Living Connection

Department of Biology | Fall 2007

www.jmu.edu/biology

JAMES MADISON UNIVERSITY.

## In this issue . . .

**Hardly a day goes by without hearing about climate change. In this issue of the *Living Connection* we focus on the topic from three perspectives including a guest article from biology alumnus Dr. Chris Gough ('97). We encourage any of our biology alums to submit a guest article for the fall 2008 issue. We also welcome your feedback and will consider including it in our next issue. Send comments and ideas for guest articles to Jon Monroe, at monroejd@jmu.edu. Lastly, look for information about the Oct. 22–27 Homecoming events on our Web site.**

# JMU biology research lending insight into amphibian extinction crisis

## Frogs and salamanders are in trouble, and so are we

*By Dr. Reid Harris*

MANY AMPHIBIAN species, such as frog and salamander species, are in trouble. Recent estimates place the percentage of threatened species worldwide at between 33 and 50 percent. These figures are staggering and indeed much has been written on the amphibian extinction crisis. There are some selfish reasons why losing so many species matter to us humans. For example, amphibian skin secretions of some species contain potent anti-HIV chemicals. Amphibians can control insect species in some areas and are generally important members of the food web. When frogs die out, tadpoles are not present to control algae in streams and ponds, altering the ecosystem. Yet, even if we were content to live with 50 percent fewer amphibian species, we might want to consider what such a massive loss is telling us about the condition of the environment in which we all live.

**In collaboration with ecologists at the University of California at Berkeley, the JMU Department of Biology is exploring how the mountain yellow-legged frog, *Rana muscosa* (above) is affected by fungal pathogens that may threaten their existence.**

My laboratory in the Department of Biology is focusing on a perplexing problem in wildlife ecology: why are species of frogs and salamanders disappearing in seemingly pristine areas around the world? Amphibian species, like many other species, are imperiled by habitat destruction and fragmentation. However, in the western United States, Central and South America, and Australia, amphibians are dying in areas that seem untouched by habitat destruction, such as national parks and forests. One agent of mortality is a lethal skin fungus, *Batrachochytrium dendrobatidis,* which only attacks amphibians, and attacks many amphibian species. For example, this pathogen has caused losses of up to 70 percent of amphibian species in Panama. Perhaps no other pathogen in history has caused so much mortality to so many species. The fungus has a swimming spore stage that spreads the pathogen from one individual to the next. In Panama, the western United States, and perhaps other areas, the pathogen spreads in a wave-like fashion from one population to the next. Why this disease is emerging now is not fully understood, but recent evidence from Costa Rica links climate change to disease outbreaks. Importantly, not all species, populations or individuals are susceptible to the pathogen. This observation allows us to study the causes of variation in susceptibility.

Amphibians have chemical defenses, such as antimicrobial peptides, that can kill the fungal pathogen. These are the same chemicals that can kill the virus that

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***Living Connection* is the official newsletter of the James Madison University Department of Biology, which is part of the College of Science and Mathematics.**

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Dean

**Judith Dilts**
Interim Department Head

**Jon Monroe**
Editor

**www.jmu.edu/biology**

# From the department head

GREETINGS to you all! As the recently appointed interim head of biology, I want to take this opportunity to tell you a little about myself.

I came to JMU from William Jewell College in October 2004 as associate dean of the College of Science and Mathematics. I am a geneticist/microbiologist and had been at Jewell for 29 years. At JMU, I saw a vibrant faculty community in the sciences focused on student learning, having the same values as the small liberal arts college where I had been serving as chair of biology for 18 years.

I have not been disappointed — the commitment to student learning, to the sciences for majors and nonmajors, and to undergraduate research is strong at JMU and the Department of Biology exemplifies those commitments. The faculty work hard to create an environment that supports and enhances student learning. They provide an excellent education for majors and nonmajors, and a number of opportunities and support for undergraduate research. They also are involved in the sort of peer-reviewed work that is important for maintaining an excellent biology department. In addition to publications in peer-reviewed journals, they have received grants to support their research and teaching, and grants from the National Science Foundation for a confocal microscope and for a summer undergraduate research program. The department is also involved in a successful NSF biomathematics proposal, which supports undergraduate research and curriculum innovation. The university, in large part because of the good work of the sciences faculty, was asked by the Howard Hughes Medical Institute to submit a proposal for funding to support any or all of the following: student research, broadening access to science, faculty development, curriculum, equipment, laboratory development, and precollege and other outreach. The proposal writing is directed by a biology faculty member with several members of the department on the core team. The 226 institutions invited by HHMI were chosen because they excel in preparing students for careers in science and medicine.

