

Laboratory of Limnology
Lake Mendota

LIMNOLOGY NEWS

University of Wisconsin—Madison



Trout Lake Station
circa 1935

Number 2

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Little Rock Lake Acidification Project



Diver Daniel Helsel, research specialist, inspects the curtain separating the two basins of Little Rock Lake.

Acid rain threatens many lakes in the upper Midwest, yet the effects of acid deposition on lake ecosystems are still poorly understood. In 1983 the Center for Limnology Trout Lake Station in northern Wisconsin was chosen by the U.S. Environmental Protection Agency as the major national site for research on the biological effects of lake acidification. The Little Rock Lake Project involves the gradual acidification of one half of the hour-glass shaped lake whose two lobes are separated by a chemically resistant, synthetic barrier. One half of the lake will be left untouched as a reference lake until 1991, and then it too will be gradually acidified to serve as a replicate. Little Rock Lake, located seven miles north of Woodruff, in Vilas County, was selected for acidification because it is representative of northern Wisconsin lakes considered most sensitive to acid rain.

The project, which is the only one of its kind in the United States, is a cooperative study involving not only researchers John Magnuson,

Tom Frost, and Tim Kratz from the University of Wisconsin-Madison Center for Limnology (CFL), but also Carl Watras, project site manager, Kathy Webster, and Paul Garrison from the Wisconsin Department of Natural Resources (DNR); Pat Brezonik and Jim Perry from the University of Minnesota; Bill Swenson from the University of Wisconsin-Superior; Bill Rose from the U.S. Geological Survey; and John Eaton, project officer, from the U.S. Environmental Protection Agency.

Little Rock researchers have made a series of predictions about what will happen in the lake as pH is lowered. Included among the many predictions are (1) all parts of the biological community including phytoplankton, zooplankton, large aquatic plants, insects, and fish will change as vulnerable species decline and a few acid-tolerant species become dominant; (2) the complex food web will become simplified as the diversity of species declines; (3) there will be changes in the rates at which biological materials de-

compose and release nutrients back into the water; (4) spawning by largemouth bass and rock bass will become erratic and the number and size of spawns will decrease; and (5) the mudminnow population will increase as predation by largemouth bass and rock bass decreases.

The study began in July, 1983. Little Rock researchers have now completed a two-year baseline study in which the two halves of the lake were found to be virtually identical with regard to chemistry and plant and animal populations. In April, 1985, they began acidifying one half of the lake. The normal pH of 6.1 was lowered to 5.6. This required about 90 gallons of concentrated sulfuric acid—the equivalent of one drop in a 50 gallon drum, considering the size of the lake basin.

One of the most dramatic findings of the initial acidification of Little Rock is that the lake proved more sensitive to acid inputs than the researchers originally predicted. That is, it took much less acid to lower the pH than researchers thought it would.

Two obvious responses to the acidification were clearer water—light penetration increased 10 to 40 percent—and the development of algal mats on the lake bottom. A mat of green filamentous algae covered 10 to 15 percent of the shallow, near-shore zone in the first two years of acidification (pH 5.6) and then expanded to cover almost all of the lake bottom when the pH was dropped to 5.1 this year.

Keratella taurocephala, a zooplankter, increased in abundance following acidification. This result was expected because survey work indicated that this species does well in acid conditions. *Epischura*, *Leptodora*, and *Asplanchna*, all zoo-

continued on page 5

Salmon Are the Bait for Hasler's Peace Project



Arthur Hasler, shown standing on the dock in front of the Limnology Laboratory in Madison, has a grand plan for reviving the salmon fishery on the Amur River in Asia.

While President Reagan and Soviet President Mikhail Gorbachev were in Iceland lowering the temperature of the cold war by a few degrees, Arthur Hasler was in the Soviet Union promoting a novel tool for peace—fish.

Hasler was sent to Russia for two months in the fall of 1986 by the National Academy of Sciences to promote a project he calls "Salmon for Peace."

