



# Department of Biology



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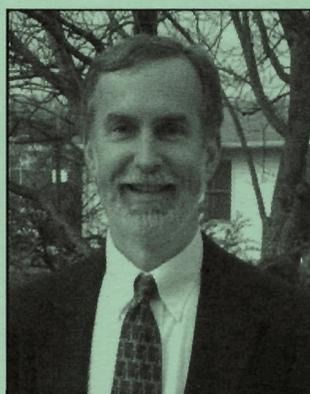
## VIEW FROM THE DEPARTMENT:

### THE BIOLOGY CORE

A little over ten years ago, the Department of Biology restructured the course requirements for a major in biology. Several options for specialization have since been added, which now provide a rich set of alternatives for our students (please see <http://www.biol.vt.edu/undergrad/requirements.php>). However, much has changed in field of biology and in the academic environment of the university. Therefore, beginning next fall, the biology faculty will start an in-depth review of the biology curriculum. We will determine if the current course requirements, or if a modified set of requirements can best prepare life-long learners in biological sciences. There are many issues to consider, including the fundamental needs of our students, the rapid pace of change in biological sciences, increasing emphasis on interdisciplinary approaches, impending changes in the university's core curriculum, and a well-accepted need to enhance training in communication skills. Although we will consider all aspects of our current curriculum, I have no doubt that much of our discussion and decision-making will revolve around a set of courses known as the biology core.

A core curriculum is defined as a set of common courses that all students share. Using this definition, the current university core curriculum, which has seven areas of learning that all students must address, is not technically a core because students select from lists of courses approved for each area. In contrast, the biology core curriculum is a set of courses that all majors take. Biology majors are currently required to take two freshman lecture courses plus two associated labs on the principles of biology, and then a set of four 3-credit hour sophomore courses. The sophomore courses may be the target of most of our curriculum review.

The intent of the four sophomore courses is to deepen the introduction that students have in biological structure and function, without a focus on any particular taxonomic group. In-depth experiences with taxonomic groups (i.e., plants, animals and microbes) are available in other sophomore courses, followed by increasingly specialized classes available in the junior and senior years. But lets get back to the four sophomore core courses. At present, they are: (1) ecology, (2) evolution, (3) genetics and (4)



Dr. Robert H. Jones  
Department Head

cell & molecular biology. Intellectually, these courses have many connections and interrelationships. Yet, each has a unique set of interesting concepts, theories, methodologies, and cadre of specialists. In fact, these areas have become so unique and specialized, that many universities have formed entire academic departments and undergraduate majors named for just one of these four areas. But times have changed. The explosion of knowledge about DNA, cell regulation, population structures, and global nutrient cycling have brought about a lot of "cross talk" between ecology and molecular biology, and between evolution and genetics. There is a growing interest in mixing or combining academic programs to enhance interdisciplinary research and education. Increasingly, we view the four core areas as part of the same spectrum of thought, differing mainly in the scale of space or time being considered. For example, ecology considers relatively large spaces and long period of time relative to cell and molecular biology, yet in both disciplines, we are often concerned with the frequency and function of specific proteins that carry out critical functions.

So where does this leave us? Do we realign our sophomore core courses to emphasize function? If so, perhaps we could have courses titled "metabolism", "evolution", "cybernetic systems", and "biogeochemical cycles". Or, do we focus on methodologies with courses titled "computational methods in biology", "molecular methods in biology", and "experimental ecology". Maybe we should combine two courses (e.g., ecology and evolution), and add another (e.g., biophysics).

The possibilities are many, and exciting to think about. However, one thing is certain. We must pay attention to flexibility. True, a common set of broad-based experiences has a lot of value, and in fact this has been a strong point of biology education at Virginia Tech for many decades. However, equally true is the fact that change in biological science is happening faster than can be matched by changes in university curricula. Therefore, we probably need to enhance choice among alternative courses, and allow for more rapid changes in the content of individual courses.

I will close by saying that when it comes to matters of curriculum, alumni and friends are among our most important assets. We would love to hear from you! Please check out our web site and drop us a line.