I know as you read this newsletter you'll understand the excitement and commitment that I can both see and feel. I hope that you will find the opportunity to come and visit at Homecoming, Oct. 22–27, or any other time — we'd love to see you. You can also visit us at our Web site, http://www.jmu.edu/biology/.

– Judith Dilts, interim head

## New faces in biology

**Dr. Alex Bannigan** is teaching Organisms labs and looking after the biology department's new microscopy suite, which houses a Nikon confocal microscope. Bannigan studies the cytoskeleton, mitosis and cell-to-cell communication in plant cells, and has been using confocal microscopy in her research for over 10 years. She earned a B.S. and Ph.D. at the University of Sydney, Australia, where she also worked as an associate lecturer briefly before coming to the United States to do a three-year postdoc at the University of Massachusetts, Amherst.

**Dr. Steven Cresawn** is a viral geneticist. He studies bacteriophages, viruses that infect bacteria, with a focus on understanding the unique organization of bacteriophage genomes. Cresawn received his B.S. in biology from JMU and his Ph.D. in molecular genetics and microbiology from the University of Florida in Gainesville. He is returning to JMU following his post-doctoral training in the Pittsburgh Bacteriophage Institute at the University of Pittsburgh. He will be teaching Cell and Molecular Biology and possible Virology and/or Genomics.

**Dr. Kerry Cresawn,** a cell biologist and geneticist, comes to JMU from the University of Pittsburgh where she most recently studied the basic biology of kidney cell function. She studies how new kidney cell proteins are directed to their final destination at the cell membrane using both microscopy and biochemical techniques. Cresawn also has strong interest in genetics and genetic technologies. Her Ph.D. work at the University of Florida involved designing gene therapy treatments for a genetic form of pediatric heart disease. She received her B.S. in biology from JMU in 1998. Cresawn will be teaching Cell and Molecular lab and a Scientific Perspectives course on genetics and society.

**Dr. Lina Rifai** is an animal ecologist. After finishing high school in Austria, she went to Jordan where she received a B.S. in applied biology and an M.S. in biology from the Jordan University of Science and Technology. She received her Ph.D. from the University of Louisville, Ky. Rifai's research in the U.S. focused on sexual selection in American robins and Eastern Pondhawk dragonflies. Before coming to the states for her Ph.D., she worked mainly in the Jordanian deserts, where many new species were discovered and the distribution, life history; and ecology of poorly known species ranging from scorpions and dragonflies to reptiles and mammals were described. She will be teaching Organisms and Human Anatomy.

**Dr. María Carolina Yáber,** a Venezuelan native, is interested in population biology, community ecology, and behavioral biology, and has worked with various species in the tropical dry forest. She received her B.A. in biology from Universidad Simón Bolivar in Venezuela, and her Ph.D. in biology from Purdue University. She worked as visiting professor at Hampden-Sydney College in Farmville, Va., before coming to JMU. She has studied the alert and alarm system of capybaras, and sex-biased dispersal and population viability of stripe-backed wrens in Venezuela. She is interested in comparing the patterns of dispersal and social system in different species of wrens in Virginia, as well as continuing with her studies of tropical species of wrens in Costa Rica. Yáber teaches Ecology and Evolution, and Organisms laboratory.