"The Amur River flows between the Soviet Union and China. Historically, they had a valuable salmon fishery," Hasler said, adding that it has declined due to overfishing.

Hasler pioneered a technique whereby biologists can boost such a fishery by taking advantage of the salmon's instinctive homing ability. The fish are imprinted to a chemical odor when very young, planted in a body of water and then drawn back as adults to a particular site along a river or lake by adding that imprinting chemical to the water.

Using this technique of imprinting fish and drawing them into the Amur, Hasler said Soviet and Chinese fishery biologists could increase many times the number—and thus the catch—of salmon that would return from the ocean to spawn.

"The salmon would deliver themselves free of charge to the backdoor," Hasler said. "It could be

a multibillion dollar fishery."

However, turbulent Soviet-Chinese political boundaries may prove harder to cross than the river between the two countries, said Hasler. He promoted his plan to the Chinese on a trip in 1983. On his recent trip, he was restricted from visiting the Chinese border area of the Soviet Union.

"It's closed, Americans can't go to those places," he said.

However, Hasler was encouraged when scientists from the Amur River area traveled to Moscow to hear him speak.

"It was really quite a victory. We had a long discussion after the lecture about rehabilitating the salmon fishery on the Amur."

Hasler would like representatives from both China and the Soviet Union to come to UW-Madison to learn how to stock and imprint salmon.

"We could take them up north and show them the Lake Michigan success story—a billion dollar business that has grown up there by rehabilitating the lake and introducing salmon."

Hasler's Soviet trip included a visit to Lake Baikal in Siberia, where he and his wife Hatheway spent their honeymoon 15 years ago.

Hasler was one of 20 scientists who participated in the exchange to the Soviet Union last year, the first such exchange in a decade.

"I've been very angry, really, with our National Academy because we've allowed the State Department to impose upon us the concept that we should punish the Russians. So we've let 10 years go by without any exchanges, and that's punishing us."

"If you've got to punish another country, it seems to me it shouldn't be curtailing exchanges of scientific thinking."

Inga Brynildson
University News and
Information Service
UW-Madison

ASLO Meeting Caps 1987

I am delighted with the way all generations of Wisconsin limnologists have responded to our first newsletter, and look forward to this continuing effort to share our common experience.

The 50th meeting of the American Society of Limnology and Oceanography was held in Madison in June. Thomas Frost, the Associate

Director of the Center for Limnology responsible for the Trout Lake Station, was local program and arrangements chairman. Tom and his many colleagues deserve our appreciation. The meeting was excellent and provided us at Wisconsin with an opportunity to recognize our heroes. The program highlighted the intellectual basis for a scientific society linking limnologists and oceanographers, the importance of and progress in experimental limnology, and the role of consumers in the dynamics of lake communities.

This issue of Limnology News features several new contributors. Inga Brynildson wrote two of the articles. Inga, the daughter of Clifford Brynildson (M.S. 1950, Hasler), was a writer for the University News Service and is now a graduate student in the Institute for Environmental Studies on the Madison campus.

The article on the Little Rock Lake acidification study was written by Annamarie Beckel. You will recognize her talents as the author of "Breaking New Waters," now available for purchase. Annamarie lives near the Trout Lake Station with her husband Tim Kratz and two young children, Megan (4) and Amy (1½). Tim is site manager for our Long Term Ecological Research program on Wisconsin lakes.

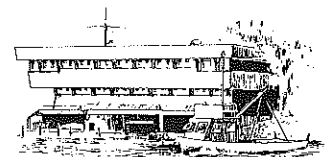
Robert Pennak provided this issue's autobiographical sketch. I especially appreciate the insights this feature provides.

John J. Magnuson, Director
Center for Limnology
UW-Madison

LIMNOLOGY NEWS

University of Wisconsin—Madison

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.



