame Environmental Research Center, have made our field work possible.

In thinking about Professor Hutchinson's opus, I am struck by his embrace of theory, comparative studies, long-term dynamics at evolutionary time scales, and experimentation. Aquatic science is a table borne by these four strong legs: theory, comparison, long-term observation and experiment. If one leg withers, the table falls. Debate about approaches is a good thing. In the end, any important idea needs to be supported by all four legs. In practice, this coherence is difficult to achieve and involves a long process of sifting and winnowing, of doubt, test and argument. The challenge is made harder by the explosive growth of information and the tendency of powerful disciplines to balkanize by fragmentation into subdisciplines. Our debates can turn acrimonious when we argue that one leg or the other is more important. We can all think of examples of this from the history of limnology and oceanography. Are we doing a good job of building the table? We have some successes, but we can do better. Some of the remarkable recent examples come from the National Center for Ecological Analysis and Synthesis, which has sponsored several innovative aquatic projects. Do we need another center focused on aquatic sciences? I believe the answer is 'yes', and that the magnitude of the questions and opportunities is more than sufficient to warrant such an investment.

As the millennium approaches, aquatic systems are front-and-center among society's concerns about the environment

As the millennium approaches, aquatic systems are front-and-center among society's concerns about the environment. Global fisheries declines, shifts in water supplies, persistent contaminants, expanding eutrophication of lakes, rivers and coastal oceans are growing problems. Certainly they have strong connections to economic welfare, and some have even linked them to global security. Surely science will be called on more and more to help society cope with these issues. What is our state of readiness? Where can we offer credible analysis and reliable predictions? In what areas is the science absent or insufficient? What questions must we answer as fast as possible? Where are we poised to make remarkable advances in a reasonable amount of time, say 5 or 10 years? The scientific community must answer these questions; no one else can do it.

It's time for an assessment of ecosystem change

comparable to the Intergovernmental Panel on Climate Change. The IPCC, aided by many scientists in this room, has been enormously successful in capsulizing scientific agreement, and genuine disagreement or uncertainty, in a form useful for, in fact demanded by, decision makers. Ecosystem change needs similar effort. What is the current status of aquatic ecosystems- fisheries, fresh water supply, connections to global biogeochemical cycles, resilience to nutrient input, biodiversity? What is the vector of change? What are the opportunities for improving conditions or mitigating impacts? An international scientific consensus on these vital questions would have enormous value to decision makers.

It's a lot easier to raise these questions than it is to answer them. In fact, it is up to all of us, not just me, to work on the answers. Societies like ASLO have a unique role to play, and I hope we seize our opportunity with energy and creativity. I'm too much of an optimist to see our current environmental predicament as an endless tunnel. But if we are in a tunnel, I'm sure that science is our headlight. This great honor that you bestow on me today has inspired me to strive for better, more useful work in the second half of my career. Thank you all.

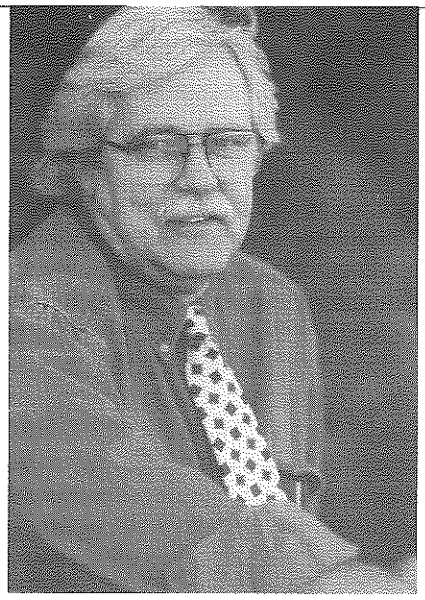
We gratefully acknowledge ASLO and David Schindler for their permission to reprint the article and speech, which originally appeared in the ***ASLO Bulletin***, Spring 1999, vol. 8, no. 1, pps. 14-15.

Apex predators in the Central Pacific Ocean

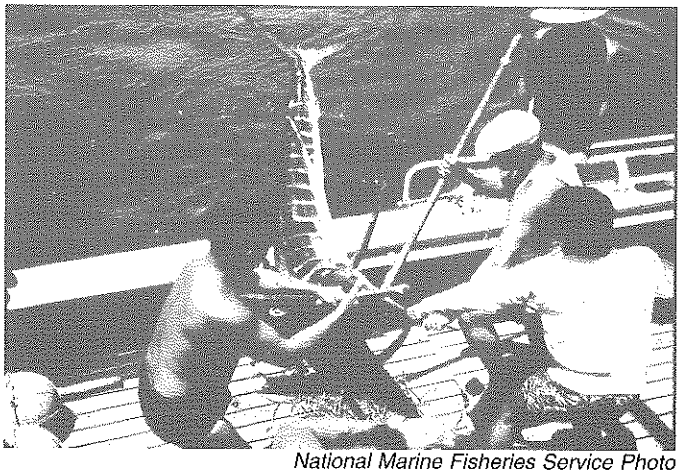
by Jim Kitchell, Associate Director of the Laboratory of Limnology

As part of my 1996-97 sabbatical, I spent six months at the National Center for Ecological Analysis and Synthesis (NCEAS) in Santa Barbara. While there, I organized and conducted workshops on Apex Predators in Marine Systems. This led to a proposal to NSF's Biological Oceanography Program which has been funded through Summer 2002.