# Interview with Bruce Wiggins

**Environmental biologist Dr. Bruce Wiggins began teaching two new biology courses in 2006: "Environmental Toxicology" and "Biological Applications of GIS (Geographic Information Systems)." Along with the change in his teaching, Wiggins shifted his research focus to using GIS to analyze landscape variables that affect eutrophication, the increase in chemical nutrients in an ecosystem resulting in excessive plant growth, which interferes with the health and diversity of fish, plant and animal populations. *The Living Connection* recently interviewed Wiggins to learn more about his research, what prompted the changes, and where he envisions it taking him.**

**LC:** *Most of our alumni who know you probably remember that you were a microbiologist who worked on bacteria in human and animal wastes. Using GIS to analyze landscape variables seems like quite a departure. Why the change?*

**BW:** Well, in some ways it is a big change, but in other ways it is a natural extension of my interests in water quality and in reducing water pollution. I have always tried to focus my research on practical methods to reduce pollution in lakes and streams. I started out as a microbiologist and developed a methodology for tracking the sources of fecal pollution in streams. This was an important tool in helping to determine what steps to take to prevent the pollution in the first place. Gradually, though, I became more interested in the larger picture, in examining the effect of factors in the landscape on water quality.

**LC:** *Did you have to re-tool to be able to work in this area?*

**BW:** Yes! I spent the last three years learning an entirely new suite of tools and a new vocabulary as well. I sat in on five classes in the geographic science department to learn about geography, GIS and remote sensing. I also spent lots of time on my own learning the GIS software, which has been challenging but very enjoyable.

**LC:** *What are your future interests?*

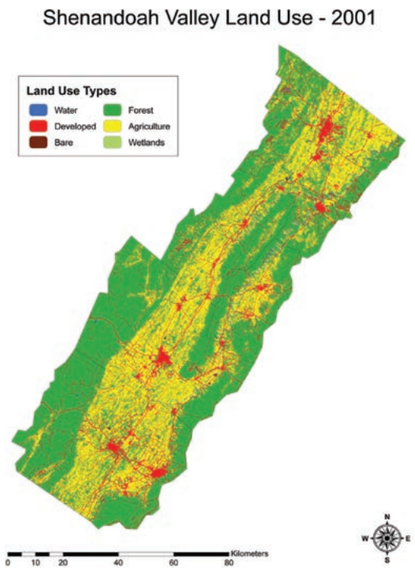
**BW:** I will use GIS to develop a set of landscape metrics for the watersheds in the Shenandoah River basin. For the most part, these metrics will be created from existing geographic data, such as digital elevation models, satellite images, hydrographic data and others. I will also use the extensive database of water quality parameters that have been collected by the Friends of the Shenandoah River over the last 10 years. My goal is to create a model that will incorporate the various landscape metrics to predict which watersheds will have high levels of nutrient pollution. Based on this model, we can then try to determine which factors are the most important in determining whether a watershed is polluted.

**LC:** *Can you describe the model? How does it work, and what can it do?*

**BW:** I plan to try several types of models, including discriminant function analysis and classification tree methods. The input to these models will be the watershed metrics, such as vegetation buffers around streams, the amount of impervious (paved) surface in a watershed, the amount and type of agriculture present, etc. The models will then use these metrics to try to predict what nutrient levels (for example, nitrate, phosphorus, ammonia) will be found in a given stream. The results will be compared to the actual measured pollution levels.

**LC:** *What will you do with the model? Who might be able to use it?*

**BW:** The model that does the best job will then be used to analyze other watersheds and to predict whether (and how much) they are polluted. The model will also be able to determine which of the metrics are the most important in determining the pollution levels, and this could be useful to state and local regulatory officials and to conservation and land use planners.




**LC:** *You are also teaching two new courses. What are they about?*

**BW:** The environmental toxicology course covers the biological effects of a wide range of pollutants, from acid rain to global warming to pesticides and environmental estrogens. A major emphasis of the course is on data analysis. Because of the complexity of ecological systems, there is a great deal of variability in the environmental effects of most pollutants; and thus statistical analyses are necessary to determine the extent of the effect.

The GIS course is an introduction to geographic information systems with a focus on using GIS to answer biological questions. GIS is an extremely powerful tool that is increasingly being used by ecologists, environmental biologists and natural resource managers. Experience in GIS is essential for any student who wishes to enter one of those fields, which is why we have added a GIS requirement for the department's new concentration in ecology and environmental biology.

**LC:** *Why start a new concentration?*

**BW:** We created the concentration in ecology and environmental biology for several reasons. First, it is an advising guide for students to let them know about the kinds of courses that might be of interest to them. Also, we added two new requirements — a GIS course and another statistics course — because both of these are very important in the fields of ecology and environmental biology. Finally, we hope that the new concentration will provide a sense of connectedness and community for those students who are interested in these areas, and also that it will attract new students to the program.

