The BCMB Buzzzzzz ..........

Dr. Cynthia Peterson, BCMB

Excellence. This was the “buzz word” for me when I assumed the position as Head of the Department of Biochemistry and Cellular and Molecular Biology in August 2008 at the beginning of this academic year. I observe excellence each day in the steady work and accomplishments of our faculty, students and staff. I want others to see that excellence too. Of the many hats I wear as Department Head, none is more important than portraying that excellence to many audiences at every opportunity. Although we have faced many challenges this year with the uncertain economic times and decreases in university budgets, we are encouraged by the outstanding education and research achievements we have seen.

We began the 2008-2009 academic year with a retreat to the idyllic setting of Norris Dam State Park. Here the focus was on faculty and graduate students presenting new research findings and setting the stage for the next two semesters. We took stock of our strengths and recognized new expertise in our department. One of our key areas of excellence that has emerged in recent years is the area of computational biology. Core faculty who work in this area include Jeremy Smith, a UT/ORNL Governor’s Chair, Hong Guo and Jerome Baudry. A new faculty member, Dr. Tongye Shen, will join us in the fall of 2009 as the fourth member of this group. Their work is bolstered by the recent award of $65 million to UTK by the National Science Foundation to mount the world’s highest performance open-access computer for research. Other achievements by researchers at UTK this year underscore the prominence of interdisciplinary science that combines mathematics, computation and biology. We have been awarded two new training grants for graduate education that total more than $6 million. The National Science foundation has funded the first of these, an Integrated Graduate Education and Research Training (IGERT) grant for “Scalable Computing and Leading Edge Innovative Technologies (SCALE-IT)” (see http://web.utk.edu/~scaleit). The National Institutes of Health sponsors the other “Program for Excellence and Equity in Research (PEER)” (see http://web.utk.edu/~peer) that focuses on increasing participation of underrepresented minorities earning PhD degrees in quantitative biology. To top it all, UTK now houses the National Institute of Mathematical and Biological Synthesis (NIMBioS, see http://www.nimbios.org) with $16 million in funds for 5 years from the National Science Foundation, US Department of Agriculture and Department of Homeland Security.

I have had the opportunity to spread the word about computational biology at UTK by presenting to the Board of Trustees in October prior to an open house that brought individuals from across the nation to hear about these new programs. A feature article in QUEST, the lead publication from the UTK Office of Research, was published during the fall semester.

We now approach the end of the 2008-2009 academic year with the pomp and circumstance of graduation and the publicity of Dolly Parton receiving an honorary doctoral degree at the ceremony. We are proud of those among the ranks of our 350 undergraduate BCMB majors who will be graduating, and the eight students earning Master’s and PhD degrees this year. As this time draws to a close,
An interview with Assistant Professor Jerome Baudry

Assistant Professor Jerome Baudry joined the BCMB Department in February 2008 bringing with him an expertise in the structure and energetics of protein/ligand complexes. Dr. Baudry makes extensive use of computer models to understand how proteins perform their functions, and to discover small molecules (like pharmaceuticals) that could modify the function of these proteins. In addition to his research Dr. Baudry is active in both graduate and undergraduate teaching and service within the BCMB Department and the new UT/ORNL Center for Molecular Biophysics. Dr. Baudry obtained his Ph.D. in Molecular Biophysics with the highest Honors from the University of Paris-06, France (University Pierre and Marie Curie) and subsequently joined the group of Klaus Schulten at the University of Illinois at Urbana-Champaign as a post-doc. After his post-doctoral work, Dr. Baudry worked in the pharmaceutical industry in North Carolina, and then accepted a Senior Research Scientist position in the School of Chemical Sciences back at the University of Illinois. We would like to share with you a recent conversation with Dr. Baudry.

Can you describe for us the path that led you to your current interest in molecular modeling and computational chemistry?

I very much enjoyed studying biology as a new student, in particular my freshman/sophomore cell biology curriculum that I am now very happy to teach in BCMB. But at the same time I found that the senior biology curriculum was very phenomenological-oriented. In my senior year I really wanted to understand more the fundamental physics behind how biological molecules “do their tricks”. I took all the biophysics classes I could and I ended up majoring in cell biology and biophysics and being admitted in biophysics grad school. Dr. Paul Vigny, directing the Paris biophysics grad school, was doing a remarkable job developing the very interdisciplinary nature of this field, and I have very good memories of those happy years spent exploring a parallel scientific universe. During my first year in grad school, I attended a lecture about computational molecular biophysics. I was really fascinated by this very new and fundamental description of biology, and by the fact that this approach not only contributed to the understanding of biological results, but also allowed a predictive approach of biology. I managed to convince this lecturer to accept me in his lab for a long rotation. My first task was to try to build on newly published results about the energetics of small organic compounds’ hydration, and I became instantly hooked. Now the funny part of the story: the lecturer who gave this great introductory lecture on computational biophysics was Jeremy Smith, then a newly-hired group leader in France, and now UTK-ORNL Governor’s Chair and Professor here in our BCMB department; and the main author of this newly published article on which I worked during my rotation was Hong Guo, who was then finishing his PhD work in Harvard and who is now Associate Professor in BCMB. I would never have thought that we would one day become colleagues in the same department. This case of “double scientific karma” never ceases to amaze me.