Sincerely,  
Robert H. Jones, Head

# Subcellular organization of the flavonoid enzyme complex, 3/1/02 - 2/28/05

Brenda S. J. Winkel, MCB - 0131010

With funding from the NSF Metabolic Biochemistry Program, the Winkel laboratory is studying the organization of metabolic pathways within cells, using the flavonoid biosynthetic pathway of the model plant, *Arabidopsis*, as an experimental system. Flavonoids are important plant secondary compounds that are best known as the blue, red, and purple pigments in flowers, fruits, and vegetables, but that also serve as UV sunscreens and in plant defense against bacteria, fungi, and insects. Moreover, these compounds are of considerable interest from a nutritional standpoint, as they have a variety of health-promoting properties when ingested by humans. For these reasons, flavonoid biosynthesis has been studied extensively from a number of different perspectives, including cellular biochemistry. It has become generally accepted that enzymes are not solitary entities that float randomly around the cell, but that they are almost always organized into macromolecular complexes that help orchestrate the efficient and controlled synthesis of metabolites in response to the changing needs of the cell. Our laboratory has published some of the only direct evidence that flavonoid biosynthesis is organized as an enzyme complex. We have recently started developing a three-dimensional model of this complex based on new structural information for several of the flavonoid enzymes. Experimental evidence for the nature of the interaction among four of these proteins is being generated using Small Angle Neutron Scattering (SANS), work being done by a graduate student, Chris Dana, in collaboration with Dr. Susan Krueger at the NSF-funded Center for Neutron Research at the National Institute of Standards and Technology. This collaboration represents one of the first applications

of SANS to the analysis of enzyme interactions and is providing us with insights into what the flavonoid enzyme complex may look like (see Figure). As a result we have been able to develop hypotheses about the relative positions of active sites and the channeling of intermediates through this system that are now being tested experimentally. Our long-term goal is to use the information gained from this work to design modified or improved metabolic systems for crop improvement and for the production of compounds of agricultural, industrial, or medical importance.



*Model for interaction of the first two flavonoid biosynthetic enzymes based on data from x-ray crystallography and SANS. Dana, Krueger, and Winkel, unpublished results*

## Comings and Goings

Our new faculty and staff hires include Young Ock Ahn (Postdoctoral Associate), Paul Brazhnik (Research Associate Professor), Atilla Csikasz-Nagy (Postdoctoral Associate), Sarah Gibson (Wildlife Lead Worker), Kristina Hudgins (Wildlife Worker), and Kristina Witter (Wildlife Worker).

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## Alumni in the News

**Cynthia Tate '95** is a PhD student at University of Georgia in the Department of Medical Microbiology, and received the Student Research Award at the 52nd Annual Meeting of the Wildlife Disease Association in Saskatoon, Saskatchewan this year.

**William Farrar, BS '72, PhD '78** recently published in the January 2004 *Nature (Medicine)* "Suppression of breast cancer by chemical modulation of vulnerable zinc fingers in estrogen receptor". The paper received worldwide press from the Reuters News Agency. This is the fourth publication by Dr. Farrar in *Nature* journals. He is the Head of the Cytokine Molecular Mechanisms Section at The National Cancer Institute. Author of over 200 research articles, Dr. Farrar was a Ph.D. student of Dr. Klaus Elgert.

This past December, **Somil R. Mehta '96** completed an M.S. in Biotechnology with a concentration in Biotech Enterprise, from Johns Hopkins University. He works at Celera Genomics in Rockville, MD where he was recently promoted to Assistant Scientist. Currently, he is doing scientific and informatic analysis on various genetic studies.

**Monica Goyanko '02** is currently working toward her second degree as a nursing student at George Mason University.

**Cris Chisholm '95** is a Doctoral Candidate in Biology at University of Maryland Baltimore County.

**Elizabeth Ellen Brittle Zumbrun '98** is currently a sixth year graduate student studying pseudorabies virus pathogenesis in the Department of Molecular Biology at Princeton University.

**Jacqueline Merrill '01** is currently attending graduate school at UVA in the Biochemistry and Molecular Genetics department and pursuing a PhD degree.

**Jason Cecil '97** is an assistant to the deputy director in the global measles branch of the Centers for Disease Control and Prevention.

**Adam Langer '97** is a staff emergency and critical care veterinarian with the Animal Emergency Center in Baltimore.

**Shelley Boone '99** completed an MD from the University of Pittsburgh and a residency at Western Pennsylvania Hospital and The Ohio State University Medical Center.

**Terrence Magner '99** was promoted to U.S. Army Captain in a ceremony in a palace in Baghdad.

**Victoria Humphreys '95** completed an MBA from Virginia Commonwealth University and has a position as business manager for a clinical trials institute.

**Jody Breckinridge '75** graduated from Officer Candidate School and holds the rank of RADM.

**Lance Grenevicki '89** accepted initiate status of the American College of Surgeons and was named as a Fellow.

**Luc Rowland '69** is president of Jeannette Rankin Foundation 2203 and is listed in *Who's Who in America*.

**Arthur Kirk '37** has received an honorary doctorate of science from Eastern Virginia Medical School.

**John McCaleb '56** co-produced a 1,856-page English-Japanese dictionary.

### April Alumni Reunion Highlights

Giving Back: sharing Experiences with Students – alumni had the opportunity to share information about their education and careers with current students.