**LC:** *Who do you anticipate will take advantage of the new concentration?*

**BW:** There has been a lot of early interest — 10 students signed up within the first weeks after it was announced, and I think that there will be more this coming year. Any student who is interested in a career in ecology, natural resources, conservation biology, natural history and/or environmental biology would benefit from this concentration.

## JMU Biology research *continued from Page 1*

causes AIDS and that show promise as pain-relief drugs for humans. Research by Dr. Doug Woodhams, formerly of Vanderbilt University, and now at JMU in my laboratory, has shown that amphibian species that co-exist with the fungal pathogen have different chemical secretions from those species that decline or go extinct once the pathogen arrives in their location. The chemical secretions of the persisting species show strong antifungal activity in laboratory assays. In addition to helping to explain why species do not go extinct when faced with this lethal fungal pathogen, many new antimicrobial chemicals have been discovered, some of which may be useful in human medicine. The amphibians' defensive secretions are important, but they may not be the whole story.

Plants and animals, including humans, harbor a vast diversity and quantity of bacteria. Within and on our bodies, we are outnumbered by bacterial cells 10 to 1. It is increasingly recognized that these microbes play an often beneficial role in maintaining health. For example, bacteria in our digestive tracks are helpful in digestion and in preventing pathogenic bacteria from successfully colonizing or multiplying to high numbers. It turns out that amphibian skin hosts a diverse group of bacteria, many of which cannot even be cultured by current techniques. When a fungal pathogen arrives on an amphibian, it does not find a "blank slate" of skin. Rather, the pathogen's dispersal stage, which is a single cell, finds the amphibian's skin bacteria already in residence. We are exploring whether aspects of amphibians' skin bacteria can help prevent infection and death by the fungal pathogen.

In one study, we have collaborated with ecologists at the University of California at Berkeley on the threatened mountain yellow-legged frog, *Rana muscosa.* Populations in the northern part of its range in the high Sierra Nevada Mountains persist with the fungal pathogen, while those farther south along the ridge top succumb to the pathogen. In this case, the defensive chemical secretions did not differ between persisting populations and those predicted to go extinct once the pathogen arrives. Members of my laboratory, Mary Alice Simon and Brianna Lam, cultured skin bacteria from these frogs from both northern and more southern populations. We then grew the bacteria with the pathogen in laboratory challenge assays. Our results indicated that quite a few species of skin bacteria produced antifungal chemicals that killed the fungal pathogen. It turned out that members of the northern population that persists with the pathogen had a higher proportion of individuals with at least one antifungal species of skin bacteria. We were very excited about these results because they indicated that amphibians' skin bacteria might provide protection against fungal disease and opened up the possibility that perhaps antifungal bacteria could be added to amphibians as a means of protection.

We decided to test the idea that adding an antifungal bacteria species to the skin would protect amphibians from *B. dendrobatidis*. Members of my laboratory, Antje Lauer, Jenifer Banning, Emily André and Karen Duncan, used a very common salamander species for this laboratory experiment because we wanted to work out the methods and see if our concept had any validity before moving on to a threatened species. Control groups were employed in the experimental design, such as having salamanders exposed to beneficial antifungal bacteria and not to the pathogen. However, our main interest was in comparing individuals exposed to the pathogen with individuals inoculated with beneficial bacteria before being exposed to the pathogen. We found that we were successful in getting the beneficial bacteria to colonize the skin, at least in the short term. We also found that this common salamander species did not die when exposed to the pathogen, indicating that it is one of the species that does not succumb to the fungus. However, we found that individuals exposed to the pathogen did lose about 30 percent of their body mass over a month-and-a-half, which is a symptom of the fungal disease. Those individuals inoculated first with beneficial bacteria before exposure to the fungus lost much less weight, which meant that the bacteria helped to prevent a symptom of the disease. This result is the first indication that we might be able to manage the disease, although certainly much more testing is necessary before field trials are conducted.