With so many potential proteins and protein/ligand complexes to study, what principles guide your choices and shape the focus of your work?

My lab’s research projects are centered on how large biomolecules (like proteins) specifically recognize much smaller molecules (like drugs) and how we can design better drugs, or proteins with enhanced properties. These molecular recognition projects are applied in my lab on projects of a pharmaceutical interest, but also on projects of agricultural and chemical interest. For instance, I have worked quite a lot on how plants and insects engage in “chemical warfare”: insects want to eat plants, plants synthesize natural insecticides, insects evolve and express proteins able to detoxify the insecticides, plants evolve new chemical tricks, and so on. There is a mix of scientific, technical, industrial and economical criteria that all play a role in the development of a research project in my lab. An important factor then is the potential for applications beyond the fundamental studies: is there a pharmaceutical interest for my protein/ligand complex that will lead to a treatment for a clinical condition? Is there a potential for agricultural development of enhanced plant species capable of resisting in-

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Focus on an alumnus: David Weaver

Dave Weaver was both an undergraduate and graduate student in the department. He started at the UT in 1985 and left in 1994 with a Ph.D. After leaving the UT, he took a postdoctoral position in the Department of Pharmacology at Vanderbilt University. He continued pharmacological research when he joined Bristol-Myers Squibb Company as an investigator in the Department of Neuroscience in 1997. Two years later he was promoted to senior investigator and joined the Lead Discovery Department at Bristol Myers Squibb where he led a team of scientists engaged in drug discovery. In 2004, Dr. Weaver joined Vanderbilt University as a Research Assistant Professor of Pharmacology and Assistant Director of the Molecular Recognition and Screening Facility. There he established the then new high-throughput screening facility through the Institute of Chemical Biology. He is now quite busy in three positions. He is an Associate Professor of Pharmacology at the Vanderbilt University Medical Center, Director of the Vanderbilt Institute of Chemical Biology High-Throughput Screening Facility and Director of New Leads Discovery for the Vanderbilt Program in Drug Discovery. Dr. Weaver’s research currently focuses on creating technologies that facilitate development of new treatment strategies for neural and metabolic disorders as well as cancer. As part of this he manages and develops high throughput screens, informatics and a growing collection of chemicals (now ~300,000) that have potential for use in basic research and the development of drugs.

Despite doing very high powered scientific research and development, his path to this was not direct. As he describes it, he took an “inertial path” for most of his career following the path of least resistance. He came to the UT with the expectation that he would enter the family business (construction). Because he was good at science, his family’s expectation was that he would go into medicine. During his first semester at the university he came to the conclusion that he would not be going to medical school. He remembers loving his classes. In particular two classes stand out: “Reality and Consciousness” taught by Professor Michael Lavin and “Art History” taught by Professor Dorothy Habel. He felt that unlike the science classes he took (where a lot of memorization was required, but little thinking), these classes focused on asking questions and making a person think. He found a certain sense of freedom in being able to choose what classes he enrolled in. Early in his undergraduate career he paid for his education by working for the family construction business in the summers. However, during the second summer he took an intensive German class that meant he had to find a job in Knoxville. He had taken “Medical Microbiology” with Professor Gary Stacey and was struck by Dr. Stacey’s enthusiasm for the subject. So he decided to ask Dr. Stacey for a job. He got one ... as a dishwasher. Dave likes to joke that he broke too many dishes so they took him off that job. However, the reality is that he did a good job and was given additional responsibilities. First he took care of the research plants in the greenhouse and then started doing “wet bench” experiments. He continued taking science classes and doing research in the Stacey lab. Around 1988 or 1989 a new Assistant Professor, Daniel Roberts, showed up in the department whose research focused on calcium signaling and calmodulin. Dr. Stacey decided he wanted to integrate this kind of research into his own and sent Dave to the Robert’s lab to learn what he could. Dave describes the Robert’s lab in those days as “small with lots of critical thinking and drive to get research done”. Because the lab was small he got a lot of training directly from Dr. Roberts. He especially remembers that all members of the lab were encouraged to not only know techniques, but know the underlying principles that made those techniques work. He credits his time in the Robert’s lab as both an undergraduate and graduate student as preparing him for the challenges of doing science in his post-doctorate and beyond. The combination of Gary Stacey’s enthusiasm for research with Dan Robert’s drive and critical approach laid the foundation for his development as a scientist. It allowed him to do good science as an individual but also gave him the flexibility to pursue team science when he went into private industry.

