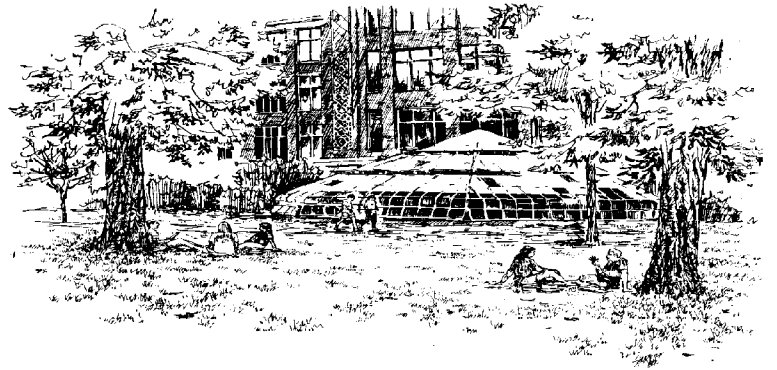


Department of Biology

Gnat's Eye Gnus

Alumni Newsletter
1999

Chair's Corner

A Message from Julian Adams

Greetings from the Department of Biology! This year, like many of the previous ones, has been a year of great change for the Department as well as the University. At the University level, the most significant event during the last year was the formation of a special Presidential Commission charged with nurturing the Life Sciences at the University (see box page 7). As the Faculty and Graduate Students in Biology encompass just about all fields of endeavor within the basic Life Sciences, we have viewed this initiative with great interest. At the College level, we welcome a new Dean, Shirley Neuman, to the University of Michigan. Dean Neuman comes to us from the University of British Columbia, where she was the Dean of Arts.

At the Department level it has been very gratifying for me to see the Department continue to grow in so many different ways. As last year we have had an excellent recruiting year. We are delighted to have Dr. Gisela Wilson join us as an Assistant Professor from the University of Wisconsin, where she was a research scientist. Dr. Wilson is an animal physiologist working with the model organism, the fruit fly *Drosophila*, on problems of great interest and relevance to our neurobiologists. She will be an important bridge between our neurobiologists - and our *Drosophila* group - who are developmental biologists working in the physiology and molecular neurobiology. I am also delighted to report that Dr. Daniel Klionsky has accepted our offer of a senior position in Cell Biology, and will be joining us next year from the University of California at Davis, together with a large group of his graduate students, postdoctoral fellows and technicians. Dr. Klionsky has established himself as a world leader in the molecular cell biology of yeast. He will provide impor-

tant leadership for our young and burgeoning group on cell biology. He is also known at UC Davis as an outstanding and innovative undergraduate teacher. Next year's GEG will feature his research program and teaching philosophy in more detail.

Drs. Wilson and Klionsky will join a faculty whose research programs are humming with activity. The Faculty have been unusually successful in obtaining research grants from the best and most competitive Federal agencies over the last two years, such that our research budget is now over \$5,000,000 a year, and in recent years has been growing at a rate of 25-35%/year. The beneficial effects of this improved level of research funding are manifold, and trickle down to the undergraduates allowing for increased undergraduate research opportunities. During the last academic year, 230 undergraduates carried out undergraduate research in the Department - a 28% increase over two years. We are also becoming much more competitive in recruiting top graduate students. This year our acceptance rate improved by 37% compared to the previous year, and by 79% compared to that two years ago!

This past academic year we entered the penultimate phase in our program to redesign the Biology concentration program - one of the largest in the College. The new one-semester five-credit introductory Biology course for concentrators (Biology 162) was taught for the first time in the Winter Semester (See article on page 7). This coming year we will enter the final phase, as we teach an expanded and extensively revised medley of 200-level courses. An added advantage of these changes is that we will be in a better position to accommodate our top students who "pre-classify" out of introductory biology by achieving high scores on the Biology AP examination.

Under the new program these students will have the option to take several core 200-level Biology courses in their first year at the UM.

Although the Department has been improving in so many ways over the last few years, there is one area in which we, lamentably, have not improved, and that concerns the physical state of the Natural Science Building. We underwent a partial renovation in the late 80's - as many of you know - but still major parts of the building remain unchanged since the second world war, and in some areas, basic services such as air conditioning, and even the roof are failing. The University has promised us that we are a top priority in the next phase of building renovations for central campus, but the cost will be several millions of dollars, and it appears that that will only occur a number of years from now. There is one part of the building however, where a relatively small investment can make a

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Faculty Highlights

Departmental notes and news

Julian Adams continued to serve as Associate Editor of *Molecular Biology and Evolution* and *Genetica*. Dr. Adams also served on the University's Life Sciences Commission.

Marc Ammerlaan received funds from the LS&A Dean's Office for development of Biology 162. (See *Gnat's Eye Gnus Alumni Newsletter '98*, p. 5).

William R. Anderson completed his term as Director of the University of Michigan Herbarium.

Raymond Barbehenn received funds from NSF in support of his project "The Gut as Arbiter of Oxidative Stress in Insect Herbivores." Dr. Barbehenn was also awarded a grant from the U.S. Department of Agriculture to study "Effects of Elevated Atmospheric CO₂ on Grasses and Their Insect Herbivores."

James Bardwell served on the University's Life Science Commission. He is the recipient of an LS&A Excellence in Research Award.

Robert Bender was presented an Outstanding Teaching Award from the Panhellenic Association of the University of Michigan. Dr. Bender received a 1999 LS&A Excellence in Education Award.

Rolf Bodmer participated in an NIH Study Section (HED-2). Dr. Bodmer has also received a 1999 LS&A Excellence in Research Award. He is the new group leader for MCDB.

John B. Burch received a *Lifetime Achievement Award* in March from the Freshwater Mollusk Conservation Society, and was the Plenary Lecturer at The First Symposium of the Freshwater Mollusk Conservation Society in Chattanooga, Tennessee. Additionally, The Malacological Society of the Philippines endowed a student scholarship award named the "John B. Burch Student Scholarship."

Robyn J. Burnham served as Associate Editor for the publication *Palaios*. Dr. Burnham also received "One Month Follow Up" and "Senior Scholar Fellowship" grants from the Fullbright Commission - Ecuador.

Steven Clark served on the USDA Grant Panel for Plant Growth and Development.

Lisa M. Curran continues to serve on the Tropical Forest Foundation, Washington DC and has received funding from the Charles A. and Anne Morrow Lindbergh Foundation for her project "Succession in Managed Forests."

Robert Denver served as Session Chair at The Symposium on Metamorphosis, Annual Meeting of the European Society of Comparative Endocrinology, Nijmegen, The Netherlands.

Ronald Ellis received the Basil O'Connor Scholar Award and the National Science Foundation Career Scholar Award. Dr. Ellis chaired the first session of the 1998 Midwest Worm Meeting at the University of Chicago, Chicago IL.

Deborah Goldberg served as Associate Editor of the *Journal of Vegetation Science*. She also completed a term as EEOP group leader. Dr. Goldberg also received an NSF grant for her project entitled "Competitive Ability of Clonal Plants: The Roles of Clonal Integration and Ramet Aggregation in Structuring Plant Communities."

William Fink heads the Neodat II Project. It is a source of information about Neotropical Fishes. The project is a major source for the ichthyology community and beyond, on an international scale. Please see <http://www.neodat.org>. Dr. Fink also received a 1999 LS&A Excellence in Education Award.

Robert Fogel continues to update his web page *Fun Facts about Fungi*.

Michael Frohlich received a three-year grant from NSF systematic biology for his project entitled "Studies of *Floricaula*/LEAFY Gene Phylogeny in Basal Angiosperms and Spore Bearing Plants."

Jesse Hay received NIH funding for his project entitled "Protein Interactions Controlling ER/Golgi Transport."

Brian Hazlett served as Associate Editor of *Marine Behavior and Physiology*. Dr. Hazlett is the new group leader for the EEOB interest group.

Richard Hume began a 3 year term as the Director of the Graduate Neuroscience Program. Dr. Hume also received the Michigan Association of Governing Board's Faculty Recognition Award.

Santha Jeyabalan received the Excellence in Education Award. She has also received recognition as a Computerworld Smithsonian Program Laureate for her project, "Virtual Fly Lab." The University recently held an awards ceremony and reception honoring Dr. Jeyabalan and 13 others whose projects were recognized and will be a part of the Smithsonian Institution's Permanent Research Collection on Information Technology.

George Kling received funding for "The Arctic LTER Project: The Future Characteristics of Arctic Communities, Ecosystems and Landscapes." Dr. Kling was also awarded a Faculty Recognition Award and served on the University's Life Sciences Commission.

John Kuwada received NIH funding in support of his project entitled "Analysis of Semaphorin's Function in Axon Guidance." He serves on the Editorial Boards of *Molecular and Cellular Neuroscience*,



New Faculty - Gisela Wilson

Dr. Gisela Wilson comes to us from the Laboratory of Genetics at the University of Wisconsin, where she was an Assistant Scientist. After receiving her Ph.D. from the University of Wisconsin-Madison, she was an NIH postdoctoral fellow at Yale University. Dr. Wilson focuses on the biochemical mechanisms that govern the flexible signaling properties of individual neurons. This flexibility underlies an organism's ability to choose between different behaviors at different times. Dr. Wilson will be teaching courses in animal physiology.

and *inSight*. Dr. Kuwada was promoted to Professor, effective September 1, 1999.

Margaret Liu received funding from AHA which resulted in her appointment as Research Investigator. This three-year project will study the "Role of the Zinc-finger Homeodomain Protein-1 in Heart Development." She has been a research fellow in Rolf Bodmer's lab.

Janine Maddock received a 1999 LS&A Excellence in Education Award.

Philip Myers received funds from the Michigan Dept. of Natural Resources for his work entitled "Boreal Mammals In Michigan," from Smithsonian for his project entitled "Revision of the Genus *Akodon*" and from the Homeland Foundation for his project entitled "The Animal Diversity Web."

Barry Oconnor was elected officer in Section A, Systematics, Morphology & Evolution, Entomological Society of America. He was promoted to Professor and Curator, effective September 1, 1999.

Diarmaid Ó Foighil served as Associate Editor of *Malacological Review*.

Laura Olsen currently serves as Chair for the Midwest Section of the Society of Plant Physiologists. Dr. Olsen was promoted to Associate Professor, with tenure, effective September 1, 1999.

Marcy Osgood received a 1999 LS&A Excellence in Education Award.

Robert Payne served as Associate Editor of the publication *Ibis*.

Eran Pichersky continued to serve as Associate Chair for Research and Facilities.

John Schiefelbein assumed the position of Associate Chair for Curriculum and served as Associate Editor of the journal *Genes to Cells*.

Gerald Smith, in addition to serving as Director of the Museum of Zoology, is now the Director of the University Herbarium.

Kathryn Tosney continues to serve as Associate Editor of the publication *Experimental Neurology*.

John Vandermeer served as Associate Editor of *The Centennial Review* and *Agroforestry Systems*.

Mark Wilson received a 1999 LS&A Excellence in Research Award.

Michael Wynne presented the "Distinguished Lecture" at the annual meeting of the Northeast Algal Society in Plymouth, Massachusetts in April of 1998.

Charles Yocum served as MCDB interest group leader. He was selected to serve a three year term on the College of Literature, Science and the Arts Executive Committee beginning this fall.