George Gallepp, editor
Linda Holthaus, production
manager

The Center Builds an Endowment

To strengthen its position as an international center for research and training in the aquatic sciences, the Center for Limnology began a funding drive in December 1983, to establish a \$900,000 endowment. Today, the fund has grown to more than 20 percent of the endowment goal, and the endowment's development council, led by Arthur Hasler, is optimistic about raising the remaining sum.

"The endowment's top priority is to provide half the support for a third professorship in the Center for Limnology," says the Center's Director Magnuson. "The Bassett Foundation's contribution [see adjacent article] gives our efforts there a big boost."

Funds from the endowment are already at work supporting the Center's research and teaching goals. In addition to the general fund, contributors have established the following separate funds:

—**The Anna Grant Birge Memorial Scholarship Fund.** Eugene Grant, the nephew of E.A. Birge, established the award in memory of Birge's daughter Anna. Since 1982 more than \$15,000 has been distributed to support the summer research of numerous graduate

students. Awards for 1987, totaling nearly \$4,000, were made to James Dowse, Mike Fullerton, Jay Nelson, Kenneth Parejko and Dan Schneider. Their areas of study include chemical and biological limnology of environments, ranging from small temporary forest ponds to Lake Michigan.

—**The Chancey Juday Limnological Data Fund.** Richard, Mary, Eugene "Tug" and Jean Juday recently established this fund in honor of Chancey Juday—their father and uncle. The fund will be used to establish a data management and archival system to preserve the valuable scientific records accumulated for Wisconsin lakes.

—**The Chase-Noland Scholarship in Limnology.** Wayland E. Noland, a professor of chemistry at the University of Minnesota and the son of Lowell Noland, established this fund in honor of his late mother (Ruth Chase Noland), and maternal grandfather (Wayland S. Chase). The scholarship will support the summer research of talented undergraduate students or graduate teaching assistants. The

recipient of the summer '87 award was John P. McCarty, a junior majoring in zoology. His research project addressed interactions between the littoral and pelagic zones of Lake Mendota.

—**The William V. Kaeser Visiting Scholar Fund.** This fund was established to honor William V. Kaeser, the architect of the UW-Madison's Laboratory of Limnology. The fund will allow selected scholars to share their expertise with staff and students at the Center for Limnology. Stephen Carpenter (Notre Dame University), recipient of the first William V. Kaeser Visiting Scholar Award, is spending this year at the Center for Limnology.

If you'd like to contribute to the endowment fund, please make your gift to the Center for Limnology Endowment Fund and mail to the University of Wisconsin Foundation (the official gift-receiving organization of the UW-Madison), 702 Langdon Street, Madison, WI 53706.

George Gallepp
College of Agriculture
and Life Sciences
UW-Madison

Bassett Foundation Gift Is the Key to New Professorship

In December, 1987, the Norman Bassett Foundation agreed to provide the Center for Limnology with five years of support for half the salary of a professor who will conduct research on the Madison lakes. The UW-Madison's College of Letters and Science will match the Bassett Foundation's gift.

"This grant allows us to get a person on board within the next year, and gives us five years to raise the money needed to endow the position permanently," says John Magnuson, the Center's director. "If we don't raise enough money in the next five years, the position will become a regular instructional position in the Department of Zoology. It's extremely important to us that we retain this as a research position."

A long-time resident of Madison, Norman Bassett founded Demco Library Supplies Inc., one of the country's three leading library suppliers. Bassett died in 1980. The philanthropic activities of the foundation he established reflect his avid interest in the arts and local civic causes.

F. Chandler Young, a member of the endowment development council and a former Associate Dean of the College of Letters and Science, was a close friend of Bassett's and is a member of the board of directors of the Norman Bassett Foundation. "Chan Young worked very hard in our behalf," says Magnuson.

"We would also like to thank the Norman Bassett Foundation, particularly Reed Coleman, the

president of the Foundation's board of directors," says Magnuson. "Many others helped get this key position. They include: Art Hasler; E. David Cronin, Dean of the College of Letters and Science; Robert Bock, Dean of the Graduate School; Robert Rennebohm, President of the University of Wisconsin Foundation, and former acting UW-Madison Chancellor Bernie Cohen.