As he put it at the end of the interview “I’m proud of going to UT. The scientific training I got, in particular in Dan Robert’s lab, was better than for most of my peers.”
The BCMB Buzzzzzz (continued)

we have taken the opportunity to celebrate the achievements among our ranks with a departmental awards reception. Please see the article about this event on page 6 and note the long list of honors! Others in BCMB have been recognized with awards from national organizations. Our previous head, Dr. Bruce McKee, was named as a Fellow of the American Association for the Advancement of Science, one of the highest honors that can be bestowed on a research scientist. Also, a third-year graduate student, Rebecca Wilson, has been awarded a Graduate Research Fellowship from the National Science Foundation. This has been an extraordinary year for our department. This is excellence.

Scholarship and education

The heart of our department is the blending of the educational mission with that of scholarship. The typical faculty members in BCMB are actively engaged in that as well. This is most easily quantified in the publications by the faculty and grants received by the faculty. In 2008 there were 43 publications and grant and contract expenditures of almost four million dollars. A list of publications can be found by going to the departmental web site http://web.bio.utk.edu/bcmb/ and following a link to publications.

The tie between the educational mission and scholarship is sometimes not readily appreciated. The faculty are supported in this activity by the graduate students and postdoctoral fellows recruited into the department. In addition, there are numerous undergraduates who work in our faculty members laboratories pursuing research projects, learning to design and conduct experiments and to analyze results. Fall semester of 2008 there were fifty-five undergraduates working in faculty laboratories and this spring semester there were fifty-six undergraduates participating in this activity. Many of these students will be coauthors on publications in scientific journals. Many present their work at the Exhibition of Undergraduate Research and Creative Achievement (EURêCA), an annual event that showcases research and creative activities sponsored by the campus Office of Research. The experience of doing original research, the frustrations as well as the excitement of discovery, is at least as valuable an education as any classroom experience.

Faculty Highlights: BCMB Award recipients at annual Arts

Dr. Barry Bruce was recently cited by Forbes magazine (May 24, 2007) as one of 10 revolutionaries who are going to change the world.

In December of 2008, Dr. Bruce McKee received notification that he had been elected as a Fellow of the American Association for the Advancement of Science.

At the December 2008 College of Arts and Sciences annual Convocation, four BCMB faculty members received awards. Dr. Barry Bruce received the award for research/creative achievement. Dr. John Koontz received the James R. & Nell W. Cunningham Outstanding Teaching Award. Dr. Dan Roberts received the Faculty Awards for Academic Outreach, recognizing excellence in academic outreach. He directs the Junior Science and Humanities Symposium, an annual competition among high school students from across the state of Tennessee. Dr. Beth Mullin received the College of Arts and Sciences Advising Award acknowledging outstanding advising in Advising Services in the College. Below are Drs. Bruce, Koontz, Roberts and Mullin.

Fall semester of 2008 there were fifty-five undergraduates working in faculty laboratories and there were fifty-six participating in this activity in the just completed spring semester.
Andrea Ward Martin invited to White House

Andrea Martin, a December 2008 graduate from BCMB, received a special invitation to the White House in the summer of 2008. She was invited as one of an elite group of students who have earned the Presidential Volunteer Service Award over the last several years. The Presidential Volunteer Service Award is an honor bestowed personally by President George W. Bush. According to the official Freedom Corps website, it is given to those who have volunteered 4000 hours or two years and who help "bring us closer together as families, as neighbors, as communities and as a Nation.” Individuals who have received the Presidential Volunteer Service Award were invited to the event along with their immediate family members. Andrea attended with her husband, Ryan Ward, who also a UT student.

Andrea was unknowingly nominated for this award. She participated in a series of inter-views with White House staff and was selected to receive the award in 2004. She was bestowed the award when she greeted President Bush as he stepped off Air Force One in Nashville, TN on August 30, 2004. She was honored for her work with a home for troubled girls through Mercy Ministries. She moved from her home in Kansas to Tennessee for the sole purpose of volunteering for this home during an interim period between high school and college. This is a home for girls ages 13-28 who struggle with issues such as eating disorders, drug and alcohol abuse, physical and sexual abuse, and unplanned pregnancies. It is a live-in counseling center for the girls and women that seek help to turn their life around. It is completely free of charge.