Biology Faculty Recently Funded Projects

Adams	MOD	Molecular Epidemiology of Congenital Malformations
Barbehenn	NSF	The Gut as Arbiter of Oxidative Stress in Insect Herbivores
	USDA	Effects of Elevated Atmospheric CO2 on Grasses and Their Insect Herbivores
Bender	NIH	Regulation of Microbial Nitrogen Metabolism
Bodmer	AHA	Role of Zinc-finger Homeodomain Protein-1 in Heart Development
Cadigan	NIH	Tissue Specificity of Wingless Signalling in <i>Drosophila</i>
Clark	NSF	Regulation of Shoot Meristem Development
	DOE	CLV Signaling in Meristem Development
Denver	NSF	Neuroendocrine Control of Amphibian Metamorphosis
Duan	MDRTC	Molecular Analysis of Insulin-like Growth Factor-I Regulated Gene Expression in Vascular Smooth Muscle Cells
	AHA	Role of Protein Kinase C in the Insulin-like Growth Factor-I Signaling in Vascular Smooth Muscles Cells
Ellis	NSF	The Evolution and Genetic Regulation of Sexual Fate in Nematodes
Goldberg	NSF	Collaborative Research: Competitive Ability of Clonal Plants The Roles of Integration and Ramet Agregation in Structuring Plant Communities.
		Protein Interactions Controlling ER/Golgi Transport
Hay	NIH	Analysis of Semaphorin's Function in Axon Guidance
Kuwada	NIH	Structure Activity Relationship of a Conserved Cardioinhibitory Peptide
Nichols	AHA	Comparisons of Vocalizations within Gaviidae, with Reference to Phylogenetic Constraints and Ecological Influences
Payne	Loon Fund	Biosynthesis of Floral Scent Benzenoid Esters
		Characterization of Arabidopsis Thaliana Genes Encoding Acyltransferases and Methyltransferases that are Involved in the Synthesis of Important Secondary Metabolites
Pichersky	NSF	Post-Agricultural Regeneration of Tropical Rain Forest in El Peten, Guatemala, and Atlantic Coast of Nicaragua
	Novartis	Inorganic Biochemistry of Photosynthetic Oxygen Evolution
Vandermeer	NSF	
Yocum	USDA	

FACULTY PROFILES - Laura J. Olsen George W. Kling

ASSOCIATE PROFESSOR LAURA J. OLSEN

by Nancy Ross-Flanigan

Anyone who's spent time around a university knows that it's not unusual for students to drop by a professor's office to talk about their test scores or to get help with confusing concepts. What sets Professor Laura Olsen apart is that students also stop in to discuss their dogs — and hers.

Professor Olsen uses one of her two Dalmatians, Haley, as an icebreaker in her Introductory Biology course, bringing the dog to the second day of class to help with a simple demonstration of the scientific method.

The students "just really enjoy that," says Professor Olsen. "They all remember my dog's name and ask about my dog, and I hear about their dogs for the rest of the semester." The canine connection also helps shy students overcome their nervousness about coming in for extra help.

"They'll come in after an exam, and they don't really know what to say, so we start talking about my dogs," says Professor Olsen. She even keeps pictures of Haley



and Zoe around her office — not just because she dotes on the dogs, but because they're such good conversation starters.

The doggie demo is just one example of how Professor Olsen connects with students in a course with enrollments as high as 350 per section. In addition to making sure lectures are organized and easy to fol-

low, she makes an effort to keep students engaged, ever mindful of how easily their attention can wander.

"Their attention span in a lecture is about 20 minutes, so you have to kind of change gears in the middle for a little while to get everybody back again," Professor Olsen says. "You can do that with jokes or demonstrations or special examples, and especially in the intro class, I try to use those. Enthusiasm works well, too. If I'm having fun, they're more likely to pay attention."

Some professors' lectures on milestones in the history of biology might provide students with a good time to catch up on their sleep. But Professor Olsen brings the topic to life by asking who was President at the time and what else was going on in the world.

"There's always at least one history major or history buff in the class who can talk about that," she says. The discussion that follows gives students insights beyond dry dates and names. "If I can get them to think that during the Civil War era, this guy was doing a really disgusting experiment, and he was doing it without any gloves, that gives them a better feel for it than just saying that in the 1860s, Friedrich Miescher was studying the chemical composition of cell nuclei. They may not put it all together, but at least for that moment they can imagine what it was like to do science back then."

Some of Olsen's teaching ideas come from workshops she has attended, both at the U-M and off campus. And most require nothing more costly or sophisticated than a pack of 3x5 index cards.

In her smaller Cell Biology classes, she sometimes hands cards out toward the end of a lecture and asks students to stop and answer a few questions, such as: "What was the most confusing thing about today's lecture?" or "What was the main point of today's lecture?"

"If you collect 40 of those, you find out real quick whether your lecture was successful or not," says Professor Olsen. "If everybody says, 'I have no idea what you were talking about,' then at the next lecture I can explain it right away and get it straightened out."

The exercise helps Professor Olsen hone her teaching skills, but it also does the students some good, she believes.

"Just having them stop and think at the end of the lecture — to take that extra five-minute review and ask 'What was it she said anyway?' or to realize they have a big blank in their notes — I think that helps with the learning process itself."

In addition to classroom teaching, Professor Olsen is an active and effective advisor and mentor for undergraduates, working with about 100 students per year. It's not unusual for students seeking a concentration advisor to ask for her by name, either because they took her Introductory Biology course or because they've heard from other students how approachable and attentive she is.

"A lot of times you can catch a student at just the right time and make a difference," says Professor Olsen. And she has. She still gets e-mail from one student who was considering dropping out of school after getting discouraging grades on her first round of exams. With Professor Olsen's encouragement, the student improved her grades — not just in biology, but also in organic chemistry. She stayed at Michigan and has been "thrilled" with the decision.

Undergrads doing research in Professor Olsen's lab get plenty of personal attention, too, as do her four graduate students. But for all her attention to teaching, advising and mentoring, Professor Olsen also manages to do first-rate research.

Her subjects are peroxisomes, organelles that protect cells from certain toxins and participate in a number of important metabolic pathways. Just how essential are they?

"The simplest way to put it is, without peroxisomes, organisms can't live," explains Professor Olsen. Babies born with Zellweger's syndrome — a genetic condition characterized by the absence of liver peroxisomes — die within a few months. Other diseases caused by defective or mistargeted peroxisomal enzymes result in severe metabolic and neurological abnormalities and are fatal in later childhood or adolescence. Plants, too, can't live beyond early seedling stages without peroxisomes.

Because the peroxisomes of all eukaryotes share many characteristics, studying them in plants or yeasts, for example, can yield results that may eventually have applications to humans. While a number of

researchers around the world work on human and yeast peroxisomes, few plant cell biologists concentrate on them. Having done her doctoral research on other plant organelles — chloroplasts — Professor Olsen found peroxisomes an intriguing area of study when she began setting up her own lab at the U-M in 1993. She focuses on protein transport in peroxisomes, again taking a different tack from the rest of the peroxisome research community, which tends to focus on genetics.

Understanding protein transport in cells is interesting from a basic biological standpoint, but also could prove useful in genetically engineering crop plants. Further, it could lead to methods of investigating the mistargeting of peroxisomal proteins, one cause of peroxisome-related disorders in humans.

The first step in Professor Olsen's work was to develop an *in vitro* assay to study the process, a delicate and professionally risky undertaking that consumed several years.

"It made me nervous, because in essence I was banking my whole career on developing this *in vitro* assay," Professor Olsen recalls. "I knew that it was possible, because I had worked with *in vitro* assays in other systems. But whether I could get it to work, I wasn't sure."

She did, and the effort paid off by laying the foundation for further work. Using the assay, Professor Olsen and her students found that "molecular chaperones" are involved in the transport process.

"Molecular chaperones are just what they sound like," she explains. "They kind of escort a protein to make sure it doesn't get in trouble and it gets to the right place." As in other organellar systems, the heat shock protein hsp70 is one peroxisomal protein chaperone, the researchers found. But they also found the first evidence in any system that another heat shock protein, hsp90, is involved in protein targeting.

A second major step was cloning a receptor that initiates the process of getting proteins into peroxisomes. "It has now been cloned by several other people, so it's not amazing, except that we did happen, luckily, to do it first," says Professor Olsen. "And that gave us some tools that are really important."

With the assay and tools in hand, Professor Olsen's lab is fully equipped to start exploring the transport process in more detail.

"We want to know how the different components come together, who are the

players and where do they play? Do they play only outside in the cytoplasm, or do some of them get into the peroxisomes? Which ones get in? Which ones don't we know about yet?" she asks. "And we also want to know about the energy required for the process. Nothing's cheap — it requires energy, so where is the energy required, and what kind of energy is required?"

While the questions are tightly focused, answering them may lead to insights with broad applications.

"As I tell my students, this is the 'Age of Biology,'" says Professor Olsen. "We are facing an explosion of information and opportunity. I believe that my work with peroxisomes will contribute to our understanding of basic cell biological processes, but I also can't ignore the potential biomedical and agricultural applications. This is an exciting time to be a biologist."

ASSOCIATE PROFESSOR GEORGE W. KLING

by Nancy Ross-Flanigan

Whether he's studying sediments in an East African lake, bacterial activity in Alaska or watersheds in Michigan, Professor George Kling has one main mission.

"What I'm interested in is how different elements — such as carbon, nitrogen and phosphorus — move through the biosphere, how they are transformed and how they relate to today's environmental problems, such as acid rain, eutrophication and global change. Almost all of the major environmental problems that we are facing — and have faced and will face — are related in part to the cycling of these elements," explains Professor Kling. "A recent recipient of a University Faculty Recognition Award, Professor Kling addresses these questions through studies of trophic interactions, food webs and the cycling of greenhouse gases in arctic tundra and tropical and temperate lakes.

Cycles of elements such as carbon seem simple at face value. Any high school biology student who's been paying attention in class can draw the familiar carbon cycle diagram. In the simplest schematic, green plants fix carbon dioxide from the atmosphere, producing reduced carbon compounds and liberating oxygen. Soil microbes take up the reduced carbon, oxidize it and release carbon dioxide, which travels up through the soil into the atmosphere, completing the cycle. It's all part of what Pro-

fessor Kling refers to as "the giant reduction-oxidation battlefield that we call life."

But tidy diagrams don't show the whole picture. Something — a whole lot of something — is missing.

"We know that we put about seven billion tons of carbon into the atmosphere every year," says Professor Kling. "Five billion of that comes from burning fossil fuels, and another two billion comes from land use changes — cutting down forests, turning them into agricultural fields and so forth. At the same time, we know that the ocean takes up about two billion tons per year, and the total amount of carbon dioxide in the atmosphere increases by about



three billion tons a year, adding up to only five billion tons. We put in seven billion, and we can only find five billion. That leaves two billion tons of carbon a year that we can't account for. It's going somewhere, and although we have some ideas, we really don't know where it's going."

The dilemma of the missing carbon illustrates just how poorly the global carbon cycle is understood. "And if we don't understand it at this basic level, we're not going to be able to make predictions about what will happen in the future when things are changed," says Professor Kling.

Even guessing at where carbon goes is impossible without also understanding nitrogen and phosphorus cycles. That's because all organisms require specific ratios of the three elements. The amount of carbon dioxide that a tree can take up, for example, is limited by the amount of nitrogen and phosphorus available to it.

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**ASSOCIATE PROFESSOR
GEORGE W. KLING (continued)**

“My research always relates back to these three elements, because whatever organisms do is constrained by their ratios. If we can understand where the carbon-nitrogen-phosphorus is going, by what pathways, and how fast it goes from one place to the next, then we’ll be able to make predictions about what will happen in a changed environment. If we don’t know those things, we can still make predictions, but we are really guessing.”