Given the encouraging results from this experiment, we are soon going to repeat the experiment with the mountain yellow-legged frog from the high Sierra Nevada Mountains in California. This species can be strongly affected by the disease and does die from the disease in laboratory trials. If we obtain results that suggest that the addition of beneficial bacteria prevents death from the fungal pathogen, then field trials would be a logical next step. The fungal pathogen in California moves in predictable directions, so we might be able to inoculate the frogs in the path of the disease and halt it. The beneficial bacteria already occur on the skins of some individuals in the populations, so we would not be adding new species to the ecosystem. Government officials would have the final say on how and when to proceed. We are cautiously optimistic that our ecological study of the interaction between skin bacteria of amphibians and their lethal skin fungal pathogen will give us a workable tool to manage and halt this horrible epidemic.

**The Cow Knob salamander, *Plethodon punctatus* (above), is native to Augusta, Rockingham and Shenandoah counties of Virginia that surround the campus of JMU.**

**Please tell us what you are doing...**

Many biology alums have submitted their stories via the alumni news form on our Web site. The most recent entries are printed on Pages 6 and 7. Look for your friends, let us know what you are doing and tell us how you could support our efforts at http://www.jmu.edu/biology/alumni.shtml. Thank you!



# Global change and forest carbon cycling: Lessons from the great north woods

*By Chris Gough ('97)*

THE CONNECTION between global change and ecosystem function fascinates me. Ask yourself this: can you think of any ecosystem which has not been shaped in some way by human activity? Consider the mottled landscape surrounding Harrisonburg. This patchy mosaic of fragmented ecosystems — urban, agricultural and forested — has been fundamentally formed by anthropogenic global change. Our human footprint is far reaching. Even the most pristine and inaccessible ecosystems are being altered by global climate change. Global change not only encompasses unprecedented changes in climate over the past half-century; it also includes habitat destruction, introduction of invasive species, increases in ozone and atmospheric nitrogen deposition, and rising atmospheric carbon dioxide concentrations. My research within the field of plant physiological ecology and forest ecology is centered on understanding the relationship between global change and ecosystem function and, specifically, forest carbon storage and cycling.

Why should we care about forest carbon storage? Globally, forests store half of the Earth's terrestrial carbon in biomass, detritus and soils. Forest carbon storage is an important ecosystem service, locking up carbon that might otherwise exist in the atmosphere as carbon dioxide, a potent greenhouse gas.

My research team at the University of Michigan Biological Station has studied forest carbon cycling in northern Michigan for a decade. In the early 20th century, forests in this area were the primary source of lumber for rapidly growing cities to the south, including Chicago and Detroit. While timber harvesting stimulated the local economy and provided an essential resource for urban development, logging debris fueled catastrophic wildfires. This form of global change drastically altered the regional landscape.

Our research findings show that harvest and fire disturbances broadly distributed across the region decades ago caused changes in site quality that continue to limit forest carbon storage and growth rates. Clear-cut harvesting and fire diminished soil fertility and reduced the maximum rate of forest carbon storage by about 25 percent. Most notably, this disturbance decreased wood production by almost 60 percent. The reduction in forest carbon storage and growth due to past disturbance was both severe and enduring, showing no signs of recovery to pre-disturbance levels after nearly a century. Contemporary forest management practices in the region limit fire and promote sustainability of forest productivity. However, widespread harvesting and wildfire disturbances once common in the upper Midwest are on the rise in tropical regions. The persistent legacies of poor management practices on forest carbon storage that we observed should serve as a caution to contemporary forest managers elsewhere.

In the future, climate change may reduce rates of forest carbon storage and growth. Climate records from our study site over the past 25 years indicate rising air temperatures and decreasing growing season solar radiation — trends that, should they continue, will negatively impact rates of carbon storage by deciduous forests in the upper Midwest. How can our results inform policy makers and forest managers? International scientists and policy makers consistently support managing forests for carbon sequestration as a strategy for mitigating anthropogenic carbon dioxide emissions. Our research is helping to quantify how much carbon forests in the upper Midwest absorb. In northern Michigan, deciduous forests distributed across 2,400 square kilometers currently sequester an impressive 62 percent of the region's anthropogenic carbon emissions or the equivalent carbon emissions from 225,000 cars.

What next? We are looking to the future and considering how multiple forms of emerging global change will interact to alter ecosystem function. Our forest carbon cycling studies have provided some answers about how past global change affects current carbon storage, and they have offered glimpses into what may lie ahead. Next time you walk through the woods, remember that forest carbon sequestration is an important ecosystem service. And like other ecosystem services, it is a biological process that is sensitive to global changes occurring everywhere — even in your own backyard.

