



# BioMass

**Biology Alumnus Newsletter**  
**University of Massachusetts at Amherst**



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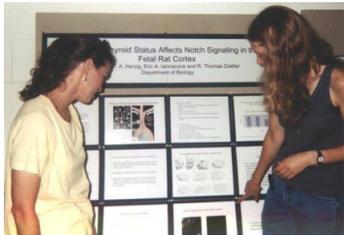
No. 03

Spring 2001

## REUs Galore!

We primed the pump with our recent **Howard Hughes Grant**. Next, federal agencies, including the **National Science Foundation**, changed their focus toward a greater emphasis on undergraduate education. Now, **Research Experiences for Undergraduates** (REUs) are becoming a regular feature of undergraduate education. The incorporation of more hands-on experience in the curriculum is in response to assertions that undergraduates who participate in research do better in future endeavors. *What is your opinion of this change?* Here at UMass the REUs are administered by the Biology Graduate Programs; we have a Plant Biology REU, a Neuroscience REU, and a BioTechnology REU. A model for the administration of REUs was developed during our original Howard Hughes-funded REU (1996-2000). That model is being replicated and elaborated by the new REUs.

In a typical REU experience, undergraduate participants work in a faculty member's lab for a summer or semester. The student carries out a research project and periodically meets with other members of the REU group to discuss the experience. Several presentations by the student are included. The first deals with the research project that is planned, the next presentation focuses on work that is being done, and the last deals with what has been accomplished. On the right,



undergraduate **Carolyn Herzig** explains her project poster to another undergraduate at a BioTech REU symposium held during the summer of 2000. The REU experience will either confirm a student's enthusiasm about a discipline or convince him/her to look for a another career.

Many students must work during the summer or a school semester. The REUs provide stipends and thus obviate semester and summer jobs. As an additional way of removing barriers to participation, travel expenses to and from a home location are also covered.

When we were first awarded the Howard Hughes grant, the University made a commitment to find ways to support future REU programs through local funding. Currently, the BioTechnology REU is being funded cooperatively with BayState Medical Center, which sees the involvement of undergraduates in laboratory research as an important way of nurturing potential health science workers.

## Chairman Woodcock's Corner

Biology continues to be one of the most popular majors at UMass with over 800 at last count, and our department continues to hum with activity. One of the bigger changes that has been happening in recent years is the increasing number of faculty retirees. As a consequence of the



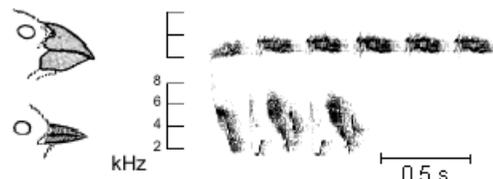
dramatic expansion of the University in the 60's, almost half of the UMass faculty will reach retirement age in the next decade. In Biology, we have already felt the impact of the wave of retirements (12 in the last 10 years), and this year we will be saying farewell to Stuart Ludlam, David Mulcahy, and Bernard Rubinstein. As you will read on p4, retirement is often the beginning of a new career phase for faculty as Emeritus Professors,

## Darwin's Finches Sing a Song about Food

The classical example of evolutionary diversification, Darwin's finches, is in the news again. **Jeff Podos**, our new behavioral ecologist, has just published evidence in the journal *Nature* in which he identifies a possible cause for the rapid evolution of both vocalization and species diversity in Darwin's finches. Jeff was awarded an NSF grant to study these phenomena. He is taking annual field trips to the Galapagos to gather data to test his theories.

Jeff's research equipment includes audio and video recorders which allow him to simultaneously capture the vocalizations and behavior of his target species. To test his hypotheses, Jeff analyzes behavior, beak morphology, and vocalizations. Experiments include the playing of high quality male vocalizations to a female to see how she responds.

The audio recordings of bird song are transformed into sonograms which are plots of time, frequency, and intensity of songs. The remarkable finding is that, in eight species of Darwin's finches, certain aspects of vocalization are related to variation in beak structure (see sonograms at right for *Geospiza fortis* (upper) and *Certhidea olivacea* (lower) abstracted from his *Nature* illustration).