In the arctic research, Professor Kling and colleagues have discovered one previously unknown carbon pathway. Just as in the standard carbon cycle diagram, arctic plants take in carbon dioxide and produce reduced carbon compounds that travel down to their roots and into the soil, where they are taken up by microbes. The microbes and the roots themselves give off carbon dioxide, which dissolves in soil water. But instead of moving directly back into the atmosphere, the dissolved carbon dioxide travels along with the soil water into rivers and lakes. Because the lakes already are saturated with carbon dioxide, any additional CO₂ is released into the atmosphere from the lakes.

In tallying the worldwide carbon balance, scientists had considered the arctic to be a “sink” — a place where more carbon is stored than released. “But we were never adding back all of the carbon dioxide that comes out of the lakes,” he explains. “When you add that back, the arctic turns out to be 20 percent less of a sink than we thought.” It also turns out that the pathway isn’t found only in the arctic. It also operates in the tropical and temperate zones.

Identifying pathways is only one step toward understanding ecosystems. Professor Kling and his colleagues also need to learn which pathways are most important in controlling nutrient cycles and how these processes respond to natural or human-imposed change. The better researchers understand these interactions, the more accurately they can predict what will happen in the future. And to make predictions on a global scale, they must understand the eccentricities of Earth’s many varied environments.

To sum up, “we’re looking at element cycles on land and in water — in the arctic, in the temperate zone and in the tropics. Then, given the information from these

different environments, we’re trying to build models that will allow us to predict the general response of the Earth to environmental change,” explains Professor Kling.

Making predictions leads to one fundamental question: Why worry about environmental changes? Hasn’t change been a constant in Earth’s history?

Yes, says Professor Kling. But something is different now. Take carbon dioxide for example. Estimates are that human activity is likely to more than double the concentration of carbon dioxide in the atmosphere within the next 50 years, from



370 parts per million to 750 parts per million. But samples of gases trapped in Antarctic ice as well as the geologic record over the past 500 million years show that atmospheric CO₂ concentrations have been as low as 200 parts per million and as high as 6,000 parts per million. So what’s the big deal about 750 parts per million?

“The answer is that the rate at which we’re changing the CO₂ is faster than anything we have experienced on Earth before. The natural biota on Earth have never been exposed to such rapid changes. Most organisms don’t have the mechanisms to adapt to environmental conditions that change so dramatically. There are exceptions, like bacteria. But for a lot of organisms, we just don’t know how this very rapid change in climate — which is what the change in CO₂ amounts to — will affect them.”

While much of his work involves looking far into the future, one project called for quick action. But even when it’s clear what must be done, convincing others to

follow that advice and finding the funds to put recommendations into place can be a frustrating, drawn-out process, Professor Kling has learned.

Since 1986, he has been part of an international team studying two lakes in East Africa that contain dangerously high levels of carbon dioxide. The gas seeps into the lake bottoms from deep within the Earth. Top layers of water keep the gas trapped, just as the cork of a champagne bottle keeps gas dissolved in champagne. When something disturbs the lake surface — heavy winds or a landslide, for example — the

effect is like popping a cork. Gas from the lake bubbles up and spews into the atmosphere, so upsetting the balance between oxygen and carbon dioxide that nearby people and animals suffocate. This happened at Lake Monoun in 1984 and at Lake Nyos in 1986, resulting in the loss of some 1,800 lives. Since then, gas levels have been steadily rising, and along with them the danger of deadly gas releases. The situation is even more critical at Lake Nyos, where a violent gas release could burst a weak dam at the lake’s outlet, resulting in a flood that could affect as many as 10,000 people in the floodplain below the lake.

In 1990, scientists studying the lakes came up with a plan for gradually pumping out the excess CO₂. Field tests in the early 1990s showed that the method would work. “Since then, it’s been a question of getting enough money” to carry out the plan, says Professor Kling. Recently, enough funding to get the project started has come from the U.S. Office of Foreign Disaster Assis-

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New Course Gets Good Marks

Students are praising the new introductory biology course that covers key concepts and offers extra time for discussion. Biology 162 replaces the Biology 152/154 sequence, a one-year survey course that students were required to take before moving on to more specialized, intermediate-level classes. Because students often waited until their sophomore year to enroll in Bio 152/154, they were juniors or seniors before they got to the heart of their Biology coursework.

Now, Biology concentrators start with Bio 162, a course that introduces the major ideas in cell and molecular biology, genetics, evolution and ecology. They can then choose among 200-level courses that focus on different aspects of plant and animal organismal biology. Prof. John Schiefelbein (Associate Chair for Curriculum), Dr. Marc Ammerlaan, and Ms. Chris Psujek made a concentrated effort to let advisors know that freshmen were welcome in the course. The result: a 10% increase in freshman enrollment at the introductory level.

Although students have not yet passed through the full sequence, initial feedback is positive. The first crop of Bio 162 “graduates,” who are moving into intermediate classes this fall, gave the new course better evaluations than students gave the Bio 152/154 sequence. Student response to the statement “Overall this course was an excellent course” averaged 3.93 for Bio 162, compared to 3.62 and 3.67 for Biology 152 and 154 respectively. (The scale was from 1-5, with 5 representing “strongly agree”). Compared to courses of similar size and level in LS&A, Bio 162 ranked in the top quarter by this measure, whereas Bio 152 & 154 were at about the 50th percentile.

One major difference between Bio 162 and Bio 152/154 is that the new course includes a discussion section, giving students a regular time to review material with their GSI. Activities in the discussion section approach lecture topics from a different angle, which is helpful to students who don’t grasp some concepts the first time around. GSIs who taught under both the old and new

system say students are asking more and better questions. Although a number of students commented that the discussion involved extra work, 72% found it helpful in mastering the lecture material.

Better integration of lecture and lab is a challenge with Bio 162, as it was for the Bio 152/154 sequence. While 60 percent of students agreed that the lab was valuable, most students seemed to view the lab as a completely separate, less important, part of the course, says Prof. Michael Martin. Countering that perception will take more than just tinkering with lab content. Lecturers will need to work harder at explaining how specific lab exercises relate to the ideas and concepts they present in their lectures, Prof. Martin says.

It’s too soon to know how well Bio 162 prepares students for the rest of their biology classes, but answers will come soon from a survey of upper level students who started with Bio 162. Professors teaching the higher-level classes will be queried to see if students arriving in their classes are more knowledgeable than before.

The Life Sciences Initiative at the University of Michigan

“Life sciences are in a period of remarkable growth and discovery, as well as increased public interest, benefit, and financial support. The University must be prepared to participate fully and preeminently in the exploration of this extraordinary advance of knowledge. ... [W]e must decide how to become one of the leading academic centers for the study and application of the life sciences.”

With these words, the President of the University of Michigan, Lee Bollinger, introduced the charge to the newly formed “Life Sciences Commission” in May 1998. The Commission, comprised of 19 life scientists from throughout the University, including three from the department of Biology, Julian Adams, Jim Bardwell, and George Kling, met over the next 8 months to formulate a plan of action and to respond to the charge. The final report of the commission (available on the world wide web at <http://www.umich.edu/pres/LifeSciencesReport/>) identified five areas of high priority on which to focus: biocomplexity, biotechnology, genomics and complex genetics, chemical and structural biology, and cognitive neuroscience. The Report was enthusiastically received by the Board of Regents and on May 21, they approved the creation of the “Institute for the Study of Biological Complexity and Human Values.” The University plans to invest \$200 million in the creation of this Institute, including the construction of a new building to be located immediately south of the Power Station. An advisory committee (one of whose members is Professor Easter of the Biology Department) is now involved in searching for a Director of the new Institute. We await future developments and the results of their efforts with great interest.

Priscilla H. Connell Endowment Fund

Raindrops clinging to a passion vine tendril, a bluebird in profile with a dragonfly in its beak, a sea of sunflowers. The award-winning photographs of Priscilla H. Connell have a simplicity that belies the effort behind them. Connell could spend hours in the field, waiting for just the right combination of subject and lighting to come together.



A summer exhibit of her photographs came together beautifully, too, thanks to a lot of behind-the-scenes effort. Department staff, the LS&A Development Office and the Connell family worked together to organize the 10-day event, the first show of the late photographer's work ever held in Michigan.

The exhibit, "Natural Impressions of Priscilla H. Connell," was held in the Rackham Art Gallery and included 32 photographs. At an opening reception June 11, Department Chair, Julian Adams, expressed appreciation for the memorial gifts Paul Connell has made to the Department since his wife's death in 1997. With the latest, the Priscilla H. Connell Endowment Fund topped \$1 million, making it the Department's first million-dollar gift. The funds will be used for faculty and graduate student awards, and there are plans for an annual Distinguished Lecture, the Priscilla H. Connell Lecture in Biology.

Although neither of the Connells was trained in biology, Mr. Connell has had a lifelong interest in the subject and still keeps a heavily highlighted biology text on his bedside table. That fascination and his wife's love of nature were behind his decision to make the donations.

Mr. Connell could not attend the reception, but three of the Connells' five children and their families were there. On the Monday after the reception, Mr. Connell called to say how proud the family was that the Biology Department wanted to exhibit Mrs. Connell's work. Daughter Pamliia and son Philip have created a book that showcases 48 of their mother's photographs, *Natural Impressions of Priscilla Harris Connell* (the same title we chose for the exhibit). Proceeds from sales of the book go to the Cincinnati Nature Center, where Mrs. Connell's work was often exhibited. For information on ordering the book, contact us at bio.alum@umich.edu.

Two posters that hung outside the gallery during the exhibit detailed Priscilla Connell's background and explain in her own words how she approached nature photography. The text of the two posters is reproduced on the next page.

About the photographer . . .

Priscilla Harrison Connell's love of nature was born and nurtured in her early years as a girl on a Clermont County farm. She remained enamored for the rest of her life. It was not until she was approaching her 40s, however, with children in high school, that she found her second love, the camera. Using it, she could share with the rest of the world her appreciation of nature's magnificence and beauty.

Priscilla Connell became an award-winning nature photographer, and her work has graced books and calendars of both the Sierra Club and the Audubon Society. During her lifetime, her work was exhib-



and Photographic Exhibit

ited at places like the Cincinnati Nature Center, which she enthusiastically supported.

The creativity displayed in Priscilla Connell's photography was no surprise to those who knew her. As a young woman, she studied music at Northwestern University and later taught violin and played with the Terrace Park Pops Orchestra. She was married for 50 years to Paul Connell, a retired physics teacher.

Priscilla Connell, known as Prissy to her friends, died of cancer in August of 1997. Her legacy to family, friends, and others is the loving eye for beauty preserved in her exceptional photographs.

About the photographer, by the photographer . . .

"You must have a lot of patience!" is an exclamation I often hear about my photography. Actually, it isn't really a matter of patience if you love what you are doing. I can stalk animals and insects for

hours at a time and add to that a lot of waiting for the right composition in the right light. It takes a lot of waiting, a lot of time – time for everything to come together to stop the moment. Sometimes I will wait for hours and then I am lucky if I can shoot the subject for a few seconds before it vanishes.

My photography is pretty straightforward. I think taking a picture of a drop of water on a spider web can be just as creative as more off-the-wall photographic manipulations. The image can be creative in a very natural way by looking carefully at a drop through the viewfinder and manipulating the camera to the right spot for the perfect composition. Along with this positioning I must have the right lighting and form and visual sense for every aspect of the picture to come together.

One of my greatest pleasures is taking pictures in outdoor natural settings. There is a lot more to photography than snapping the shutter and I find all of it truly

fascinating. There is always much to learn, both technically and visually. There is also the excitement and challenge of being able to produce a picture that a publisher would want to use. Careful planning, shooting and editing has helped my sales to calendar companies and book and magazine publishers.