"Jim Kitchell and I are certainly looking forward to working with a new colleague interested in studying the Madison lakes. We will be advertising the position this winter."

G.G.

Pennak Recalls His Start as a Limnologist



During my sophomore year at a Milwaukee high school, I was fortunate in having a biology teacher who "turned me on," and from that time I was convinced that I wanted a career in aquatic biology. The 1930s were Depression years, and it was difficult to earn and borrow enough to get through my undergraduate studies. I attended the Milwaukee Extension Division as a freshman and sophomore, and transferred to Madison for my junior and senior years. It was during the latter year that I first met Chancey Juday, when I took his courses in plankton organisms and limnology. My enthusiasm was such that I bought an old brass microscope, and on weekends I spent much of my time in my room observing aquatic organisms that I collected with a homemade plankton net.

When I finished my B.S. in zoology in 1934, however, I was depressed and without any means of support. I managed to get a job at a YMCA camp for the summer, and on one memorable day in August I received a letter from Juday asking me to be his research assistant for the 1934-35 academic year. I was, of course, absolutely ecstatic, for it meant that I would be able to work on a graduate degree. My job consisted of making qualitative and quantitative counts of an accumulation of zooplankton and phytoplankton samples taken from lakes in the Trout Lake area during previous years. I worked at a table in Juday's office. In those early graduate

months, Juday was remarkably helpful and patient with my efforts as a neophyte. In June of 1935 I received the M.S. in zoology, and that summer I worked as Juday's research assistant at Trout Lake. My roles at Trout Lake in the summers of 1935 to 1938 were varied, and Juday gave me increasing responsibilities in handling the plankton and bottom fauna programs.

After reading a brief paper in an obscure journal about the microzoans of sandy beach interstitial waters, I became interested in the possibilities of this kind of study for a dissertation. Although such work was removed from plankton and bottom fauna, Juday nevertheless gave his approval, and, indeed, he gave me free rein to collect and prepare my samples at many Trout Lake area waters.

In the 1935-36 academic year I continued with my plankton counting in Juday's office. Realizing that I needed teaching experience, I asked to be relieved of the plankton work beginning in September of 1936. He reluctantly agreed, but gave me his blessing and some generous words of praise. (He rarely gave compliments.) During 1936-37 and 1937-38, then, I was a teaching assistant in zoology, but at the same time, I continued to do some work for him, especially on his experimental supercentrifuge program.

I obtained the Ph.D. in June of 1938 and worked that summer at Trout Lake as a postdoctoral research assistant. Without a subsequent job, I was short-tempered and cross as an old bear, until one day late in July when I received a note from L.E. Noland. It said, "My dear Pennak: I have received a request from the Biology Department at the University of Colorado. They want an invertebrate zoologist on their faculty, especially a limnologist. I have accepted the position for you."

During my four years of close association with Professor Juday, I came to know him very well indeed. Although he was usually taciturn and quiet, there were many times when he was talkative and outgoing, and I cherish those conversations. From the standpoint of research philosophy, there are two items that he was insistent on passing on to me: (1) When you need help from other disciplines, don't hesitate to ask for it from your colleagues, whether they be chemists, microbiologists, geologists, physicists, engineers, or what-

ever; (2) When you are ready to publish, be sure you have ample data, *lots* of data, so you won't have to resort to mathematics to substantiate their truth and reliability.

Because 1938 was a post-Depression year, there were no research funds at the University of Colorado. I was extremely fortunate, however, in obtaining a grant for field and laboratory apparatus from the American Philosophical Society. The grant enabled me to begin a long series of investigations on high-altitude limnology, reservoir limnology, and various aspects of freshwater invertebrate biology.

In the summer of 1939 I was given gratis research facilities at the Woods Hole Oceanographic Institution, where I gathered enough data on intertidal sandy beach organisms for five papers—an extension of my Wisconsin work. From this modest beginning there has developed a whole area of marine and freshwater meiobenthic research.