The new Apex Predators Project focuses on the effects of fishery exploitation as it alters the abundance and composition of the fish community that occupies the top of food webs in the Central Pacific. An assemblage of modeling and statistical methods are used to evaluate changes in food web structure and ecological interactions owing to increased fishing by the longline fleets that capture tunas, billfishes and sharks in the international waters of the Central Pacific. My research involves close collaboration with a group of National Marine Fisheries Service personnel led by Chris Boggs, a Center for Limnology alumnus (Ph.D., 1984) who now serves as Chief of the Fish Biology and Ecology Investigations Unit at the Honolulu Laboratory of NMFS. Tim Essington (Ph.D. 1999) will join the Apex Predators team as a postdoctoral fellow beginning in September of this year.



Jim Kitchell



National Marine Fisheries Service Photo

Commercial fishing for apex predators in the Central Pacific

As an expansion of the initial effort, another Center alumnus, Bob Olson (Ph.D. 1990 and Senior Scientist, Inter-American Tropical Tuna Commission, La Jolla, CA) and I serve as co-chairs of a Fishing Strategies Working Group sponsored by NCEAS. We focus on developing analytical approaches to ecological questions surrounding purse seine fisheries in the Eastern Pacific Ocean.

The North Temperate Lakes Long-Term Ecological Research Program

By John J. Magnuson, Director, and Tim Kratz, Acting Associate Director for the Trout Lake Station

The long-term regional ecology of lakes has become a major research program at the Center for Limnology. One of our favorite quotes is: "A fundamental characteristic of complex human systems, 'cause' and 'effect', are not close in time and space." (Senge 1990. *The Fifth Discipline*).

That idea is still apparent when "human" is replaced by "ecological" or "limnological." These are properties of complex natural systems. For years, ecologists and limnologists were unable to set up systematically a research endeavor that would deal directly with longer-term and broader-spatial processes. These processes act over decades to centuries across the landscape at regional to global scales; they include the slow drivers that often are the most critical to the sustainability of our world. These are the ones we are least likely to detect without the new research platforms of Long-Term Ecological Research Sites that can function as biosphere observatories.

We were among the first funded by the National Science Foundation to initiate an LTER site; that was in 1981. Now, 18 years later, we have a longer record of the limnology of lakes on a richer array of properties than our predecessors (E. A. Birge, C. Juday, and their colleagues) were able to gather in the 1930s and early 1940s in northern Wisconsin. Juday had hoped to synthesize the lake data from those early years but passed away before he had the opportunity. Today, synthesis and integration are built into the daily routine of the LTER program.

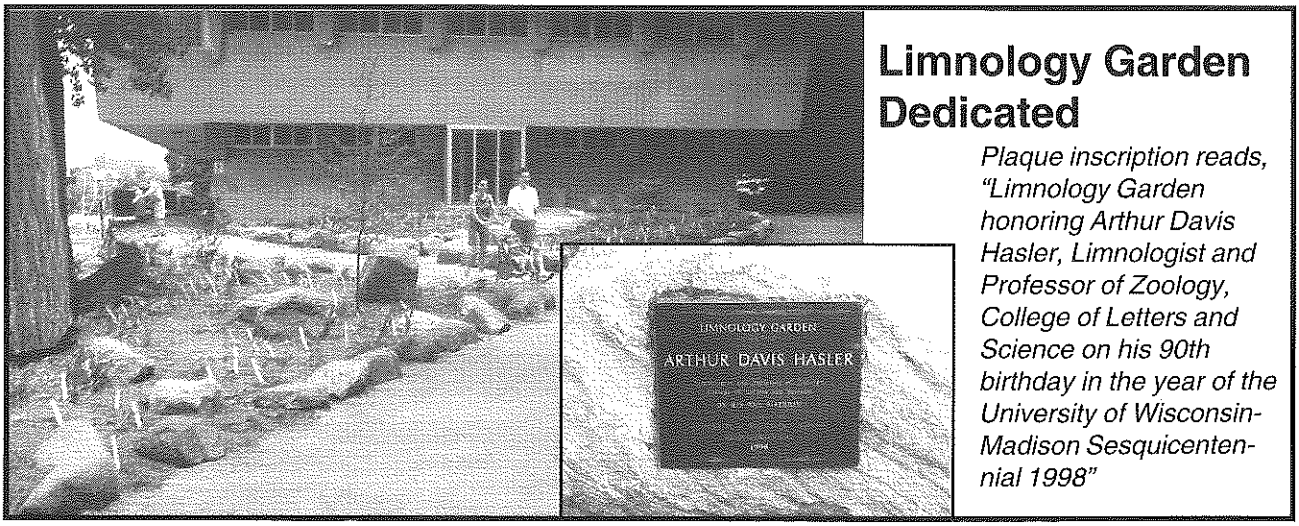
Our study not only includes the collection and husbandry of the valuable limnological record, it also includes the analyses of internal lake dynamics, the interactions with climate variability and change, interactions with the human-dominated landscapes, the determinants of biodiversity and invasions, the biogeochemical cycling in lake ecosystems, and comparisons of lake ecosystems with a wide range of terrestrial and marine ecosystems.