When I was growing up I lived among art and artists, music and musicians. I feel certain that this background has been a great influence in my approach to photography. For this I am truly grateful. I am rather passionate about photography and all that it entails – from the basics of getting in the field with the right equipment for the job at hand to everything I need to create the "perfect" image – that is, learned techniques, both mechanical and compositional, together with an eye for not only looking but "seeing." I hope I expose the film at the right time and in the right light before the picture vanishes forever.

Through photography I have learned patience under undesirable as well as desirable circumstances. I've learned to concentrate when my body has been in strange and awkward positions. Sometimes I'm rewarded with a photograph that's been worth the anguish, and sometimes not. Usually I've learned something from the experience. But my failures have taught me the most.

I spend as much time photographing as I can. When I'm not actively photographing I'm thinking about it. I plan to "seize" the rest of my life practicing my passion."

Priscilla Harrison Connell
1925-1997

Excerpt, "About the photographer, by the photographer..." is taken from the book: *Natural Impressions of Priscilla Harris Connell*, compiled, designed and edited by Pamliia Connell Grafe & Phillip S. Connell.



Pictured above (from left to right): Julian Adams, Philip Connell, Dean Pat Gurin, Pamliia Connell, and Peter Connell

Senior Faculty Profile

Wes Brown

Professor Wesley M. Brown has been at the University of Michigan since 1980 and served as Department Chair from 1991-96. He received his Ph.D. degree from the California Institute of Technology in 1976. A past president of the (International) Society of Molecular Biology and Evolution, he is on the editorial boards of several scientific journals in the area of molecular evolutionary biology. He has influenced the field of evolutionary biology not only through his outstanding research, but also by training a large number of graduate students and postdoctoral fellows who have gone on to productive academic careers.

GEG: *You've had a longtime fascination with the relatedness of living things. Rumor is, you were scrawling your own versions of phylogenetic charts when you were just a kid. Is that true? What made you start thinking about such things at such an early age?*

It's true. I was just always intrigued by animals — I still am. My father was an avid fisherman, and he did some hunting, so we spent a lot of time outside. My mother had taken some botany classes and probably would have been a botany professor if she had been able to complete as much education as she wanted to. So I suspect there was some nudging from her. But I didn't get interested in plants, much to my mother's chagrin. They're interesting, but it was animals that attracted my attention — they move faster. When you're a little boy, you want to chase frogs and snakes and things like that.

GEG: *In spite of those interests, you didn't go into biology when you first entered the University of Colorado as an undergraduate.*

No. When I went to college, I went into parties. I was a goof-off — one of those wastrel undergrads who joined a frat and went to all the parties. I didn't show any academic promise at all as an undergraduate. Well, that's not absolutely true. I majored in political science, but I took a few biology courses and did extremely well in those. That became important later — it was the only way I was able to get accepted into graduate school, given my abysmal record.

GEG: *How was it entering a biology graduate program without having an undergraduate degree in the subject?*

In some ways it was a disadvantage, because at the beginning of graduate school, before they'd let me off probation, I had to take all of the biology courses that were required for an undergraduate major. But it might have been an advantage in another way, because I could spend that time concentrating on the subject that I was interested in, rather than having to satisfy other undergraduate requirements. I'd already done that. The other big advantage was that I was older and considerably wiser than I was when I was a freshman. I had taken a year off between finishing my bachelor's degree and going to graduate school. I spent six months of that year in Germany, working for German companies and living on a German salary. It wasn't the most pleasant thing in the world, and that may have given me the incentive to settle down when I got back. I had been interested in majoring in biology before I went to college, but I got sidetracked once I was there. When I came back to Colorado from Germany, I really knew what I wanted to do. And that inclination has lasted for quite some time.



GEG: *You not only jumped into biology, but you jumped into the vanguard, with your interest in using techniques of molecular biology to explore evolutionary relationships. That was pretty radical stuff at the time.*

Well, there were a lot of exciting things happening then. The synthesis between biochemistry and biology was developing, and that was very stimulating to someone with my interests. When I was a master's student at the University of Colo-

rado, the biology department there was almost moribund. At that time — it's changed a lot since then, of course — the exciting things that were happening in the realm of molecular biology were going on over in the chemistry department. So I went over and took a bunch of chemistry courses and got interested in that side of biology. Being interested in classical questions about evolutionary relationships, but being trained in what were at the time very modern, advanced techniques of molecular analysis, put me in a position not only to do a lot of interesting things, but also to think about the old questions in new terms. That may have helped to propel me toward the forefront. I think that anyone whose interests bridge two areas that aren't well-fused probably has that advantage, because these overlapping areas are often the most fruitful. There are many questions that you can answer if you know something about two disciplines that you can't answer by going at it from either one side or the other.

I went on to do my Ph.D. work at Cal Tech, which at that time was the epicenter for research on DNA and nucleic acids. I was really interested in molecular biology for a long period and did some really good, cutting edge stuff there.

GEG: *What do you consider your greatest contributions from that period?*

Probably the biggest contribution was being one of the very first people to apply molecular analysis to questions about relationships. I took mitochondrial DNA and really developed that as a model system for these studies. I guess I view that as my main contribution because it's one that people continue to use in labs all over the world.

GEG: *You also did some seminal work in using mitochondrial DNA to answer questions about human evolution, leading to the conclusion that present-day humans evolved from a small, "mitochondrially monomorphic" population. The press picked up on this and became fixated on the idea of a "mitochondrial Eve." Some of this work was done in the University of California, Berkeley, lab of molecular evolution pioneer Allan Wilson, who along with Vincent Sarich, had generated controversy with the contention that humans, gorillas and chimps had been evolving separately for only five million years. When you began working on human evolutionary relationships, did you have any idea how controversial the area was and what potential existed for people to misunderstand the conclusions?*

Not really, because I got started in that area before I hooked up with Allan Wilson at Berkeley. So I was unaware of

the controversies that swirled around in that area. I got a little taste of it early on at Cal Tech. I went to a symposium, and I remember there were people who were just frothing at the mouth about Wilson and Sarich. I didn't know about their work at the time, so I didn't understand what it was specifically that people were fulminating against, and I couldn't understand their vehemence. I still don't, in a way.

This sounds strange because of things that have been written [in books such as "The Search for Eve" by Michael H. Brown, and "The Runaway Brain" by Christopher Wills], but I never viewed myself as a molecular anthropologist. I thought that using new approaches to address questions about human evolution was an important thing to do, and I thought someone ought to do it just to demonstrate that it could be done. But I wasn't particularly fascinated by questions of human history specifically. I've always been much more interested in more global phylogenetic questions — how are various kinds of worms related to each other and how are they related to bugs and how are they all related to us? Those kinds of questions have always fascinated me more than anthropocentric questions like, "Where did we come from?" I'm interested in animals, period, across the board — humans, worms, snails, whatever, but I haven't ever really gotten so enamored of one group that I wanted to study it to the exclusion of everything else.

GEG: *And it's those "global phylogenetic questions" that you've focused on since you've been at UM?*

Right. When I was still at Cal Tech, I was torn between molecular biology and evolutionary biology. Had I taken a job in a biology department that had a more molecular, mechanistic slant, I might very well have continued on in molecular biology. But Michigan has had a tremendously strong program in evolutionary biology for long, long time. Given my interests, I attract a lot of really good students and post-docs in that area, so I moved toward questions in that area, away from molecular biology, except as a set of techniques to apply.

For the past 15 years, my lab has been looking at very deep, very ancient relationships. Once we feel that we have a reasonable knowledge of those relationships, then we can start asking questions about evolutionary mechanisms. We can ask what kinds of changes take place to cause, say, echinoderms — sea stars, sea urchins and so forth — to develop body styles that are so radically different from ours.

GEG: *How do you go about exploring these ancient relationships, and what has led you to use the techniques you use?*

Because of early studies I had done, I realized in the early 1980s that nucleotide sequence of mitochondrial DNA changed very fast, making it a good character to use to study relationships that are relatively recent, geologically speaking. But if I really wanted to study the things that I was interested in — namely those very old relationships — I needed something that changed much less quickly. In the mid-80s, David Wolstenholme at the University of Utah sequenced mitochondrial DNA from the fruit fly. I realized then that since fruit flies and mammals had mitochondrial DNA whose gene order was very different, mitochondrial DNA gene order might be a useful character for studying these older relationships.

So I started to try to determine whether gene order changed slowly enough to make it useful. As a consequence of studies in my lab and in other labs, it began to look more and more as if gene order was fairly stable and could be used to tease out some of these old relationships. At that point, we started to shift over to our present strategy, which is to simply sequence whole mitochondrial DNAs. We get a lot of information of all kinds from doing that, but one of the pieces of information we get is the order of the genes — how the genes are arranged on the little, circular mitochondrial chromosome. And with caution in interpretation, it looks like a very good character.

The problem, of course, is that there are an awful lot of major groups of animals, and it takes a fair amount of time to sequence a mitochondrial genome. So we're limited in that respect. But a lot of other labs all over the world have picked up this approach, and I think we'll see in the next few years the development of a fairly complete data set that can be used to build a tree of all the animals. And of course, other people are approaching the question with other molecules, and developmental biologists are looking at developmental pathways as a character, so these are all complementary approaches.

GEG: *In addition to your research accomplishments, you've taught Molecular Biology, Genetics and other courses. Do you enjoy teaching as much as doing research?*

Well, I don't like to teach large lecture classes. When I have more than 20 or 30 people in a classroom, I feel that all I can do is do what a good textbook does,

and that doesn't seem to me like teaching. All you can do up there is sort of regurgitate. But I'm the type of person who always has learned from reading — that's the way I get information. Oral transmission doesn't work as well with me, and so perhaps that's what leads me to that bias.

I have enjoyed very much the teaching that I've done in my lab, which has been mostly one-on-one teaching of undergraduates, graduate students and post-docs. I've also enjoyed the really small courses, particularly undergraduate honors courses, that I've taught here, where I've had a chance to interact. Those are fun. You can discuss things, you can argue about things, you really feel like you can open some doors. You feel like you can impart information to these people that they wouldn't get on their own.

GEG: *You spoke earlier about the high quality of students who've been attracted to your lab. Have many of them gone on to careers in biology?*

Yes, I've had a lot of really good people in my lab, and nearly all of them have gone on to academic careers, so I feel good about that. It's been a big lab for a lot of the time, and I've also been occupied with other things — for example, when I was Department Chair I spent very little time with my lab. But I must have done something right in creating an atmosphere where people could question things and seek answers to them, and it must have been a fairly pleasant exercise for them since so many of them have hung on.

GEG: *What do you think you did that was right? How would you describe your approach to mentoring?*

Well, I really don't try to cram my interests down anybody's throat. My grants are to do certain things, and there's a certain breadth that's allowable, but you can't just go off on a tangent. But within the confines of that, I try to allow students to come up with questions that they're interested in and to investigate them. And I try to be as critical as possible, in a good way, in helping them shape the specific questions they ask in ways that they can really get answers. I also try to be critical in terms of the data they gather to make sure that it's good quality and that it's analyzed correctly.

There are always questions that I'm personally interested in that I dangle in front of my students to try to get them interested, but for the most part, they haven't

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The Biology Honors Program

The Department of Biology's first Symposium for Honors students, held April 10, capped off changes that have been taking place in the Honors program over the past two years.

One major change, which occurred during the 97-98 academic year, was the creation of a formal standing committee to oversee the program. The committee is charged with monitoring every step of the process once a student applies for Honors. Ultimately, it is this committee that awards Honors to undergraduates, after reviewing thesis readers' recommendations and meeting to review and discuss each thesis.