At the beginning of my work at Colorado I naively resolved to keep abreast of limnological literature in general, in addition to the broad field of freshwater invertebrate biology. For a few years this was feasible, but with the subsequent increasing avalanche of research papers, it became impossible, and I have always spent too much time trying to keep track of too much.

Early on, I became convinced that "limnology" and "stream biology" are distinct disciplines, and accordingly I began teaching a stream biology course in 1946. I believe it was the first true stream biology course to be given anywhere. At that time, the literature of stream biology was negligible, but today it forms an increasingly huge segment of freshwater research.

I began work on *Fresh-water Invertebrates of the United States* in 1941, with a detailed 10-year schedule. It has amply fulfilled my personal mission of encouraging and increasing a wider interest in the biology of freshwater invertebrates. The third edition is now in preparation. The *Collegiate Dictionary of Zoology* (1964) was a spare-time project; it was well received and was judged a "Reference Book of the Year" by the American Library Association.

My academic life has otherwise been filled with the usual frequent seminars, committees without end, 57 graduate degree students, depart-

mental chairmanship (six years), five professional society presidential positions, Acting Graduate Dean, many editorial positions, National Research Council (eight years), travels, professional meetings, and many honors. Especially during the past 15 years, I have done a great deal of lake and stream consultation work for mining, engineering, and land development firms, and for various United States and foreign governments and private agencies, some 40 contracts in all.

Although I elected to take an early "retirement" in 1974, I have been allowed to retain a modest office-lab. Lately, however, I have been able to do more and more salmon and trout fishing.

Most of all, I have enjoyed events of the past 54 years hugely, especially my students and colleagues, as well as my many varied research interests.

Robert W. Pennak
University of Colorado
Boulder, Colorado

Little Rock *cont. from page 1*

plankton predators, seem to be disappearing. They are now absent or their numbers are very low in the acidified basin.

The initial acidification also affected benthic insects. One group of chironomids, the Tanytarsini, experienced a decline in the numbers emerging in the acidified basin.

Researchers don't yet know how the changes in algae growth or in the populations of zooplankton and benthic insects may affect other parts of the lake's biological community, including fish populations. The bass in the acidified basin, however, have shown signs of reduced growth, perhaps because of decreased food availability or the increased energy expenditure needed to find suitable nesting and feeding habitat.

Preliminary results also indicate that young-of-the-year perch from the acidified basin had more mercury in their body tissues. The connection between acidification and mercury in fish is not yet clear, but with additional funding from the DNR, the researchers are hoping to examine mercury cycling more closely.

Additional acid was added to the treated half of the lake last spring to bring the pH down to about 5.1. The researchers will observe changes over the next two years. The pH of the lake eventually will be lowered to 4.6, which is roughly the average pH of rain in the area.

One of the purposes of the Little Rock Lake Project is to determine how long it will be before lakes in northern Wisconsin are affected by acid rain. By dividing the total dose of acid added to Little Rock by the current annual dose now received by northern lakes, Center for Limnology researchers can estimate the time frame in which undamaged lakes are likely to be affected. The results from Little Rock will be applicable to many other lakes in northern Wisconsin, as well as other regions of the country.

Another task of the project is to distinguish natural fluctuations in lake acidity from the effects of acid rain. Before acidification the summer pH in Little Rock was about 6.2 and the early spring pH was about 5.3. The pH change in Little Rock represents a 10-fold increase in acidity in the spring. This large increase could be due to what is known as an "acid pulse"—a large influx of acid from snowmelt. Or the increase could result from the natural processes of decomposition that occur in all lakes over the winter. Preliminary data collected by Center for Limnology researchers indicate that the spring increase in acidity in this lake appears to be due primarily to natural causes rather than an "acid pulse."