Food availability could be a driving force for changes in beak structure which might lead to behavioral isolation via mating incompatibilities. Thus, two powerful interacting forces, feeding and communication at the time of mating, could be the causative agents of rapid speciation. Furthermore, in a number of species of Darwin's finches, beak structure has been shown to vary from generation to generation, depending on the types of available food. This adds credence to Podos' theories of interplay between beak shape and communication. Could the changes in food types over protracted time intervals result in the selection of beak shapes that preclude vocalizations once successful in attracting mates? This might select for species with a more variable song repertoire. In Jeff's hands, Darwin's finches have once again become a laboratory for the study of evolution.

and right now, 7 Emeriti (Ed Davis, Arthur Mange, Jack Palmer, Hal Rauch, Ted Sargent, Art Stern, Bob Wilce), have office or lab space in the Department. Retirements also provide an opportunity for us to recruit new teachers and researchers, and this year we have been searching for new faculty in Vertebrate Evolution (see p4) and Cell Biology. Students seem to be especially attracted to work with new faculty (minimal generation gap?), and the fresh ideas they bring

to their teaching has a very positive impact throughout the department (see p2). As we look to the future, further changes are in store, one of which will be 'Distance Learning'. How does a department that emphasizes hands-on experience in teaching and research labs take maximal advantage of this opportunity? We would very much like to hear your opinion on this and other aspects of department life - by e-mail, 'snail' mail or any other conduit. *CLFW*

## Information Technology (IT) in Teaching

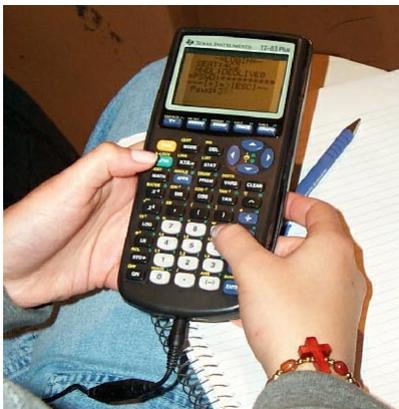
The latest "buzz" in improving teaching is IT. Some efforts are aimed at replacing teachers and books, but others are aimed at improving teacher/student interactions. Projects of both types are being pursued within the Biology Department.

**Randy Phillis**, who teaches introductory biology using ClassTalk Technology, just returned from delivering a presentation at a [Pew Center for Academic Transformation](#) conference on IT in teaching. At the conference both of the aforementioned aims of IT in teaching were presented. Randy returned with many new ideas and a reassurance that the Biology Department is at the forefront of thinking with regard to IT and teaching.

The Massachusetts Board of Higher Education recently published a mandate on IT in higher education. An included target is laptop ownership by every undergraduate. While this may seem like a dream at the moment, the Biology Department is anticipating that eventuality.

**Randy Phillis** and **Elizabeth Connor** from Biology, **Steve Goodwin** from Microbiology and **Adam Porter** from Entomology have combined forces to use an innovative cluster of technologies in their teaching of Biology 100 and 101. In this endeavor they are supported by our teaching technology expert **Steve Brewer** and the ClassTalk expertise developed in the Physics Education Research Group, headed by **Bill Gerace**. Students come to class with their personal \$100 TI calculators

which they plug into the ClassTalk network. During the lecture, small student groups are given problems to solve and the answers, accompanied by class results, are projected for the entire class to see and discuss. Students are also encouraged via an online daily-updated web page to read the relevant chapters in the required text prior to lecture and to earn credits by successfully completing short online quizzes before class. This allows class



time to be spent in clarifying the information rather than exposing students to it for the first time. In Biology 100 and 101, the use of IT does not result in a dilution of course content; the same amount of material is covered with more time spent clarifying concepts. The ClassTalk approach will be extended in spring 2002 when **Elsbeth Walker** will use it to teach genetics. Genetics would seem a natural course for this approach; it would be helpful to provide students the opportunity to solve genetics problems with the instructor at hand to help analyze responses and to provide reasons for the inappropriateness of certain solutions.

Randy reports that, at the Pew Conference, courses were described in which 50 or 100 laptops were connected with wireless technology to the course hub. If groups of two or three students were to use one computer, then classes of 200 to 300 students could be accommodated. The key to developing IT-supplemented pedagogy is to enhance rather than eliminate the role of the teacher.

Several other faculty have introduced IT into their courses. **Dennis Searcy** has experimented with the use of an online textbook in his Cell Biology course. This requires that every student have access to an online computer or terminal. Currently, about 85% of UMass students own computers. **Pat Wadsworth** reports that she has ceased to use paper handouts in her 400 student course, Biology of Social Issues; all visual materials are on the course website. Use IT and save a tree!

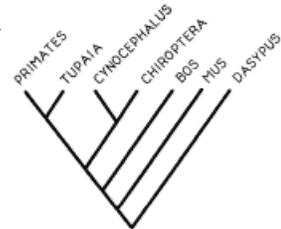
## Genes: New High Fashion on Campus?