The timetable for conducting research also has been more clearly spelled out. Students must apply for Honors (in Biology, Cell and Molecular Biology, Microbiology or Plant Biology) early in the sophomore year and must identify a research mentor by the end of that year. To meet the requirement of at least two terms of independent research, students are encouraged to work full time on their Honors thesis during the summer between their junior and senior years, although many do the

In the past, students had to submit two separate papers, an Honors review during the second year and an Honors thesis proposal during the third year. Under the new system, students write a single, formal proposal that combines elements of the review and thesis proposal. This paper, submitted during the third year, describes the project's background and the specific hypothesis to be tested.

Another change is that Honors students must enroll in Biology 201, "Introduction to Research in the Life Sciences," during the sophomore year. This course surveys the range of research opportunities in the Department of Biology and in other life sciences at UM and gives students a feel for the process of research, says Dr. Robyn Burnham, Chair of this year's Honors Committee.

After finishing the research project, each student writes an Honors thesis in the form of a research paper that could be submitted to a journal in the student's area of interest. Like such a paper, the thesis is expected to be a report of a substantial body of original results obtained during a sustained period of investigation. For students

student selects three readers, including the student's faculty sponsor, who agree to evaluate the thesis within ten days after it is submitted. A member of the Honors Committee serves as a fourth reader. The student's mentor also submits a report that describes the roles of the student and others in the lab in designing, executing and interpreting the experiments on which the thesis is based. About two weeks after theses are due, the Honors Committee meets to review the readers' recommendations and decide on the appropriate level of Honors.

The new Honors Symposium gives students an opportunity to display their work, and all students are encouraged to participate. At this year's symposium, held in the Anderson Room of the Michigan League, almost all of the students who received Honors were present, many with family members. Honors Committee members judged the students' posters, and awards were presented to the winners. Eric D. Hoopfer won the \$100 first prize for a poster describing his project, "Cloning and Expression of *Xenopus laevis* BTEB and Its Possible Role in Neural Development." Runners-up and recipients of \$25 each were Snehal R. Desai ("Screening and Analysis of Zebrafish (*Danio rerio*) Transgenic Lines Overexpressing *sema2Z* and the Identification of *sema2Z* Receptor Expressing Cells") and Aimee E. Wagnitz ("Motor Neurons Actively Deform a Specific Region of the Neural Tube During Exit").

About 110 undergraduates participate in the Biology Honors Program each year, and some 30 Biology graduates receive Honors at the various levels each spring.

Offering Honors options to students stimulates their intellectual development, Dr. Burnham believes, providing them with the opportunity to do research "in a setting that is controlled, yet allows them to be independent. They can learn on their own, and experience both success and failure themselves as opposed to reading about them, or being lectured to about them." The program also helps students decide whether they want to continue with research after graduation and lets them to explore options for their future.



work between their sophomore and junior years.

graduating in May, the thesis is due one week after the end of winter break. Each

Department of Biology May 1999 Honors Recipients

Biology concentrators:

Highest Honors

Eric D. Hoopfer, "Cloning and Expression of *Xenopus laevis* BTEB and Its Possible Role in Neural Development," Mentor: Robert J. Denver

Lewis A. Rosenberg, "The Mitochondrial Genome of *Priapulus caudatus*: Sequence, Gene Arrangement and Phylogenetic Implications," Mentor: Wesley M. Brown

High Honors

Stacy K. Tong, "The Effects of Ionizing Radiation on Ceramide Levels, Caspase-3 Activity, and Apoptosis in Brain Tumor Cell Lines," Mentor: Phillip E. Kish

Aimee E. Wagnitz, "Motor Neurons Actively Deform a Specific Region of the Neural Tube During Exit," Mentor: Kathryn Tosney

Melissa C. Walsh, "Expression of the NMDA Receptor in the Primate Brain," Mentor: James Meador-Woodruff

Honors

Courtney A. Dwight, "Does Estrogen Play a Role in Masculinization of the Brain?" Mentor: Douglas L. Foster

Lia S. Florey, "Characterization of Amphibian Corticosterone Levels in Response to Stress," Mentor: Robert J. Denver

Christopher A. Jones, "Maiden Origin(s) of Inhibitory Protein Factor (IPF): Report of a Novel mRNA Species which may Code for this Inhibitor of Vesicular Glutamate Uptake into Synaptic Vesicles," Mentor: Tetsufumi Ueda

Katherine Krajewski, "The Effects of Aging and Insulin on Protein Degradation in Isolated Mouse Skeletal Muscle," Mentors: Thomas Reynolds and Donald Dengel

Athena I. Patrianakos, "The Transcription Factor GATA-2 is Expressed During Pituitary Development," Mentor: Sally A. Camper

Jessica L. Pitsch, "Studies on the Mechanism of Artemisinin Resistance and the Effect of an Artemisinin-PEG Combination in Malaria," Mentor: Steven Meshnick

Erica Roosen, "Comparison of Enzymatic Hydrogen Peroxide Degradation in the Guts of *Orgyia leucostigma* (Lepidoptera: Lymantriidae) and *Malacosoma disstria* (Lepidoptera: Lasiocampidae)," Mentor: Michael M. Martin

Amit Singal, "Mosaic Analysis of the Sex Determination Gene, *fog-3*, in *Caenorhabditis elegans*," Mentor: Ronald Ellis

CMB concentrators:

Highest Honors

Seena Davies, "Identification of Regions Differentially Methylated in Inflammatory Breast Cancer (SUM149)," Mentor: Sofia Merajver

Bernadette M. deGuzman, "The Role of REVOLUTA in Lateral Shoot and Flower Meristem Formation," Mentor: Steven E. Clark

David K. Rhee, "Identification, Molecular Cloning, and Characterization of Zipper Protein Kinase 2 (ZPK2)," Mentor: Lawrence B. Holzman

High Honors

Snehal R. Desai, "Screening and Analysis of Zebrafish (*Danio rerio*) Transgenic Lines Overexpressing *sema2Z* and the Identification of *sema2Z* Receptor Expressing Cells," Mentor: John Y. Kuwada

K. Victoria Modica, "The *vnd/NK-2* Homeobox Gene Specifies Neuronal Identity in the Developing CNS of *Drosophila*," Mentor: Dervla Mellerick-Dressler

Craig A. Sisson, "Differential Regulation of Telomerase Components in EBV Transformed B-Cells," Mentor: Rosemary Rochford

Honors

Amer K. Ardati, "Characterization and Analysis of Goldfish *Pax6*," Mentor: Peter Hitchcock

Manpreet S. Chadha, "Molecular Analysis of Genes Involved in Retinal Degeneration," Mentor: Anand Swaroop

Samaresh Dasgupta, "The Effects of Growth Hormone on the C/EBP β ; Specifically Looking at LAP and LIP," Mentor: Jessica Schwartz

Aaron M. Freilich, "The Effect of Age on Ras Activation in Murine T-lymphocytes," Mentor: Richard A. Miller

Eleanor A. Howe, "*Drosophila* FMRF amide-Related Peptides: Structure-Activity Relationship," Mentor: Ruthann Nichols

Rajani A. Koimattur, "Characterization of JIP-1," Mentor: Benjamin Margolis

David S. Lee, "A Bcl-x₃ Adenovirus Selectively Induces Apoptosis in Transformed but not Normal Mammary Cells," Mentors: Venil N. Sumantran and Max S. Wicha

Daniel E. Murphy, "Role of Mutations in a Human Cytomegalovirus Gene in Drug Resistance," Mentor: John C. Drach

Elizabeth L. Somsel, "*Legionella pneumophila* and the Type IV Secretion Systems: Adaptation of Conjugation Machinery for Virulence Factor Export," Mentor: Michele Swanson

Microbiology concentrators:

High Honors

Jennifer L. Giel, "Examination of Global Protein Production Patterns and Similarity of *Escherichia coli* Strains using Two-dimensional Gel Electrophoresis," Mentor: Frederick C. Neidhardt

Honors

Timothy H. Tran, "Nalidixic Acid Resistance and Efflux Pumps in *Escherichia coli*," Mentor: Robert Helling

Plant Biology concentrator:

High Honors

Jessica P. Penney, "Correlative Controls of Senescence in *Arabidopsis thaliana*," Mentor: Larry D. Noodén

COURSE OVERVIEW – BIOLOGY 311/412

Introductory Biochemistry is a course required for many students who major in one of the Biology concentrations. It is also required for pre-med students. Dr. Marcy Osgood is the Lecturer who teaches the Keller Plan course for Introductory Biochemistry, Biology 311. The Department also offers Biology 310, taught by Dr. Karen Ocorr, and is a lecture course for Introductory Biochemistry, and students can choose between the two courses. Biology 412 is still offered for students who wish to proctor for 311.

Many of our alums may remember taking Biology 411, but the course was re-numbered in the mid-1990's. Since Biochemistry is a prerequisite for ALL the upper level Biology courses, the administration felt it should be numbered as a lower level course. The course is still offered using the Keller Plan self-taught program. Students have generous access to the "Biochemistry Suite" on the 4th floor of the Nat Sci Building. The suite includes cubicles for one-on-one tutoring, areas for lecturing and discussion, and provides an atmosphere for learning at one's own pace. Dr. Osgood shares her thoughts.

GEG: *What exactly is the Keller Plan?*

MO: In the 1960's, Fred S. Keller, J. Gilmour Sherman, and others developed a synthesis of educational methods and practices that has often been called the Keller Plan or the Personalized System of Instruction (PSI). Key aspects of this teaching method include:

Self-paced

so students can proceed according to their abilities, interests, and personal schedules. Students in Bio 311 must take

12 unit quizzes over the course of the semester—at any time they want, but they must take them sequentially. Midterm and final exams are on particular dates, though.

Unit perfection condition

which means students must demonstrate mastery of a unit before proceeding to other units; each unit quiz must be passed before moving on to the next unit. Students have 4 chances to master ("pass") the unit quiz.

Motivating by lecture and demonstration

instead of by-the-book for communication of critical information. Weekly optional lectures stress the "big picture" or give new information not included in the book. They also provide suggestions for more effective studying or use of resources.

Importance of the written word in improving instructor-student communication

which helps develop comprehension and expression skills through quizzes, exams, and e-mail question-answer dialogs.

Tutoring/proctoring

which allows repeats on exams, enhanced personal-social interaction, and personalized instruction. Proctors provide not only grading of written quizzes, but give an oral portion of each quiz to make sure that each student is getting the whole story. Proctors are available to help with questions ~70 hrs/week; they answer simple and more involved questions (though the more difficult they refer to Dr. Osgood) and pass on their study tips.

GEG: *Is the Keller Plan effective?*

MO: Research studies have shown PSI to have a number of advantages over conventional educational methods, and few

disadvantages. Students, especially those who would normally perform at the lower or middle levels, learn significantly more, as measured by final examinations and by tests of long-term retention (given years later). They like the classes and tutoring, and develop good habits that carry over to other courses and learning activities. Disadvantages are mostly concerning extra effort being required by the instructor, a higher drop rate in some courses (especially by students who cannot break their habits of procrastination), and extra room requirements. The requirement that students must pass the quiz for one unit before proceeding to the next is an important key in learning Biochemistry via the Keller Plan. Since I have been here, no student has taken any quiz more than twice (remember the limit is four).