When the study is completed the scientists will attempt to restore Little Rock to its original condition. This phase of the research may offer insights into how to "rehabilitate" lakes damaged by acid rain.

Annamarie Beckel
Center for Limnology
Trout Lake Station



The Trout Lake laboratory is about to double in size, with the 3,868 ft² addition (right) to the 1967 building (left). The addition, built with funds from the National Science Foundation, the Wisconsin Alumni Research Foundation and with the support of the University of Wisconsin, will house new analytical and experimental facilities as well as additional office space.

Juday "Children" Visit Madison During ASLO Meeting



Chancey Juday's grandson, Richard, daughter, Mary, and son, Richard, in Madison during June for the annual meeting of the American Society of Limnology and Oceanography.

They were children then—in 1926—when parents Chancey and Magdalen Juday loaded the kids and dog Teddy into the Model T and headed north from Madison across dirt roads for the first of many two-day treks to Trout Lake near Minocqua.

Richard and Mary Juday, now in their 70s, visited the UW-Madison campus recently. They came to attend the annual meeting of the American Society of Limnology and Oceanography (ASLO) that celebrated their father, Chancey Juday, a pioneer limnologist and ASLO's first president.

Their father was the quiet, taller half of the Birge and Juday duo which made UW-Madison the birthplace of limnology in North America.

Chancey Juday came to Madison in 1900 with a master's degree in science from Indiana University to work for Professor Edward A. Birge at the Wisconsin Geological and Natural History Survey. Birge later became university president.

Juday taught the first limnology course on the UW-Madison campus in 1909. After the Geological Survey fell on hard times in 1931, Birge arranged for Juday to become a professor of zoology. Juday also served as director of the Trout Lake Limnological Laboratory until 1942. He died in 1944 at age 73.

Richard and Mary Juday took time to recall their father and to

reflect upon those summers at Trout Lake and the birth of limnology in North America:

"We realized we were behind the times when we'd stop for a train and everybody else started up again and Pop had to get out and crank the Model T," said Richard, recalling journeys to Trout Lake. "That was two days of hard driving on rough roads—something you don't forget very easily."

Mary Juday now lives in Washington, D.C., retired from a position as a political analyst with the Department of Naval Intelligence. She received a doctorate in history from UW-Madison. She said she didn't recall her father ever trying to teach her about lakes, but "I used to go on field trips to see the lakes and to have the pleasure of the countryside—we just loved it."

Richard received his doctorate in chemistry from UW-Madison in 1943. He is now emeritus professor of chemistry at the University of Montana-Missoula.

An older son, Chancey Evans Juday of Garland, Texas, did not attend the ceremony.

Both Richard and Mary Juday said they were aware of the significance of the work going on at the north woods lab. "One of the things was the amount of mail that he got from all over the world, and exchanging scientific materials back and forth," as well as the number of

visiting scientists, said Mary.

She recalled a visit to Trout Lake by G. Evelyn Hutchinson, Yale University limnologist. "The lab was right at the state forest headquarters and there were a lot of lumberjacks around. They'd never seen a man wearing shorts before. When Dr. Hutchinson came in they were quite upset."

Richard said the fact that his father didn't have a doctorate frustrated his mother. "She used to needle him once in a while, but he'd say, 'Well, who would I take one from?' There was no one in the country who could examine him."

Later in his career, Juday received an honorary doctorate degree from Indiana University and the Leidy Medal from the Philadelphia Academy of Natural Sciences.

Juday supervised 13 doctoral students, and with Birge and their associates published more than 260 papers between 1924 and 1944.

Both Judays regretted a falling out between their mother and Birge following their father's death, which involved a lack of retirement benefits for all but the six years Juday was a full professor. In anger, Magdalen Juday shipped her husband's extensive library to Philadelphia.

"It's too bad things did come to a head," said Mary. "There were so many years when they were so close and had done so much together. We were like one big family."

"Birge didn't come to father's funeral," noted Richard. "But that's all water under the bridge."