These new approaches led to findings, new ideas, and new concepts: the idea of the lake's position in the landscape as a key determinant of the status or character of the lake; the year-to-year variability of the lake; and the synchrony of the lake's dynamics with nearby lakes.

Limnology has been dominated by questions of lake status or what determines how green a lake is or how good the fishing is, for example. New sets of questions come with a long-term regional approach to lakes. How and why does a lake change from year to year and over the decades? How can we understand and predict how lakes will change and which lakes will change in the same way? How can we determine whether the changes are unique to a given lake or a response to regional or global drivers? These are important in the world in which we live, so that society can plan for changes or prevent less desirable or more catastrophic changes.

The lakes we study include the first lakes studied by our predecessors in the Trout Lake and Madison areas. They are serviced by the two lakeside field stations, the Trout Lake Station in Vilas County and the Laboratory of Limnology on Lake Mendota on the Madison Campus. They attract a wide array of investigators and students from across the campus, the state and the world. What additional surprises will emerge from this powerful research platform?

The understanding of events, conditions, and processes that LTER provides will contribute greatly to a better synthesis of ecological science at the time and space scales most important to sustainability.



Limnology Garden Dedicated

Plaque inscription reads, "Limnology Garden honoring Arthur Davis Hasler, Limnologist and Professor of Zoology, College of Letters and Science on his 90th birthday in the year of the University of Wisconsin-Madison Sesquicentennial 1998"

UPDATE
One purpose of the newsletter is to help you keep up-to-date with old friends. Submit your item for the newsletter to Limnology News, Center for Limnology, UW-Madison, 680 N. Park Street, Madison, WI 53706.

People in the News

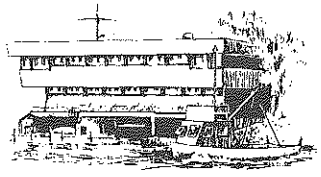
- **Steve Carpenter** was one of nine professors to receive Mid-Career Awards funded by the Wisconsin Alumni Research Foundation; winners are selected by the Graduate School research committee. Steve was awarded $60,000 to study the processes that control productivity of lakes.
- **Steve Carpenter** is the President-elect of ESA. His one-year term begins in August 2000. Steve recently chaired a committee of the ESA to summarize the state of scientific knowledge about nonpoint pollution of rivers and lakes with phosphorus and nitrogen.
- **Larry Crowder** (Asst. Scientist 1978-82) has been named the Stephen Toth Professor of Marine Biology at Duke University.
- **Charles S. Holt** (M.S. Hasler, 1962) died August 1998. He received his Ph.D. from the University of Minnesota and was a specialist in stream ecology at the H.T. Peters Aquatics Laboratory at Bemidji State University.
- For the past two years, **Jim Kitchell** has served as a member of the Ecosystem principles Advisory Panel, appointed by the U. S. Congress to develop guidelines for fishery management practices by the National Marine Fisheries Service. The panel's report "Ecosystem-Based Fishery Management" will be forwarded to Congress in early 1999.
- **Jim Kitchell** received National Science Foundation support for his Apex Predators in Pelagic Marine Systems project
- **Gene Likens** (Ph.D 1962, Hasler) was recognized for his ecosystem research by the Hudson River Environmental Society, Inc. with its Distinguished Service Award. Gene was also awarded an honorary doctoral degree by the Wageningen Agricultural University in The Netherlands, and he received the 1997 R.A. Vollenweider Lectureship in Aquatic Sciences from Canada's National Water Research Institute, an annual award to a freshwater scientist in recognition of contributions to excellence in international research and scientific leadership.
- **Mark Olson** (Post Doc 1994-96) and **Janet Fischer** (M.S. 1996, Ph.D 1997, Frost and Magnuson) have accepted a tenure-track Community Ecologist position at Franklin & Marshall College in Lancaster, PA. They are excited about the balance of teaching and research in this position, which begins in January, 2000.