GEG: *Why do students choose the Keller Plan over a lecture course?*

MO: There are several reasons, and these vary according to student:

- Some like to avoid a lecture and so choose the Keller plan
- Some believe that it will be easier/allow them a better chance at a better grade (an incorrect assumption - more on this later).
- Many prefer the flexibility of having no set time to take quizzes. The Biochem Suite, where the proctors are available for helping and giving quizzes, is open and staffed ~ 70 hrs/week, and so can accommodate any student's schedule. The Keller plan is particularly attractive to those students who work outside of the University, or who have other responsibilities (e.g., children)

■ Some students want the opportunity to experience self-directed learning BEFORE grad/professional school; they want to know if they can do it on their own.

■ Some want the opportunity to proctor; though a student does NOT have to have been a 311 student in order to proctor, many believe it will make them a more viable candidate.

■ Some have heard (from friends, roommates) that it is a really good way to learn the Biochemistry, and since so many of them are premed, they want the chance to learn it well.

GEG: *The enrollment for 311 has more than doubled in the last 10 years. Why do you think this has happened?*

MO: There are more premeds than



ever in the University. They have to have it for Med School, and Biochem is also invaluable as prep for the MCAT exam. I also think word of mouth about the course has contributed to the increase. Students realize that not only do they learn, but also they learn that they can learn on their own. The course requires highly motivated students, and we have that here at Michigan. That's why it works.

GEG: *How often does a student visit the Biochemistry suite?*

MO: They all have to come at LEAST 12 times, in order to take the 12 quizzes required. Many come more often, to talk to me or to the proctors for help, to meet with their study groups, or sometimes to just study there, in a quiet and helpful atmosphere.

GEG: *How many proctors do you have/need?*

MO: I need ~ 1 proctor/5 students. This ratio allows students to have relatively immediate attention when visiting the Suite, and the proctors have enough to do so they don't get bored. Most semesters this means I need ~60 proctors.

GEG: *How many super-proctors do you have/need?*

MO: I usually have 6 or 7. These students have already been proctors, performed extremely well in all aspects as a proctor, and have a desire to learn more about teaching/education. They are often grad-school bound or interested in education as a career (as opposed to the majority of proctors, who are premed). At least one of the SPs has responsibility for the computer related aspects of the course (the web page, the e-mail groups); the others all take on a special project for the semester that will benefit the course as a whole.

GEG: *How does a student become a proctor and/or a super proctor?*

MO: After successfully completing (at least a B, in most cases) one of the Biochem classes offered (Bio 310, 311, Biochem 415 or Chem 451) the student "applies" to me for the following semester. They have to tell me why they want to proctor, what abilities/talents they have that will make them a good proctor. I choose from the pool that apply. Some semesters I choose most; some semesters I have to turn down many applicants. I do not want more than 70/semester, and I only take that many if the 311 course is large (~350). Many of the students have already participated in some teaching or tutoring program; some are involved in outreach programs to the community; some have been proctors in the Physics Keller plan. I choose the



super-proctors. Proctors can let me know that they are interested, but it is strictly my choice—and they are the best I can get!

GEG: *Do you have problems getting proctors for 412?*

MO: Some Fall terms I do not get enough, and this can force me to cap the Bio 311 class at its 300 student "maximum." If I get more proctors, I can usually let in as many students as want the course (for some reason, this has never been more than ~350)

GEG: *What is the courseload for students in 412?*

MO: Proctors are required to be in the suite 4-6 hours. They are given weekly quizzes to be sure they know the material they are teaching to the students. They are also required over the course of the term to give a 15-minute presentation regarding some aspect of modern biochemistry, to me, and to the other proctors. This can range from disease to ecology with biochemical aspect. They must provide an outline and a bibliography of references from the last two years. The presentations are graded by me and the other proctors.

GEG: *How are proctors evaluated?*

MO: Each student who visits the suite completes an evaluation of the proctor with whom they met. So each Bio 311 student completes at least 12 cards. This provides feedback for the proctors and for me. We have a "proctor of the week" based on these comment cards and my evaluations. The proctors get feedback and motivation to do well. Many of the proctors and super proctors are interested in teaching at some level, and seem to enjoy teaching the students and see them "get it."

GEG: *What is different about the way you teach the Keller Plan vs. the way it was taught ten years ago?*

MO: All I can tell you is what I have heard; Bio 311 is graded more strictly than 411—fewer "A's"; the exams are tougher ("impossible!" "brutal"), but the book is better and the study guide is better.

GEG: *Do you think a person who*

took Bio 411 10-15 years ago feel it was the same course? Why or why not?

MO: The good students will have gotten just as much out of it in the "old days", because those who are self motivated always get a lot out of it.

GEG: *How do you keep the information up to date and interesting?*

MO: I give weekly optional lectures in which I try and bring up newsy Biochem information. Our web page often gets updated with topical Biochem tidbits. But this is a down side of the no-lecture Keller plan; there is no regular way to disseminate new information to all the students. Luckily, it is an INTRODUCTORY Biochem course; though the illustrations of processes change, most of the basic material does not.

GEG: *What is your contact with students?*

MO: I have weekly office hours (~3-4 hrs/week) for individual and group questions. I give an optional lecture each week. I send out at-least-weekly e-mail messages to the whole class. I spend ~ 10-15 hrs / week answering individual e-mail questions from students. This is the largest time commitment to student "contact"; they seem to prefer it to coming in to see me, and it allows me the ability to answer all questions individually. I also provide time for special meetings with students other than the scheduled office hours; these meetings usually start AFTER the midterm exam, when students realize that they need extra help. I sometimes help students set up study groups, and meet with them the first time as a group to get them going.

GEG: *You and Karen Ocorr, the Lecturer for the lecture course in Introductory Biochemistry, have received funding for a study comparing the effectiveness of the Keller Plan course versus the Biochemistry lecture course. Please tell us about that.*

MO: Well, we both use the same textbook, "Principles of Biochemistry," and we co-wrote the Study Guide. So far we have taken two semesters and done a comparison of midterm and final exams. We include 25 questions that are the same in both courses, and so far there has been no significant difference in how the students do on those questions in both courses. The average grade in both courses is the same, although the lecture course is graded on a curve. The enrollment for Bio 310 is 50-100 per term, versus 300-350 in Bio 311. This also affects the curve. One of the advantages about offering these two courses

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generous support! We gratefully
acknowledge those who recently
contributed to the
Biology Department.***

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Chair's Corner

Continued from page 1

huge difference to our research and teaching programs – and that concerns the greenhouse attached to the building on the south side facing the “diag”. The greenhouse is a University of Michigan landmark (shown on the top of page 1 of this newsletter), known and beloved by generations of students. It is a beautiful structure, but it is in a deplorable state, completely inadequate for modern plant biological research, as neither the temperature nor humidity can be controlled. We have estimated that it will cost between one and 1.5 million dollars to renovate into a state-of-the-art modern facility, while maintaining the original form. We are currently actively searching for donors to help preserve and modernize this lovely part of our University heritage.



Course Overview - Biology 311/412

Continued from page 15

is the students choose to be where they are, they have options about how they learn Biochemistry. In addition to comparing grades, we have distributed a survey at the end of the year to query students as to how they feel they did, what can be changed, etc. We have sent surveys to former students asking how the course they took prepared them for other upper level courses. Unfortunately, we do not have enough data to offer an analysis on this yet.

GEG: *What is your ultimate goal for the study?*

MO: In addition to learning if what we're doing works, we hope to publish our results. There is a lot of older literature on the Keller Plan and its success, but not much recent, and not much at all in the Natural Sciences.

Senior Faculty Profile - Wes Brown

Continued from page 13

pursued those. Some labs are like a production line, and that isn't the way my lab runs. My way is probably less efficient if you're oriented toward getting a specific set of scientific questions answered. If, on the other hand, you're interested in getting good quality answers to a variety of questions, then maybe it's not so bad. I've always tried to encourage the people in my lab to not be narrow in their interests or in their approaches, but to be flexible.

GEG: *Do you see yourself continuing this type of work for the rest of your life?*

No. I'm planning on retiring in three years. I'm ready to do something else. What will I do? Fish. Travel. Watch the tide go in and out. A lot of people want to die with their boots on, and I think for some of them, it's because they can't do anything else or they don't know what else to do. But I'm planning on making a clean break. When I step down three years hence — my official retirement date is June 2002 — I don't plan on continuing in any academic sense in biology. I'm still very interested in animals, and I'll probably take my shovel out and dig up mud from the bay and sift it through screens to see what's there, and sort it out and try to figure out exactly what it is. And I enjoy birdwatching. I really love the tropics, and my wife and I have for a long time talked about the possibility of getting a place, probably in the New World tropics. But you know, I don't plan on doing systematic, academic type scholarly stuff — I just want to look at the pretty birds. It isn't that I regard the problems I've been studying as being any less significant or any closer to solution. It's just that, you know, I did it. Been there, done that. It's really that kind of a feeling for me. I've accomplished much more in my career as a biologist than I ever planned on, or than I ever anticipated being able to do.



Faculty Profile - George W. Kling

Continued from page 6

tance. Once the project is underway, Professor Kling hopes it will attract more funding.

This and other projects of Professor Kling's have obvious news appeal, and when reporters call, he makes time to talk. It's not because he wants to be a media star, but because he thinks it's essential for the public to understand what the work is about. He has been interviewed by the New York Times, Discover magazine, National Public Radio and other media outlets and has worked with crews from The Learning Channel and the BBC.

"I have much more fun thinking about how good it is to do these things than actually doing them," Professor Kling admits. "Although professors can stand up and blither on for 50 minutes in a classroom, most of us are not brilliant speakers. I have fun talking to people about the science, but I'm not as comfortable talking when I'm going to be quoted. Still, it's so important to tell people what you're doing, to give them a feeling for why science matters and why education matters. Then the next time a congressional bill comes up that will increase funding to the National Science Foundation, maybe they'll say, 'You know, I kind of like those things I see scientists doing on TV, and I understand their relevance to society — I think I want to support them.'"

Nondiscrimination Policy Statement
The University of Michigan, as an equal opportunity / affirmative action employer, complies with all applicable federal and state laws regarding nondiscrimination and affirmative action, including Title IX of the Education Amendments of the 1972 and Section 504 of the Rehabilitation Act of 1973. The University of Michigan is committed to a policy of nondiscrimination and equal opportunity for all persons regardless of race, sex, color, religion, creed, national origin or ancestry, age, marital status, sexual orientation, disability, or Vietnam-era veteran status in employment, educational programs and activities, and admissions. Inquiries or complaints may be addressed to the University's Director of Affirmative Action & Title IX / Section 504 Coordinator, 4005 Wolverine Tower, Ann Arbor, MI 48109-1281, (734) 763-0235, TDD (734) 647-1388.

Two Graduate Students Receive Helen Olson Brower Memorial Fellowship

This year the Helen Olson Brower Memorial Fellowship in Environmental Studies was again awarded to two graduate students. Christopher Baraloto was awarded a Fellowship for his proposal "The Effects of Selective Logging on Natural Regeneration of Tropical Forest Trees in French Guiana." Daniel DeJoode received a 'Brower Fellowship' for his project "A Study of the Effects of Timber Harvesting on Species Diversity in Northern Forests." The Fellowship was established in 1994 by Caspar and Sally Offutt, in honor of Mrs. Offutt's mother. Chris and Dan each received an award of \$5,000.

Meet Daniel DeJoode

For Dan DeJoode, the Brower Fellowship has provided support for him and his family so that they could spend a field season in Wisconsin. Without the Fellowship, Dan says he does not know how he, his wife and his child would have been sup-



ported this summer. The fellowship has also allowed Dan to purchase some botanical references necessary for his work and to help defray some out-of-pocket expenses that incurred from using his personal vehicle to travel to his field sites everyday.