Both Judays said they were pleased at the recognition given their father at the ASLO conference and at naming the Trout Lake Station dormitory, "Juday House."

Mary said she thought her father would be especially pleased with the "Chancey Juday Limnological Data Fund" recently established by UW-Madison's Center for Limnology. The fund will be used to modernize and upgrade the Center's data management capabilities.

"That was something I'm sure father would have been very thrilled, very supportive of because he felt it was so important to have detailed information—not just from here but from all over the world," she said.

Inga Brynildson
University News and
Information Service
UW-Madison

UPDATE

One reason for this newsletter is to help you keep up-to-date with old friends. If you've written a new book, changed jobs, received an impressive award, or had a new species of arthropod named in your honor, we'd like to tell others of your good fortune. If you have information for the newsletter, send it to: Limnology News, Center for Limnology, UW-Madison, Madison, WI 53706.

People in the News

Sol Burstein, member of the Center for Limnology Endowment Development Council, retired as vice chairman of the board of Wisconsin Electric Power Company.

David Frey [Ph.D. 1940 (Juday)] has been elected President of Societas Internationalis Limnologiae (SIL).

Arthur Hasler, who turned 80 in January, was recognized by: (1) the International Ethological Conference, held in Madison last summer, for his contributions to the field; (2) ASLO, at a Symposium on Experimental Limnology and Oceanography in his honor, during its meetings in Madison last summer; (3) the Mendota-Monona Lake Property Owners Association as its Citizen of the Year.

John Hunter [M.S. 1958, Ph.D. 1962 (Hasler)] is the new President of the American Institute of Fishery Research Biologists.

Robert Olson [Ph.D. candidate (Kitchell)] and **Christofer Boggs** [M.S. 1980, Ph.D. 1984 (Kitchell)] have received the W.F. Thomson Award from the American Institute of Fisheries Research Biologists for the best student paper in fisheries journals in 1986. Their paper, "Apex Predation by Yellowfin Tuna (*Thunnus albacares*): Independent Estimates from Gastric Evacuation and Stomach Contents, Bioenergetics, and Cesium Concentrations," appeared in the Canadian Journal of Fisheries and Aquatic Sciences 43(9):1760-1775.

Irv Stein, member of the Center for Limnology Endowment Development Council, has been selected Realtor of the Year for 1987 by the Greater Madison Board of Realtors.

Don Stewart [Ph.D. 1980 (Kitchell)] has received the American Fisheries Society award as the principal author of "the most significant paper published in *Transactions of the American Fisheries Society* during 1986." The paper, "Dynamics of Consumption and Food Conversion by Lake Michigan Alewives: An Energetics Modeling Synthesis" (Trans. Am. Fish. Soc. 115(5):643-661), was coauthored by Fred Binkowski.

Recent Degrees

Xi He. (M.S. 1986, Kitchell). Xi studied minnow population and behavioral responses to exploitation and piscivory. Interactions among minnow species and predator-avoidance responses profoundly influenced distribution and the intensity of zooplanktivory. His doctorate will center on predator-prey interactions in small bog lakes.

Paul Jacobson. (M.S. 1987, Magnuson and Clarence Clay). Acoustic techniques for remote sensing of fishes are being developed by Paul to efficiently study the distribution, abundance and size of pelagic fishes. His master's degree focused on Trout Lake cisco populations and will be extended to doctoral research in Mendota and Trout Lake.

Mike Jech. (M.S. 1986, Magnuson and Clarence Clay). Mike is part of a research team studying oceanic fronts using sonar. This research on the north wall of the Gulf Stream has developed from a background of thermal ecology (Magnuson), and acoustics (Clay). The master's described the physical oceanography of the front. His Ph.D. will relate the fine structures of physical oceanography to the distribution of acoustic scatterers.

Dan Schneider. (M.S. 1987, Magnuson). Dan works closely with Dr. Tom Frost on the community ecology of temporary ponds near the Trout Lake Station. His master's examined the importance of the duration a pond contained water on the development of species interactions. He continues his Ph.D. on the same topic.