The year 2001 marks the beginning of a new era in which we know the entire genome sequence for several organisms, including our own species, *Homo sapiens*. We are now faced with making sense and use out of the vast assemblage of information about our genome. Molecular biology once pursued the understanding of gene structure and expression. Now, the field of bioinformatics has the task of organizing and understanding the design and evolution of the large databases we know as genomes. The sheer vastness of the data will require new approaches to handling databases and accessing the data therein. This opportunity to develop new technology and methodology might be likened to the challenge of landing a human on the moon. One approach will be to compare our genome architecture to that of closely and distantly related species - not comparing gene structure but rather the clusters and orderings of genes on the chromosomes on which they lie. The evolution of gene patterns may teach us about the function of the large amount of "junk" DNA that lies between the transcribed DNA that codes for proteins and structural RNAs. The Biology Department has joined the cadres of scientists who will be exploring genome organization in a variety of species.

In 1998 **The University of Massachusetts Automated DNA Sequencing Facility** was established with Biology faculty member **Ron Adkins** as Director. Since its opening,



the facility has applied its machinery to the sequencing of DNA of over 200 different species. The facility services the sequencing needs of 60 laboratories in the 5-College community. Each year sees its usage increasing with a 6,400 sequence throughput in the past year, representing 3.2 million nucleotide pairs identified. Facility director **Ron Adkins** is interested in the deep structure of mammalian phylogenetic divergence as exemplified by this tree of mammalian evolutionary branching, excerpted from one of his earlier publications, which includes primates, tree shrews (*Tupaia*), flying lemurs (*Cynocephalus*), bats (Chiroptera), mice (*Mus*), cows (*Bos*) and armadillos (*Dasypus*). Ron's current research is exploring the evolution of the deep structure of the speciose group of mammals which includes mice and rats. Another Biology faculty member **Yin-Long Qiu** uses the facility to study plant genomics. Microbiology Professor **Derek Lovley** used the facility extensively to contribute to the *Geobacter* genome project. Biology courses use the facility to provide training in the application of the tools of molecular biology. In addition to genomics research per se, the facility is being used by university geneticists in a variety of ways.



Geneticist **Randy Phillis** explains typical scenarios: "Once we have induced a mutation in our organism of choice, we can identify the locus of the mutation and sequence the gene. Then we can compare that gene to the worldwide database of gene sequences and perhaps find homologous genes whose properties have been identified previously. This gives us clues to how our gene works. Second, we can engineer a mutation in a known gene in order to explore the effects of such a mutation. The sequencing facility can quickly allow us to check that our engineering created the mutation we desired."

The Sequencing Facility is an indicator of the serious commitment the University and its biology faculty have made to support modern genomics research and teaching.

## Alumni Mailbag

**Don H. Smith '34 BS.** Next Issue:(?) List(s) of: (1) Former beneficiaries of Torrey Fund & their present duties. (2) Present beneficiaries of Torrey Fund & their future plans. (3) \$\$\$ Condition of the Torrey Fund.

*Eds: The Ray Ethan Torrey Scholarship Fund is alive and well. Each year 6-7 undergraduates are provided \$500 in support of plant biology research. The Plant Biology Program administers the scholarship and has its own newsletter.*

**Harold S. Lewis '43 BS.** I enjoy your Newsletter! You mentioned Frank Wing '40. Do you have his address? ... an old friend of mine.  
*Ed: Frank Wing, 5431 Granada Blvd, Sebring, FL 33872*

**David Marsden '43 BS.** Dr. David H. Marsden died Dec. 26, 1999.

**Vicky Haard '65 BS.** Working part time at "The Naturalist" in Davis CA, enjoying 4 grandchildren, volunteering for Gideons and working on my Private Pilot certification.

**Clare (Schloemer) Neuman '66 BS & '68 MAT.** I am retired now (2 years) after a 30 year career as a biology teacher.

**Mary A. Anderson, '68 BS.** Captain Mary Alice (Buck) Anderson, Medical Corps, USN assumed command of the Naval Aerospace Medical Research Laboratory on 5 August 2000. The mission of the laboratory is to conduct research and development in aviation medicine and the allied sciences. Night vision studies, spatial disorientation work, and sound attenuation research are current projects.  
*Eds: Go Buck!*

**Neil Fennessey BS '75 Zool.** I am a professor of civil & environmental engineering at UMass Dartmouth. Specialty area is hydrology and water resource planning and management. My Zoology training helps me communicate with the biology-types but the world is better off that I am not one of them. I still have a passion for auto racing ... shared with my advisor, Dr. Klingener.