An understanding of how forest ecosystems change as a result of extractive harvesting is critical to predicting ecological impacts from forestry, to guide future management decisions, and to contribute to theories of community composition and change. Many authors have studied disturbance and succession in canopy tree spe-

cies. Less work has focused on understanding herbaceous communities, although they can comprise up to 75 percent of the temperate forest vascular plant species richness. The empirical literature on the effects of logging on understory plant communities is rather limited and does not provide clear indications of trends. Some authors find no significant changes in understory diversity after clearcutting other than a flush of invading species dominating for a relatively short period with no species apparently becoming locally extinct. Others suggest that herb diversity declines immediately and remains depressed for nearly a century following clearcutting. However, it is not clear from the literature if species actually disappear at a stand or landscape level even if local diversity declines. Nor is it clear if some guilds (e.g., vernal herbs) are affected more severely than other forest resident species.

Dan's work focuses on the effect of logging on the herbaceous community. In particular, he is studying the dynamics of species richness and community heterogeneity following logging by evaluating the role of ecological processes that may operate on different spatial scales. On relatively small spatial and temporal scales (e.g., meters to hundreds of meters and days to years) processes such as microclimate stress, competitive interactions, and physical damage may be important. At larger spatial and temporal scales (e.g., hundreds of meters to kilometers and years to decades) dispersal and persistence in refugia may be important factors influencing diversity.

Dan's research attempts to link the various processes to understand at what scales species are sensitive to logging disturbance. His study includes community-level vegetation surveys to test hypotheses of multi-species changes after logging, including analyses based on life history traits of particular species. A component is to assess diversity at different spatial scales to determine if local changes in diversity (e.g., 1 m²) correspond with changes at larger spatial scales (e.g., up to 1 ha). Diversity is being assessed on sites that have been harvested at different times in the past (a chronosequence) and on sites before and after harvesting. Adjacent un-

cut stands are also compared to the cut stands. This combination allows a description of patterns and changes that may occur over many years in harvested and unharvested forests, and the opportunity to examine mechanisms of change by knowing initial conditions before disturbance. An additional aspect of Dan's work is to conduct population-level experiments involving selected individual species to test hypotheses of community-level changes. Individual plants are monitored before and after logging to observe mortality from a disturbance, and experiments are being implemented to test the effects of microclimate, competition, and recruitment limitation on population persistence.

Dan's work takes place on the 100,000 ha Menominee Indian Reservation in north-east Wisconsin, which has a 150-year tradition of sustainable timber harvest. Many forests in the Great Lakes region have been subjected to large-scale clearcutting and fragmentation in the late 19th and early 20th centuries. A mosaic of farmland, early succession forests, and plantations have replaced them. The Menominee reservation has never been extensively clearcut and fragmented. The Tribe employs various selective timber harvest practices (single tree selection, shelterwood, and small-scale clearcuts) so that the forest retains many features of prehistoric forests such as structural diversity and small-scale, patchy disturbances. Therefore an opportunity exists to combine logging with a native forest ecosystem that has not experienced the same large-scale, intensive anthropogenic disturbance common in the region.

Meet Christopher Baraloto

Since 1997, Chris Baraloto has been working in French Guiana as an affiliate of Silvobab-Guyane, the South American center of the European Tropical Forest Research Network (see <http://kourou.cirad.fr> for further information) to revise forest management strategies in the region. Although French Guiana is anomalous among tropical countries - its 8 million hectares remain almost entirely under forest cover, recent road construction projects are projected to augment the surface area affected

by logging activity. Chris' responsibilities within this collaborative project include three objectives: (1) To quantify the effects



of logging activities on abiotic factors, (2) To quantify the effects of logging on the regeneration of commercially valuable species, and (3) To determine the environmental requirements for regeneration of twelve commercially-valuable tree species.

The Brower Fellowship has allowed Chris to continue work on several projects this year. In collaboration with the Office National des Forêts and a local logging company, he conducted a study of environmental and demographic impacts before and after logging at the Montagne Tortue concession. In addition, he finished a study of environmental impacts at the Paracou field station, where research plots were logged twelve years ago. Within these plots, he continued to survey the growth and recruitment of seedlings of twelve commercially valuable species growing under different environmental conditions. Chris has also established new field and greenhouse experiments investigating the growth and morphology of these species under abiotic conditions (light, litter, soil, water, and nutrients) manipulated to represent those he has quantified in logged and natural forest habitats. The Brower Fellowship has also sponsored my participation in a multinational collaboration of seven research laboratories to study the regeneration of *Dicorynia guianensis* (Caesalpiniaaceae), the most valuable timber species in the region.

The results of these studies have already begun to be implemented into local management strategies. Results of impact

studies at Paracou and Montagne Tortue suggest that small reductions in affected surface areas, brought about by the use of directional felling techniques or pre-logging road planning, can have considerable implications due to the fine spatial scale at which most abiotic factors respond to logging activity. In addition, he found that one species, *Sextonia rubra* (Lauraceae) suffered severe juvenile mortality during logging activities. This and other results have initiated pre-logging inventory reforms in which individuals will be guarded as seed trees to promote future regeneration.

The synthetic result of much of Chris' work is that tropical tree species are indeed unique in their regeneration strategies, and represent a gradient between the commonly described pioneer and climax guilds. In fact, in French Guiana he has suggested that each species may need to be considered individually when developing management plans. As a result, he is currently working with the ONF to develop factsheets for each of the major timber species. These 'fiches d'essences' will compile available information on ecology, physiology, population genetics, etc. of each species so that all forestry personnel can make more informed decisions during the logging process.

While it will take several tree generations to determine if indeed these efforts have promoted an economically or ecologically sustainable management system, Chris remains confident that by integrating the interests and efforts of researchers, managers, and loggers, we will be able to increase harvest volumes while decreasing the environmental and demographic impacts of logging activity. Without the support of the Brower Fellowship, Chris feels his participation in these efforts would have been severely limited.

The Helen Olson Brower Memorial Fellowship has become a highly-anticipated and coveted fellowship for graduate students in Biology. The competition challenges students to submit well-thought-out proposals for research related to the problem of the conservation and/or the wise use of natural resources.



Graduate Student News

Recent Ph.Ds

Winter 1998

Christine Elizabeth Thacker completed her dissertation entitled "Phylogeny, Ontogeny and Gonad Microstructure of the Gobioid Fishes (*Teleostei: Perciformes*)," under the direction of William L. Fink.

Shane Anthony Webb completed his dissertation entitled "A Phylogenetic Analysis of the Goodeidae (*Teleostei: Cyprinodontiformes*)," under the direction of Diarmaid Ó Foighil and Gerald R. Smith.

Spring 1998

David Samuel Treves completed his dissertation entitled "Evolution of Acetate Crossfeeding Polymorphisms in Long-Term Populations of *Escherichia coli*," under the direction of Julian Adams.

Fall 1998

Melvin R. Dickerson completed his dissertation entitled "Heart Rate in *Drosophila Melanogaster*," under the direction of Ruthann Nichols.

Timothy Gramlich Howard completed his dissertation entitled "The Relationship of Competitive Hierarchies for Germination, Growth and Survivorship to Relative Abundance of an Old Field Community," under the direction of Deborah E. Goldberg.

Brad R. Moon completed his dissertation entitled "Structural and Functional Integration of the Snake Axial System," under the direction of Carl Gans.

Ming Tsan-Su completed his dissertation entitled "Cell Type Specification During Heart Development," under the direction of Rolf Bodmer.

Recent Ph.Ds (cont)

Winter 1999

Donna Garvey Brickner completed her dissertation entitled "Signals, Receptors and Protein Targeting; Determining the Molecular Mechanisms for Peroxisome Biogenesis in Higher Plants," under the direction of Laura Olsen.

John Richard Cooley completed his dissertation entitled "Sexual Behavior in North American Cicadas of the Genus *Magicicada* and *Okanagana*," under the direction of Richard D. Alexander.

Benjamin Adam Salisbury completed his dissertation entitled "The Nature and Evidential Interpretation of Phylogenetic Character Data," under the direction of George Estabrook.

Rachel Ann Simpson completed her dissertation entitled "Ecological Factors Affecting the Reproduction of *Lespedeza virginica*, an Old-Field Perennial Plant," under the direction of Beverly Rathcke.

Jihong Wang completed her dissertation entitled "Molecular Characterization of O-methyltransferase Involved in Floral Scent Production of *Clarkia breweri*," under the direction of Eran Pichersky.

Rackham One Term Dissertations Fellowships were awarded to **Vici Blanc** (Adams), **Donna Brickner** (Olsen), **Deborah Ciszek** (Alexander), **Dunrie Greiling** (Rathcke), **Kirsten Hardiman** (Bodmer), **Laurel Hester** (Dawson), and **Christopher Picone** (Vandermeer).

Christopher Baraloto (Goldberg) received a Sokol International Summer Research Fellowship.

Rackham Predoctoral Fellowships were awarded to **Dennis Lavrov** (Brown/Mindell) and **Scott Peacor** (Werner).

Departmental Dissertation/Thesis Grants were awarded to **Guillermo D'Elia** (Myers), **Chad Hershock** (Goldberg), **Sheila Schueller** (Rathcke) and **Kerry Yurewicz** (Werner).

Daniel DeJoode (Curran) and **Christopher Baraloto** (Goldberg) are this year's recipients of the Helen Olson Brower Memorial Fellowship.

The Emma J. Cole Fellowship for a Distinguished Graduate Student in Plant Biology was awarded to **Jacqueline Courteau** (Rathcke) and **Miroslav Kummel** (precandidate).

Sheila Schueller (Rathcke) received an Outstanding Graduate Student Instructor Award.

Derek Dimcheff (Mindell) received a fellowship from the Cancer Biology Training Program.

Vici Blanc (Adams), **Wendy Crookes** (Olsen), **Kirsten Green** (Clark) and **Aaron Liepman** (Olsen) were all recipients of fellowships from the Cellular Biotechnology Training Program.

Genetics Training Program fellowships were awarded to **Jemileh Jemison** (precandidate, Cadigan), **Steven Roach** (precandidate) and **Katherine Teeter** (precandidate).

Ricard Carvajal (precandidate), **Dunrie Greiling** (Rathcke) and **Tara Rajaniemi** (Goldberg) all received National Science Foundation Fellowships.

William Lindsay Whitlow (Hazlett) received a Graduate Research Fellowship from the National Oceanographic and Atmospheric Administration.

Salvatore Cerchio (Payne) received a three-year Fellowship from the Environmental Protection Agency.

Recent Master's Degrees

December 1998

Wei Chen
Isabel Constable
Jessica Correa
Sally Anne Green
Yong Huang
Elizabeth Nightingale
Sally Kay Petrella
Radhika Puttagunta
Sheila Schueller
Lydia Skrynnikova
Jihong Wang

April 1999

Alex Ade
Kathleen Apakupakul
John D'Auria II
Rachel Ehrenberg
Sean Friday
Kirsten Green
Hyun-Soo Je
Aaron Liepman
Erika Milam
Nathan Nowak
Charles Strauss
Jill Wylie Sears

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Alumni News

Notes from around the world

The Thirties

Donald P. Duncan (BSF '37, MS '39, PhD '51 Minnesota) retired from the University of Missouri 14 years ago. He held the position of Director of the School of Forestry, Fisheries and Wildlife. He now resides in Columbia, MO.

The Forties

Grace Blanchard Iverson (BS '49, MS '54, Minnesota, PhD '61, Stanford University) is an adjunct professor at Florida Atlantic University. She resides in Hobe Sound, FL.

Norman W. Vogel (AB '40, MS '43, PhD '56 Indiana, Honorary ScD Washington & Jefferson) is currently Professor Emeritus of Biology at Washington & Jefferson College.