*Dr. William Farrar, BS '72, PhD '78 gives advice to VT biology students and faculty.*

*More Highlights on Page 4*

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## More Alumni Highlights



Alumni Reception with our former professors (a.k.a. OWLS - Older Wiser Learned Scientists) on the 2nd floor patio of Derring. Academic posters and the plans for the new Biology building were displayed for alumni who also had the opportunity to tour the facilities.



Dr. George Simmons, whose retirement was celebrated the next day, with advisory board member Dr. Deborah Koller.



L-R: Dr. Joe Cowles, Dr. George Simmons, Dr. Ernest Stout and Dr. Jack Cranford.



L-R: Dr. Brenda Winkel, Dr. Susan Eriksson, Dr. Muriel Lederman, Dr. Rebecca Scheckler, Dr. Paige Warren, Dr. Lynn Adler and Dr. Jill Sible.



Biology Alumni and Department Recognition Luncheon where we celebrated the retirements of Dr. Muriel Lederman and Dr. George Simmons.

## Milestones

**John J. Tyson**, University Distinguished Professor of Biology in the College of Science at Virginia Tech, has been named one of Virginia's three Outstanding Scientists of the Year 2004, according to an announcement by Governor Mark R. Warner and Science Museum of Virginia Director Walter R.T. Witschey. John was recognized for his world leadership in developing the new field of computational cell biology.

**Brenda Winkel** has obtained an AdvanceVT Leadership Fellowship. The fellow will be appointed Associate Director of the Fralin Center for Biotechnology, allowing her to work with the Director to learn more about the role of this individual in providing leadership and vision for the Center. She will also lead an effort to establish a Graduate Program in the Plant Sciences on campus; as part of this a Research Symposium will be organized in Spring 2005 involving participants from other institutions to discuss the future of research in the plant sciences and provide insights into successful existing graduate programs in this area.

**Ann Stevens** received a College of Science Certificate of Teaching Excellence, in recognition of her many contributions to high-quality teaching. Dr. Stevens has been a major force in revamping our microbiology course offerings. She teaches cell and molecular biology, microbial physiology, and specialized courses for graduate students. She has also advised many graduate and undergraduate researchers in her lab, and has served as advisor for the Biology and Microbiology clubs.

**Duncan Porter** has been selected as this year's recipient of the Thomas Jefferson Medal for Outstanding Contributions to Natural Science by the Virginia Museum of Natural History Foundation. This award recognizes Dr. Porter's life-long leadership in teaching and research, and his recent role as director of the Darwin Correspondence project at Cambridge University, England.

**John Cairns, Jr.**, University Distinguished Professor of Environmental Biology Emeritus has been inducted as an Honorary Member (the highest honor) into the World Innovation Foundation (W. I. F.). The W. I. F. is an international multidisciplinary consultative research group advising nations and their governments behind the scenes.

**Nicole Mammerella** a biology major who graduated in 2003, was recently selected as a National Science Foundation Graduate Scholarship, which appears to be the first such award given to a Virginia Tech Biology Major. Nicole is currently pursuing a PhD at Harvard.

**David Popham** received a 2-year grant from NIH to begin studying the germination process of *Bacillus anthracis* spores, the agent that causes Anthrax. This research may lead to better methods to decontaminate buildings that have been exposed to spores. Dave also received a 4-year grant from NIH to continue

his studies of cell wall synthesis in *Bacillus subtilis*. Studies of this process in actively growing bacterial cells are designed to identify targets for the development of new antibiotics. The cell walls of bacterial spores play important roles in determining the extreme heat resistance of these cells. An understanding of the details of how this structure is assembled can lead to better methods for preserving food and for cleaning up spore-contaminated sites.

**Derrell McPherson**, who recently finished his PhD working with David Popham, received the 2004 Outstanding Dissertation Award in Sciences, an honor given by the graduate school. Congratulations to Derrell for his hard work and success, and to David for his excellent mentorship!

**Hilu's Work Top Story In Recent American Journal Of Botany.** Flowering plants are the largest group of plants and contain just about all our food crops, said Khidir Hilu, whose research breaking into new grounds in the molecular evolution of flowering plants makes up the featured article in the recently released December 2003 issue of the American Journal of Botany.

Khidir gave an invited talk at the National University in Mexico on Recent Advances in Flowering Plants evolution. He will also give two invited talks in Europe, one at Milan University on Molecular Evolution in Angiosperms and one in Technical University Dresden, Germany, on Fast Evolving Genes in Deep Level Systematics and Evolution. That is in addition to his international collaborative work with colleagues in Mexico and Germany on dating the time of origin of various groups of land plants such as mosses, ferns, conifers and flowering plants using different types of molecular information.