**JMU biology grad Chris Gough's ('97) research centers on understanding the relationship between global change and ecosystem function, specifically forest carbon cycling.**

Chris Gough ('97), a JMU biology graduate, is a research scientist at the Ohio State University and is co-principle investigator of the University of Michigan Biological Station Forest Carbon Cycle Research Program. For more information, contact Gough at gough.21@osu.edu.

**Research findings at the University of Michigan Biological Station show that harvest and fire disturbances decades ago continue to limit forest carbon storage and growth rates.**

# Career tracks

**Current biology students are encouraged to use the alumni news section of the Department of Biology Web site, www.jmu.edu/biology/, to see what our alumni have done with their JMU degrees.**

During the past year, we received the following news from our alums about their current endeavors. If you don't see your name or would like to send us an update, please complete the Web submission form and stay in touch!

**Mark Dertzbaugh ('82),** mark.dertzbaugh@us.army.mil, is the chief of business plans and programs at the U.S. Army Medical Research Institute of Infectious Diseases. He is responsible for planning and management of the institute's $85 million research program including strategic planning, program and portfolio management, business development and technology transfer. Dertzbaugh serves as the institute champion of organizational transformation, and he is also secretary of the USAMRIID portfolio management and information technology governance committees. Before taking his current position he worked in various capacities for USAMRIID on projects to develop vaccines, therapeutics and diagnostics for biological threat agents including plague and anthrax. (posted 9/15/06)

**Aimee Escueta ('93),** aescueta@aol.com, is an attorney with the firm Higgs, Fletcher & Mack in San Diego. "After graduating from JMU, I moved out to San Diego and worked a bit in a few labs," says Escueta. "I completed a master's in public health, health services administration in 1998. That same year, I moved to Chapel Hill, N.C. to work on my Ph.D. in health policy and administration. I ended up completing my coursework and comps and taking a long break before working on my dissertation in order to go to law school. I graduated from University of North Carolina-Chapel Hill School of Law in 2003. I practiced law for a few years in Denver and then moved to San Diego in fall 2006. I currently practice in all areas of health law but mainly medical malpractice defense litigation. I'm also trying to (finally) work on my dissertation in the hopes of finally completing my Ph.D." (posted 12/12/06)

**Kimberly (Gourley) Poole (B.S. '94, M.S. '99),** is putting her biology degrees to new uses. "After completing my B.S. degree, I worked as a veterinary technician for several years before returning to JMU for a master's degree in biology. I then taught as an instructor for both the biology department and for the College of Integrated Science and Technology. I'm home now, with two daughters, whom I plan to home school. I have taken up both gardening and beekeeping during my unemployment, however, so perhaps I can claim to be an 'applied' biologist!" (posted 3/5/07)

**Jason Caldwell ('99),** jason-caldwell@uiowa.edu, received a Ph.D. in December 2006 from the University of Iowa for his thesis "Characterization of Chordotonal Dysfunction in *Drosophila melanogaster*." "I will be leaving the lab of Dr. Daniel Eberl in the University of Iowa Department of Biological Sciences and starting my postdoctoral research at Duke University in the Department of Anesthesiology in the lab of Dr. Dan Tracey," Caldwell says. "I will be studying the molecular mechanism of pain sensation in the model organism *Drosophila melanogaster*." (posted 5/4/07)

**Amanda Anderson ('00),** amanda.anderson.678@gmail.com, is a naturopathic physician and home-birth midwife. After graduating from the National College of Natural Medicine, a four-year accredited naturopathic medical school, she is opening a family practice in Portland, Ore. (posted 3/9/07)

**Kelly (Poliquin) Doroshenk ('00),** poliquin@wsu.edu, received a Ph.D. in cell biology and molecular genetics from the University of Maryland in May 2006. "I am currently a postdoc in Dr. Tom Okita's lab at Washington State University working on rice storage protein transport and localization. I am married to another JMU alumnus, John Doroshenk ('00)." (posted 1/24/07)