The Sixties

Kraig Adler (MS '65, PhD '68) is a Vice Provost for Life Sciences (a newly created position) at Cornell University, with responsibility for approximately 500 professors (about 1/3 of the university faculty) distributed throughout five colleges and the Experiment Station. This is a half-time position, as Dr. Adler maintains his Professor of Biology appointment as well.

Betsy (Hawkins) Feinberg (BA '64, Received the Phi Sigma Award in Biology and the Bradley Moore Davis Award in Botany). Following her studies at U of M, Betsy earned a teaching fellowship at Columbia, then went to New York University and earned an advanced English degree. She is now CEO of a high tech internet company that she is preparing for the public. She hopes to utilize her company in providing interactive multimedia educational programs that are designed specifically for the Internet.

Allen M. Solomon (BA '65 Biology, PhD '70 Rutgers) has been senior Global Research Ecologist since 1992, one of five "S&T scientists in the US EPA's Office of Research and Development." After leaving UM in 1965, and taking his PhD at Rutgers University in 1970, he worked as a Professor at University of Arizona (Asst Prof. 1970-76) and at Michigan Technological University (tenured Prof. 1989-92), was Staff Ecologist at Oak Ridge National Lab. (1976-87) and Project Leader at the International Institute for Applied Systems Analysis in Vienna (1987-90). He states that his professional life was more directed by the three summers at U.M.B.S. and his "Nat. Sci. days" than by any other experience in his life.

Ronald L. Stuckey (PhD '65) retired from Ohio State University, in '91, and since has been focusing his research on the History of Botany and publishing books. His most recent book is on Edwin Lincoln Moseley (1865-1948): Naturalist, Scientist, Educator. Other interests include invading aquatic flowering plants, weeds, their history, family geneology and local history in Seneca and Crawford County, Ohio. He was a faculty member at OSU for 26 years. Please contact bio.alum@umich.edu for information on ordering Ronald's book.

Margaret Gray Towne (BS '61, MS '62) received her EdD from Montana State University in 1995. She also attended the Princeton Theological Seminar, and is involved in the integration of science with theology. She was appointed to the J. Omar Good Distinguished Visiting Professorship of Evangelical Christianity at Juniata College this past spring. She specializes in Evolution/Creationism, but also is involved in environment issues.

The Seventies

Howard Kirchick (BS '71, PhD '78) after receiving his PhD, Howard spent four years as a postdoc and a year as research instructor in the Dept. of Cell Biology at Baylor College of Medicine. He has spent the past 16 years in the diagnostics industry performing research and development of diagnostic products for infectious diseases. His current position is Director of Product Development for infectious diseases diagnostics at Biosite Diagnostics in San Diego, CA. This company manufactures rapid diagnostic test devices for the hospital lab. Their products are used as aids in the diagnosis of infections with microbes such as *C. difficile*, *E. histolytica*, *G. lamblia*, *C. parvum* and others currently under development.

Barbara Gideon (BS '78, MPH '82, University of Illinois) is currently the Vice President of Marketing at UCSF Stanford Health Care.

Randy Gottler (BS '75, MS '80, EMU) and his wife, Linda, now reside in Phoenix, AZ. Randy is currently working as a laboratory superintendent for the City of Phoenix.

Stanwyn Gerald Shetler (BS '55, M.S. '58 Cornell Univ., PhD '79 U of M), although officially retired, is continuing research at the Smithsonian on a daily basis. Currently, he is preparing a complete revision of the 50-year-old check-list of vascular plants of the Washington-Baltimore

area. He is also editing the final eight volumes of the translation of the Flora of the USSR. He continues to lecture and lead field trips, such as the one he lead to Ontario's Bruce Peninsula in June for the Virginia Native Plant Society. He is a member of the state board of this society, as well as the board of the Audubon Naturalist Society of the Central Atlantic States. During the past two years he has coped with a mild heart attack, a bypass operation, and lingering heart problems. Stanwyn's wife, Elaine (Retberg) Shetler, spent over two years at the University of Michigan before going to Washington with him and finishing her BS in Botany at the University of Maryland. They met at the University of Michigan in the Department of Botany. The Shetler's now reside in Sterling, VA.

The Eighties

Jonathan M. DeNike (BS '86 Botany, MS '91 Michigan State) is currently conducting botanical & entomological research projects at an environmental consulting firm. Jonathan resides in Prescott, MI.

Anthony J. Nieuwkoop (PhD '85) is an Associate Professor, Dept. of Biomedical and Health Sciences at Grand Valley State University. He received tenure in the Spring of 1998, and has received NIH funding for three years for his continuing project, "Characterization of the Hut (*Histidine Utilization*) Region of *Rhizobium Fredii*." Anthony now resides in Holland, MI.

Sharon Allee Reutter (PhD '85) is a Research Physiologist for the US Army at Edgewood Chemical Biological Center in Maryland. She resides in Churchville, MD with her husband, Dennis.

Amy E. (Harvey) Thomas (BS '85, MA '92 Toledo) is back in school studying religion and writing a dissertation on Christian and Neoplatonist interpretation of authoritative texts in the 3rd century. Amy enjoys what she is doing now, but misses "hard data." She now resides in Chicago, IL.

John D. Wilkinson (BS '81, MD '86) completed Anesthesiology residency at the University of California, San Francisco in 1990. He then began a position as Anesthesiologist, specializing in Pediatric Cardiology and Heart and Liver Transplantation, at the California-Pacific Medical Center. He relocated to Bend, Oregon this year and is currently in private practice.

The Nineties

Paolo B. Abada (BS (Chem) '98, BS in (CMB) '98) is a freshman in the MD-Ph.D. program at the University of Southern California School of Medicine, with a full scholarship and stipend. He is enjoying his studies and his life.

Kenneth D. Angielczyk (BS '98) resides in Berkeley, California. He is a graduate student at the University of California, Berkeley in the Department of Integrative Biology.

Laura L. Avery (BS '95) is currently enrolled as a third year medical student at Wayne State University. Laura resides in Birmingham, MI.

Ken Bishop (BS '93, DO '98 Chicago College of Osteopathic Medicine) resides in Warren, MI and began his Emergency Medicine Residency Program at William Beaumont Hospital in Royal Oak, MI in July.

David Bricker (MS '97) is completing an MA in Journalism and plans to pursue a career in science writing. He indicates that anyone wishing to e-mail him may do so at qmorris@indiana.edu.

Kristin K. Dascomb (BS '94) received her MPH in 1996 from Tulane School of Public Health and Tropical Medicine, the Ph.D. from the Tulane University Graduate School. She is now attending the Louisiana State School of Medicine in pursuit of her MD degree.

Jarrod Anthony Hanshaw ('96) is working for a construction firm, and resides in Ann Arbor.

Uta A. Hussong (BS '90) resides in Kailua, Hawaii and holds a position at Unisyn.

Amy Janowicz (BS '93, DDS '97) did her residency in general practice dentistry at the Audie Murphy Veterans' Hospital in San Antonio, TX. In July, '98 she joined a large dental practice in Traverse City as an Associate Dentist. Amy also lives in Traverse City, MI.

David Minjoon Kim (BS '97) resides in Silver Spring, Maryland and is a second year student at the University of Maryland Dental School.

Larisa Lacis (BS '96) is currently enrolled in the De Paul University, College of Law and studying to be a patent attorney, focusing on the biotechnology/pharmaceutical field. Larisa married an alum and now resides in Chicago.

Gary Mally (BS '91, DO '97 Missouri) is currently a second year Radiology Resident at Garden City Hospital. Gary competes regularly in snow and wake boarding competitions. He plans to relocate to Hawaii upon completion of his residency and fellowship. Gary lives in Garden City.

David Miller (BS '90) spent two years in a UM lab researching differential expression of TGF in renal proximal tubule cells. He then held sales positions with Hoefer Scientific Instruments and FMC BioProducts before accepting his current position as Genetic Systems Rep. with Perkin-Elmer Applied Biosystems. David married the former Rebecca Marburger (LS&A '94) in 1994. He is now completing his MBA at the UM Business School evening program. He offers "Best Wishes" to Dr. Carl Gans and wishes to thank him for his excellent tutelage. David and Rebecca reside in Plymouth.

John D. Miller (BS '94, DPM '98 Ohio) is currently in a three-year podiatric surgical residency at Presbyterian /Saint Luke's Medical Center in Denver, Colorado. He hopes to become an associate in a practice upon completion of his residency in June, 2001. John lives in Lakewood, CO.

Gilbert D. A. Padula (BS '91, MD '97, Michigan State University) resides in New York and currently holds a Resident position at Memorial Sloan-Kettering Cancer Center.

Sylvie Marie Perez (BS '96) is now enrolled at Eastern Michigan University in their Masters Degree program of Cellular/ Molecular Biology. She plans to graduate 1999. Sylvie is currently holding an internship position at Parke-Davis and she resides in Ann Arbor.

Suzanne Pettit (BS '95) is living in El Portal, California and working as a Biological Science Technician at Yosemite National Park. She is currently working on a Mountain Lion Research Project through the Biological Resources Division of USGS.

Marc Philippe Ramirez (BS '95) received his MD degree from The University of Illinois at Chicago College of Medicine in May. Then he began a Residency in Pediatrics at Tulane University School of Medicine in New Orleans, Louisiana in July of this year.

Jennifer Schisa (BS '90 PhD '97 SUNY at Stony Brook) completed her PhD in Genetics in 1997 and began postdoc work in the lab of James Priess in April of 1998, studying cell fate specification in *C.elegans*. Jennifer married Cory DeMattei, whom she met in Grad school, in August of 1998. Cory, is also a PhD in Biology (Microbiology). Jennifer and her husband both work as postdocs at Fred Hutchinson Cancer Research Center in Seattle, WA.

Catherine Waterfield (BS '94, MD '98, Ohio State University) now resides in North Worthington, Ohio and works as a Resident at Riverside Methodist Hospital.

Daniel Watson (BS '96, BS Vet. Sci '94 Illinois) is currently a third year student in Veterinary Medicine at the University of Illinois. Daniel lives in Burr Ridge, IL.

Johnny L. Wu (BS '93) completed his podiatric surgical residency at Columbus Hospital in Chicago and has his own podiatric practice in Bartlett, IL.

In Memoriam
WENDY S. O'NEIL
1953-1999

Wendy S. O'Neil, 45, died at her home Tuesday April 13th. Born in Petoskey, Michigan on June 16, 1953, she was the daughter of Marilyn C. and Jay T. O'Neil of Petoskey. Ms. O'Neil graduated from Petoskey Public Schools. She earned her bachelor's and master's degree in Forestry, Botany and Environmental Science from the University of Michigan. She felt compelled to be a scientist who could work with people. While employed by the Nature Conservancy of Michigan, she worked on the Registry Program with landowners to voluntarily protect and manage special plants, animals or habitats. She organized a response team in the state for endangered Piping Plover before federal activity began. Ms. O'Neil received a state award for individual efforts to protect endangered species as well as a Keep Michigan Beautiful Award for Registry. She was also instrumental in leading an effort to save Colonial Point Forest in Northern Michigan. Later, as a resident of New York, Ms. O'Neil worked as the Director of Preserve Selection and Design for the Nature Conservancy in Albany, NY and then became the Director of Government Relations and Public Lands. She was subsequently involved in the NY Governor's Commission on the Adirondacks in the 21st Century as a Natural Resources Specialist. Ms. O'Neil found the Adirondacks to be her home. At the time of her death, she was on medical leave from the Adirondack Council. She dedicated her professional life to protecting the environment and saving wild places.

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