**John Storella '80 MS** I left my position at the law firm in April 2000 and joined CIPHERGEN Biosystems. We are a proteomics company determined to revolutionize the field of protein biology with a patented SELDI mass spectrometry system. ... We fractionate proteins using a biochromatographic surface, and analyze the captured proteins by mass spectrometry. ... One practical application of the technology is the discovery of diagnostic markers by comparing the proteins from healthy and diseased biological samples. ... On a more personal note, my wife, Lisa, ... is a television producer. Next week she has two pieces airing ... follow-up programs produced by KQED to the Moyer's series on PBS on end of life issues. John

**Brian Bettencourt '96 BS** I successfully defended my PhD dissertation at U. Chicago. ...

(see all the alumni mail, unexpurgated, at URL:  
[www.bio.umass.edu/biology/alumni/links/alum\\_response.html](http://www.bio.umass.edu/biology/alumni/links/alum_response.html))

Keep in touch using the various avenues provided:

- Jot down your comments on the enclosed card or letter and send them to:  
**Biology Alumnus Newsletter**  
**Biology Department**  
**University of Massachusetts**  
**Amherst MA 01003-5810**
- Use the electronic route via the [Biology Alumni Forum](#) where you can leave Email messages for all participating Biology alumni.

*The BioMass Staff*

## Pumping Iron

All plants require iron for normal growth and development. When sufficient quantities of iron are not available, symptoms of iron-deficiency develop.

Due to its poor solubility, iron is present in soil water in extremely low concentrations. In response to the paucity of available iron in soil water, several mechanisms for its uptake have evolved. One of these mechanisms, chelation, is operative in the grasses, the group of flowering plants that includes important agricultural crops such as corn, wheat, and rice. Grass roots secrete compounds called phytosiderophores which chelate iron ions present in soil water. **Dr. Elsbeth Walker** and her research team have cloned the *yellow stripe 1 (ys 1)* gene and shown that the product of chelation, the phytosiderophore-iron complex, is moved across the plasma membrane of corn root cells by the protein Yellow Stripe 1 (YS 1). This study appeared in a recent issue of the journal *Nature*.

The cloning of *ys 1* is a significant advance in the elucidation of the mechanism by which grasses acquire and distribute iron. An understanding of iron uptake may permit the engineering of iron-rich crop plants that could play an important role in alleviating iron deficiency anemia which afflicts three billion people worldwide. Since the iron phytosiderophore chelates ions other than iron, plants into which *ys 1* has been inserted might prove useful for the removal of metal ions from contaminated soils.

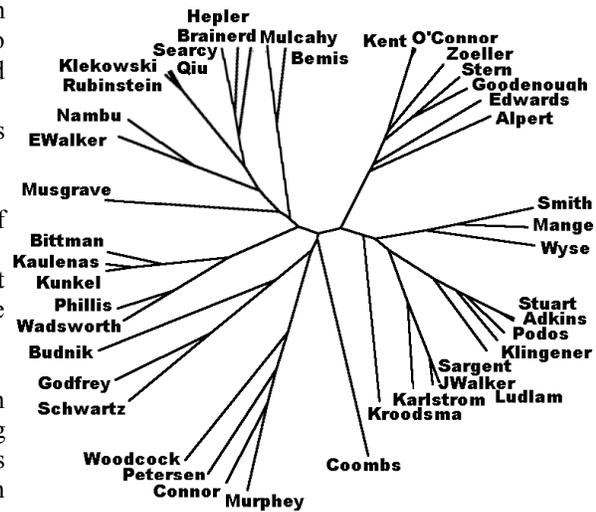


## Alumni Help on Faculty Timeline

Postcards returned by alumni often contain queries about professors or instructors with whom we have lost touch over the years. Our alumni could help the Biology Department by answering some of the Alumni Mailbag queries. We, on campus, are focusing on the present and future and have lost track of when particular professors were on campus as Biology, Zoology or Botany faculty. We are going to try to reconstruct the historical timeline of faculty residence on campus by sending a postcard questionnaire to you, our alumni.

This could be fun and of interest to our alumni and our current faculty. Help us turn this accompanying random tree of some of our present and past faculty into a tree rooted in our memorable past! Please indicate on the accompanying postcard the years when you were on campus and your

most memorable courses and professors who you think belong on the tree. Using this data we will construct a timeline and publish it in the next BioMass. The timeline may jog the memories of other alumni and lead to more information and Alumni Mailbag queries. Do not hesitate to use Email to speed up the information gathering process (alumni\_forum@bio.umass.edu).