**Mary Lolis Garcia-Cazarin (M.S. '00),** garciacazari@uthscsa.edu. "After receiving my M.S. from the Department of Biology at JMU, I continued my graduate studies at the University of Kentucky Department of Pharmacology where I obtained my Ph.D. in May 2006. I am currently a post-doctoral fellow in the Department of Cellular and Structural Biology at the University of Texas Health Science Center in San Antonio. I am doing research in the fields of diabetes and obesity in the laboratory of Dr. Lily Q. Dong." (posted 10/20/06)

**Allison Bowden ('02),** aabowden@vt.edu, graduated from veterinary school at Virginia Tech and recently joined Old Dominion Animal Hospital in Charlottesville, Va. "I will be concentrating on small animal internal medicine and surgery." (posted 4/29/07)

**Georgina Owusu-Asiedu ('02),** ginaoa@gmail.com, worked at the National Institutes of Health/National Cancer Institute for a year and then started medical school at Virginia Commonwealth University in fall 2003. "I will start residency in pediatrics at University of North Carolina-Chapel Hill this summer and hopefully will do a fellowship in pediatric emergency." (posted 4/30/07)

**Elizabeth (Karle) Pierce ('02),** emp34@case.edu, has taken a post-doctoral position with the new director of bone marrow transplantation at Case Western Reserve. "I will be studying idiopathic pneumonia syndrome, a side effect of bone marrow transplant." (posted 7/19/07)

**Tatiana Robinson ('02)** is at Colorado State University where she is working on a M.S. in epidemiology. (posted 9/6/06)

**Jennifer Tripp ('02),** jat9s@virginia.edu, is currently a fourth-year medical student at the University of Virginia School of Medicine. "This fall I will be applying to residency programs in general surgery. Since graduating from JMU in 2002, I have been involved in cardiovascular, infectious disease, neonatology, and cardiothoracic surgery research projects. I had the opportunity to present orally at the Infectious Diseases Society of America 2006 conference in Toronto and won the Edward H. Kass award for my project 'Septic Shock Survival Enhanced Through Therapeutic Use of Anthrax Lethal Toxin.'" (posted 4/27/07)

**Sean Barron ('03),** sbarron@med.unc.edu, is a second-year doctoral student at the University of North Carolina-Chapel Hill. "I came in through the interdisciplinary biomedical sciences program and recently joined the neurobiology curriculum in the lab of Dr. Robert Rosenberg. A short synopsis of my research interests can be found at: http://www.med.unc.edu/neurobiology/students.htm. Just click on my name." (posted 10/6/06)

**Sabrina Harshbarger ('03),** harshbsk2004@yahoho.com, says "After graduating from JMU (go Duuukes!!!), I attended and graduated from the Old Dominion University medical laboratory sciences program with a second B.S. in medical technology. I graduated in December 2006 and just passed my American Society for Clinical Pathology board certification for medical technicians. I hope to get into physicians assistant school soon." (posted 7/19/07)

**Jacqueline McCarthy ('03),** jacgmac@yahoo.com, works for Estee Lauder and is pursuing a master's degree. "For almost a year, I worked in the microbiology lab in the research and development center of Estee Lauder Companies. Now for more than two-and-a-half years, I have been at Estee working in the active ingredient and natural products lab. I do natural plant extractions and source other natural (and synthetic) biologically active raw materials for our formulations. I have been working full time and going to school part time. I am almost done with my master's thesis on the topical applications for wound healing. I plan to attend physician assistant school next year." (posted 8/2/06)

**Kitrina Wargo ('03),** kitrinawargo@gmail.com, graduated from the University of Illinois College of Veterinary Medicine in May 2007. "I am currently working as an associate veterinarian at Mallard Point Veterinary Clinic and Surgical Center in a southwest suburb of Chicago. Wayne Journell ('02) proposed to me at JMU on New Year's 2007. We plan to get married in Northern Virginia in June 2008!" (posted 8/13/07)

**John (Jack) Horigan ('04),** john.horigan@gmail.com, completed an M.A. in philosophy and social policy at The American University (Washington, D.C.) in May 2006. He is currently working for the National Rehabilitation Hospital in the Center for Cognitive Neuroscience. "My current research at CCN includes psychological response of pediatric patients to robotic stimuli (using robotic cats), ethical concerns related to the use of robotic stimuli in healthcare, and cognitive and motor indices of early onset Parkinson's disease. Other current work: Moral complacency in placebo controlled testing in developing nations and ethics in higher education (specifically academic integrity/cheating etc.)" (posted 8/28/06)