**Bruce Parker's** 18 page "Review of Research Studies at Mountain Lake, Virginia" along with new data appeared as the lead article in the latest issue of *Banisteria* in February. The editors used one of Bruce's aerial photographs of the lake for the cover. A second paper on the hydrologic budget for Mountain Lake is in preparation.

**Joe Falkinham** and his colleagues, Dr. Nick Oberlies at Research Triangle Institute (RTI) in North Carolina and Professor Feras Alali of the Jordan University of Science and Technology (JUST), Irbid, Jordan have received an International Collaborative Biodiversity Group (ICBG) grant from the National Institutes of Health. The objective of the grant is to isolate and identify novel antibiotics for treatment of infectious disease and chemotherapeutic agents for treatment of cancer and central nervous system diseases. The source material for the new antibiotics and chemotherapeutic agents will be native plants and soil bacteria in Jordan. A second objective of the grant is to contribute to a description of the biodiversity of

*Continued on next page*



## Special Awards presented at the 2004 Biology Commencement



Dr. Jack Cranford

**Jack Cranford** was the recipient of the most influential professor award. Dr. Cranford is Associate Professor of Mammalogy and Ecology and has been at Virginia Tech since 1977, the year that he completed a Ph.D. at the University of Utah. Over the years, he has earned a reputation as one of the department's best teachers. Recently, his influence has multiplied greatly because he has taken on the roles of director of our academic advising center, and associate department head. Dr. Cranford, uses humor, compassion, and his skill as a teacher, to be an extremely effective mentor for our students. One student wrote of his teaching "*His personality and abundant knowledge gave us something to desire and someone to look up to*". Another said "*One can't ask for a better advisor about academic or career goals, for he has a sincere interest in you as an individual.*"

This year, the Departmental Graduate Student Teaching award went to **Chris Burcher**. Chris is a biology Ph.D. student working on stream ecology in the laboratory of Dr. Fred Benfield. Chris has been a teaching assistant in our department since fall of 2001. His students have described him as approachable, dedicated, fair, always willing to help, and fun. He has taught several different laboratory courses, always showing enthusiasm for the subject matter, and inspiring his students. The Biology Department appreciates the excellent job he has done in the classroom.

**Ms. Betsey Waterman** was recognized as the Department's most outstanding advisor. Betsey joined our department in October 2002, and has proven to be an extremely capable academic advisor for our 1300 undergraduate majors. But her work goes far beyond academics. She works tirelessly after hours to support many extracurricular learning and service activities. Her deep compassion is infectious, leaving a strong stamp on countless students, faculty and staff.



L-R Nicole Reynolds, Kristen Lucia and Morgan Nordstrom

The 2004 Outstanding Senior Awards were presented to **Morgan Nordstrom** and **Nicole Reynolds**. **Morgan Nordstrom** is president and founder of an organization called WORLD, which has established internet connections clinics in Kenya and volunteer medical personnel in the United States. Recently, Morgan and 12 other students traveled to Ecuador to deliver medical supplies and equipment to a hospital in Quito. Morgan remained in Ecuador for the semester to study at a nearby University and to continue volunteering. Morgan was also a teaching assistant for 2 years; she conducted undergraduate research with Dr. Timothy Long in Chemistry; and she held officer positions in several campus organizations. Morgan will be attending Eastern Virginia Medical School in the Fall. **Nicole Reynolds** has been involved in campus life in many capacities, most notably as the President of the Class of 2004 where she represented the interests of approximately 5000 other students. She has been involved in substantial ways, and often as a leader, with many campus organizations. Nicole has also conducted research both in the Biology Department and at National Institutes of Health. She recently defended her honors thesis on research conducted in Dr. Rich Walker's lab. In spring 2004, Nicole was selected as the College of Science Outstanding Senior and the Virginia Tech Woman of the Year. Nicole will be attending the Focus on the Family Institute in Colorado Springs, CO in Fall and she plans to attend medical school in 2005.

The 2004 Undergrad researcher award went to **Kristen Lucia**. Kristen has been involved in research in the Biology Department since Fall 2001. She first worked with Dr. Robin Andrews on life history features of chameleons. For the past 2 years she has worked with Dr. Jack Cranford, recently completing an honors thesis titled "*The effects of diet quality on the activity patterns of *Peromyscus leucopus**". Kristen has been an undergraduate teaching assistant at Virginia Tech, and an instructor at the Johns Hopkins University Center for Talented Youth. She is a member of several honor societies and plans to attend graduate school at Miami University at Ohio where she will continue her research on small mammals.