## New Faculty Profiles

In September 2000, we welcomed **Jeff Podos**, our new behavioral ecologist. Jeff comes to us with a B.A. *magna cum laude* from Franklin and Marshall University, a Ph.D. from Duke

University and a postdoc at the Department of Ecology and Evolutionary Biology, U. of Arizona, where he worked on the Analysis of Biological Diversification project. Jeff spent this winter in the Galapagos studying Darwin's finches (see page 1). At right is a Galapagos tortoise being studied by the young Daniel Podos.



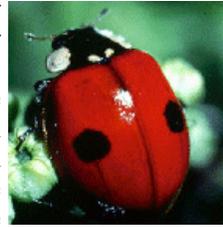
This Fall we will be joined by **Elizabeth Dumont**, our new vertebrate evolutionary biologist. Her research goal is to understand "the integrated roles of morphology, behavior and ecology in mammalian evolution." Elizabeth obtained a B.A., with honors, in anthropology at Indiana University and a M.A. and Ph.D in anthropology at SUNY Stony Brook. Elizabeth was voted "Teacher of the Year" by the Class of 2002 in her recent position as Assistant Professor in the Department of Anatomy, College of Medicine, Northeastern Ohio University.

## Activities of Retired Faculty

Retirement does not mean metamorphosis into a couch potato. Some retired professors continue to contribute to campus programs. **Art Stern** is Faculty Advisor in Commonwealth College (CC is the Honors College). Some of the best students on campus are enrolled in CC, and that makes advising enjoyable. Art also teaches occasionally in Introductory Biology. Some retired faculty provide service to home town, Amherst. **John Roberts** is Trustee of the Jones Library. **Otto Stein** is Member of Amherst Town Meeting. **Arthur Mange** is on the Board of the Burnett Gallery of the Jones Library and recently exhibited his photographs. Other retired faculty continue with scholarly endeavors. **Jack Palmer** just finished a book (his eighth) entitled *The Living Clock*. He spends summers at Woods Hole where he can be found in his office at the Capt. Kidd. **Ted Sargent** just published an essay in *"Human Traditions in United States History"* (1924-1940 volume) He gives talks on two continuing passions, birds and American historical figures. Ted has several books in preparation including a history of recent bird extinctions, *"Burden of Sorrow: The Passing of American Birds."* **Bud Moner** is writing his memoirs of growing up (from tap dancer to budding scientist) in Bayonne, NJ. **Bob Wilce** continues his research on Arctic algae.

## Continue Helping Us Help You

We are very grateful to our alumni and friends for responding to our plea for help. Thank you! Your generosity has enabled us to support the projects you have identified; the unspecified donations are being used to enrich the undergraduate research experience, enhance undergraduate field trips, and support the undergraduate organization *BioSci*. We welcome your ideas and contributions; please contact us!



The Biology Department continues to support students through scholarship funds established with and supplemented by alumni contributions. These include the **Ray Ethan Torrey Scholarship** for undergraduates in the plant sciences and the **William and Margaret Nutting Scholarship** in field biology. The **Massachusetts Museum of Natural History** has also benefited from alumni support. All contributions, targeted or unrestricted, are greatly appreciated. The University budget has been tight for many years and alumni contributions are an extremely important source of funds for many initiatives for our students. If you respond to the annual UMass Telethon, you can direct your donation, or a portion of it, to the Biology Department.

Direct contact with our alumni has been and continues to be important to us. For years, alumni in academic departments throughout the U.S. or holding nonacademic positions have been invaluable to our recent graduates by providing advice, and helping to locate support for graduate studies and to find jobs. We want to remind all alumni that help from nonacademic quarters is more important than ever. If you would like to be on our list of potential contacts, please send a brief description of your field of work and how best to reach you to **Ed Davis** or **Bruce Byers**, Biology Department, Morrill Science Center, University of Massachusetts, 611 North Pleasant St., Amherst MA 01003-9297 or Email [bbyers@bio.umass.edu](mailto:bbyers@bio.umass.edu). Many student ask to have individuals with "real life" (nonacademic) jobs come speak with them. Should you be available for such talks with small student groups, or for one-on-one conversations, please let us know.

If you are interested in biology alumni who have joined the internet age with a presence on the WWW, visit the alumni links page and learn about their academic and commercial exploits. To list your WWW page, or make changes, contact us by Email through the Alumni Forum, or write directly to Joe Kunkel at [joe@bio.umass.edu](mailto:joe@bio.umass.edu).

The Biology Alumni Website provides professional links which can help young biologists explore alternative career paths in biology. One link may help academics plan sabbaticals. Any links you might wish to share with other alumni should be Emailed to us for posting. **Please communicate with us via the enclosed return card or by Email.**

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