Student Awards

- **Elena Bennett** received the CIC/WISE Grant (Committee for Institutional Cooperation: Women in Science and Engineering) and an IES (Institute for Environmental Studies) Travel Award.
- **Heather Buchholz** received a Hilldale Undergraduate Research Award for 1998-99. Her advisor is Steve Carpenter.
- **Jeffrey Houser** received a NALMS Graduate Student Travel Grant.
- **David Lewis, Sarah Gergel** and **Ben Greenfield** were awarded Star EPA fellowships which provide stipend, tuition and research support for up to three years for graduate environmental study.
- The 1998 Chase Noland Undergraduate Award in Limnology was presented to **Julie O'Leary**. The 1999 award went to **Kari Hammarsten.**
- Anna Grant Birge Memorial Awards in 1998 went to **Carlos Santos Flores, Bill Foreman, Cheegwan Lee, Linda Puth, Amina Pollard,** and **Linda Zelewski**. In 1999, awards went to **Ben Greenfield, Cheegwan Lee, Linda Puth, Gary Quick, Carlos Santos Flores, Jeff Schell, John Spranza** and **Karen Wilson**.
- **Elena Bennett, Jeff Houser,** and **Tara Reed-Andersen** received John Jefferson Davis Travel Awards.

LIMNOLOGY NEWS

The University of Wisconsin-Madison Center for Limnology publishes Limnology News for its alumni and friends. Comments on the newsletter, articles and article ideas are welcome. Contact Limnology News, Center for Limnology, 680 N. Park St., University of Wisconsin, Madison, WI 53706.



Editors
Janet Blair
Linda Holthaus

Recent Degrees

- **Tara Reed Andersen** (Ph.D., 1999, Carpenter) modeled the phosphorus dynamics of Lake Mendota and its watershed. Interesting new aspects of the model included the role of differences in the stream riparian on the tributaries, and also the potential influence of any future zebra mussel invasion. She joins the faculty at UW-Green Bay in August.
- **Shelley Arnott** (Ph.D. 1998, Magnuson and Frost) completed her Ph.D. through an analysis of zooplankton species richness and species turnover in north temperate lakes using the rich database from Dorset Environmental Science Centre in Ontario. She is now a post doctoral researcher with Dr. Norman Yan at Dorset.
- **Elena Bennett**, (MS 1998, Carpenter) found that phosphorus imports (in the form of fertilizers and feed supplements for livestock) to the Lake Mendota watershed far exceed exports (in the form of harvested crops, meat and dairy products). The excess phosphorus accumulates in the soil. A global budget showed that similar buildups are occurring worldwide. Elena has begun doctoral work in Oceanography and Limnology with Steve Carpenter.
- **Dorothy Boorse**, (Ph.D. 1998, DeWitt) analyzed the community structure of invertebrates in prairie ponds at the International Crane Foundation in the context of island biogeography. She is an Assistant Professor at Gordon College in Wenham, MA.
- **Tim Essington** (Ph.D. 1999, Kitchell) completed his Ph.D. on the predator-prey interactions of largemouth bass. Tim considered the role of structural habitat in mediating fish distributions and predation rates, and how complex food webs might lead to alternate stable states in predator and prey abundances. He is now a post doctoral researcher with Jim Kitchell, working at the National Marine Fisheries Service laboratory in Honolulu, HI.
- **Tom Hrabik** (Ph.D. 1999, Magnuson) analyzed interactions with the exotic rainbow smelt and the distribution of fishes and their welfare in Northern Wisconsin. He developed explanatory models for fish vertical distribution and for the among lake dispersal of the exotic rainbow smelt. He is taking a postdoctorate research position with our Long-Term Ecological Research Program studying the regional ecology of lakes in the landscape with Tim Kratz.
- **Beth Sanderson** (Ph.D. 1998, Frost and Magnuson) completed her Ph.D. on the analysis of water clarity of the Long-Term Ecological Research Lakes near the Trout Lake Station. She considered the role of chlorophyll and dissolved organic carbon on Secchi depth and extinction coefficient. She also related cyclic changes in water clarity and chlorophyll to an internally driven oscillation in the perch population of Crystal Lake caused by cannibalism and age to reproduction.
- **Katherine Webster** (Ph.D. 1998, Magnuson) completed her Ph.D. on the geochemical responses of lakes in the Trout Lake area to drought and the role of geomorphic and landscape controls on the differences in response among lakes. Kathy is employed by the Wisconsin Department of Natural Resources in the Bureau of Integrated Science as a researcher.
- **Theodore Willis** (M.S. 1999, Magnuson) completed his research on the ecotonal changes in the fish community at lake inlets between stream and lake shore communities in the Trout Lakes area. He is continuing his Ph.D. on a related project on the integration of lake and stream ecology.

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