**Ashley Godwin ('05),** aeg9f@virginia.edu, took a year off after graduating and worked for Foxhall Internists in Washington, D.C., as a bone density technician. In August 2006 she started her first year of medical school at the University of Virginia. (posted 9/11/06)

**Jennifer Brennan ('06),** jcbrennan@ucdavis.edu, is working on a M.S. degree in avian sciences at the University of California, Davis. "My research is focusing on monitoring fecal testosterone levels in wild kestrels to see if it is an efficient biomarker of reproductive success. My general interests are finding noninvasive biomarkers of pesticide or pollutant exposure in wild populations. Animals that interest me are raptors and mammalian predators. I hope one day to teach at the university level and a short-term goal is to hike the Pacific Crest Trail after completing my master's degree." (posted 11/13/06)

**Leah Carpenter ('06),** carpenter.ld@gmail.com, is employed as a research assistant with the National Institutes of Health. (posted 10/10/06)

**Lisa Delluomo ('06),** delluolm@gmail.com, worked after graduation at the University of Maryland Medical Center in the pathology lab on a Centers for Disease Control-funded study about rapid HIV tests. "I volunteered in an HIV clinic, enrolling people into my study, and collecting their blood and oral fluid samples. I tested the samples back at the lab, as well as received and tested HIV samples from clinics all over the country. After a year, I enrolled in Lake Erie College of Osteopathic Medicine in 2007 and anticipate graduating in 2011!" (posted 8/13/07)

**Lindsey (Dean) Hamilton ('06),** lnhamilt@gmail.com, is currently working at NASA headquarters in Washington, D.C., as a research assistant. "I am responsible for researching experiments and projects conducted by all NASA centers around the country and rewriting their research so that a layperson can understand the research. I am currently working with a team on a document that will go to Congress and the president that describes NASA's accomplishments for fiscal year 2006, how the budget was spent and future goals for each of the many parts of NASA." (posted 9/15/06)

**Gurpreet Mann ('06),** mann.gurpreet@gmail.com, just finished her first year in the forensic sciences program at George Washington University. "My concentration is in forensic molecular biology so I am constantly using my undergraduate background in biology during my master's studies. This summer I will be working in D.C. as well as participating in an internship at the Armed Forces DNA Identification Laboratory in Rockville, Md." (posted 5/29/07)

**Gene Wong ('06),** wonggw@sco.edu, is attending the Southern College of Optometry in Memphis, Tenn. (posted 10/20/06)

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*Karen Ahrens Guntharp ('80), director of development*

### *Discussion on Endowments — the gift of a lifetime*

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Contact Guntharp by calling (540) 568-6605 or e-mailing her at gunthaka@jmu.edu to explore the possibilities of supporting biology's top needs.

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## Dr. Louise Wilkins-Haug ('76)

Division Director for Maternal Fetal Medicine
Brigham and Women's Hospital

DR. LOUISE WILKINS-HAUG performs some of medicine's most complex surgeries — operating *in utero* to correct abnormalities of the fetus or to prolong the development of the fetus prior to delivery. As the medical director of the Center for Fetal Medicine and Prenatal Genetics at Brigham and Women's Hospital in Boston, she boasts one of the most preeminent medical careers in her field. She is the director of maternal fetal medicine, a high-risk obstetrician and a faculty member associated with Harvard Medical School. Over the past 13 years, she has done extensive work on placental genetics and has been involved in groundbreaking fetal surgeries, providing hope for unborn infants whose medical conditions would, without intervention, lead to irreversible, fatal damage. She was listed in *Boston* magazine as one of the top 100 doctors in Boston — an area that has one of the highest concentrations of highly skilled doctors, as well as the acclaimed Mayo Clinic.

*I appreciate how much Madison has developed in the past 30 years. I'm very impressed by the expansion and diversity of biology and other sciences at JMU, particularly the research areas being undertaken by faculty and students in biology.*
*–Dr. Louise Wilkins-Haug*

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