In Print

BREAKING NEW WATERS: A CENTURY OF LIMNOLOGY AT THE UNIVERSITY OF WISCONSIN. We highlighted this book in the first issue of "Limnology News." The book covers Wisconsin limnology from Birge's arrival in Madison in 1875 until Hasler's retirement in 1978. The first two chapters deal with the eras of Birge and Juday (chapter 1) and Hasler (chapter 2). The chapters are written from the perspective of the students and associates who worked with those scientists. The last chapter compares the outlook, approach and achievements of Birge and Juday with those of Hasler.

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Where are they now?

William Schmitz, Ph.D. 1958
(Hasler)

**Department of Biological Sciences
University of Wisconsin
Marathon County Center
518 South 7th Avenue
Wausau, WI 54401**

A professor teaching animal biology, human anatomy and the conservation of aquatic resources, Bill monitors several winterkill lakes and a meromictic lake.

Charles Holt, M.S. 1962 (Hasler)
**H.T. Peters Aquatics Lab
Bemidji State University
Bemidji, MN 56601**

Charles is Professor of Biology and Coordinator of the Aquatic Biology Program. He teaches limnology, aquatic vascular plants, ichthyology, fisheries biology and biology of polluted waters. Research projects include the restoration of a winterkill lake near the Canadian border and a water quality study of seven lakes in the Bemidji area.

Andrew Lenz, M.S. 1965 (Hasler)
**144 N. Leverett Road
Leverett, MA 01054**

Nick is an environmental artist, maker of one of a kind fake Chinese pots, internationally nefarious bonsai grower, locally nefarious lay-preacher, and has to his discredit over 35 non-scientific publications. He is also rumored to grow the rare and exquisite Leverett Lime Discus fish.

Thomas Wissing, Ph.D. 1969 (Hasler)
**Department of Zoology
Miami University
Oxford, OH 45056**

Tom is a professor and the Assistant Chair of his department. He works on the feeding ecology of fishes and the pharmacotropic dynamics of sediment

pollutants in fishes. He is Science Editor of *Fisheries* and Editor-in-Chief of *The Ohio Journal of Science*.

Kenneth Mills, M.S. 1972 (Magnuson)
**Department of Fisheries and Oceans
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Ken is a research scientist conducting fish population research at the Experimental Lakes Area, northwestern Ontario. Research is primarily on acidification, but also cadmium, experimental exploitation, eutrophication and food web manipulation.

Stephen Brandt, Ph.D. 1978
(Magnuson)
**University of Maryland
Chesapeake Biological Laboratory
P.O. Box 38
Solomons, MD 20688**

An associate professor, Steve is studying species interactions and trophic dynamics and their relationship to thermal structure in Lake Ontario, Lake Michigan, the Western North Atlantic Ocean and Chesapeake Bay. He uses acoustics to assess fish abundances and behavior and assess stocks of pelagic planktivores in Lake Michigan and striped bass in Chesapeake Bay.

William Tonn, M.S. 1980, Ph.D. 1983
(Magnuson)
**Department of Zoology
University of Alberta
Edmonton, Alberta
Canada T6G 2E9**

Bill is Assistant Professor of Zoology. In addition to teaching, he is examining population regulation of crucian carp in Finland, fish assemblages in central Alberta's Athabasca River drainage

basin, and prey choice among piscivorous yellow and Eurasian perch. He is also beginning a research project in the Mackenzie River delta area of northern Canada.

James A. Rice, M.S. 1981, Ph.D. 1985
(Kitchell)
**Department of Zoology
Box 7617
North Carolina State University
Raleigh, NC 27695-7617**

An assistant professor and Extension fisheries specialist, Jim is studying size-dependent recruitment mechanisms of larval and juvenile fishes, and the effects of piscivory on reservoir fish communities. Jim provides county Extension agents and landowners with training and information on warmwater fisheries and aquaculture.

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