The invitation came complete with the presidential seal and reads: “The President cordially invites you and your immediate family members to his remarks on Volunteering.”

Faculty Honors:

In 2002 Elizabeth Howell had an image of the protein she is studying selected for the cover of the Journal of Computer Aided Molecular Design. This work was a collaborative project with Maria Zarodsky and Leslie Kuhn from Michigan State University. More recently the National Science Foundation put out a call for a competition related to science as art and Liz submitted the image selected for the journal cover. This image was selected by the Molecular and Cellular Biosciences Division of NSF and now hangs in the hallway of the NSF building in Arlington, Virginia, as shown below. The image is a three dimensional representation of the plasmid R67 encoded dihydrofolate reductase which can transfer resistance between bacteria against the antibiotic trimethoprim and has an entirely different sequence and fold from chromosomal DHFR.
Celebrating excellence

The BCMB department gathered late in April with a beautiful view of the University of Tennessee from the 27th floor in downtown Knoxville at Club LeConte to reflect on a year of success and recognize excellence among our undergraduate and graduate students, staff and faculty. Thanks to generous donations that have been made to the department, we were able to offer scholarships and cash awards to our most outstanding majors, staff and faculty members. This year marks the inaugural year for three undergraduate fellowships and scholarships. First, the Emmett and Nannie Hale Fellowship for Predentistry recognizes an undergraduate with an excellent academic record and career aspiration for dentistry. Our BCMB Research Scholarship recognizes a student who has been actively engaged in undergraduate research with aid towards tuition and a stipend to support their lab work. Finally, the C. W. Fite Fellowship for Outstanding Professional Promise recognizes an undergraduate student who demonstrates excellence in their academics and professional development activities. For graduate students, we have three new awards for research and teaching, endowed with gifts by the Holton, Wright and Kouns families. Faculty who have distinguished records in teaching and research, along with staff members who contribute uniquely to our teaching and academic mission, were also recognized with awards at the reception.

Staff Awards from BCMB:
Teaching: Randy Brewton
Non-Technical Service: Angela Gilley
Technical Service: Ron Johnson

Undergraduate Awards and Scholarships from BCMB:
Top BCMB Graduate for 2009: Andrew Sneed
Emmett and Nannie Hale Fellowship for Pre-Dentistry: Kevin Kuo
BCMB Research Scholarship: Stacey Nicole Lee
C.W. Fite Fellowship for Outstanding Professional Promise: Payal Sharma

BCMB Graduate Student Awards:
Holton Plant Sciences Award: Justin Vaughn
Wright Research Award: Adrienne Norris
Kouns Excellence in Teaching Award: Sumit Goswami

BCMB Faculty Awards:
Junior Faculty Outstanding Teaching Award: Assistant Professor Ana Kitazono
Senior Faculty Outstanding Teaching Award: Professor John Koontz
Junior Faculty Distinguished Scholarship Award: Assistant Professor Elena Shpak
Senior Faculty Distinguished Scholarship Award: Professor Liz Howell

In addition to these departmental awards, we had many students who earned recognition from elsewhere within the UT organization. Our top pre-health majors in BCMB were recognized with two scholarships from the College of Arts and Sciences. These include Mohammed Al-Wadel, Brandon Birckhead, Wesley Dutton, Noah Ehinger, Alison Charruf Frey, Brett George, Reem Hussein, Charles Lanman, Jonathan Lockhart, Jenna McKinnie, Nathan Stebbins, and Heather Williams, who won the Ed Hawkins Memorial Scholarship, and Buck Lyman, Alicia McClintock and Eric Mason, who were named with the Dr. and Mrs. Donald Bradley Sr. Scholarship. At the graduate student level, three of our students were recognized with awards from the Division of Biology. These include Amber Bible, who earned the prestigious Alexander Hollaender Fellowship of $6000, and Adrianne Norris and Hyuck-Joon Kang, who won the new Cokkinias Award of $1000 each.
sects and reduce crop damage? Those are definitely very important questions that I include in the project selection process.

**What factors led to your choice to build a career in an academic setting?**

I have done scientific research in quite a diverse set of environments: in academia, in the military, in national labs in Europe and in the US, and in the industry. I have a lot of respect for colleagues in all these settings. However, my home is in academia. Firstly, because of the importance of teaching; every trade understands the necessity of passing on knowledge from one generation to the other, but in academia this goal is a structural part of the job. I went for the tenure-track adventure partly because I wanted to teach, and here teaching and research come together naturally. The other reason why I wanted to work in an academic setting is that I believe that the path to discovery is as important as the discovery itself. As academic scientists we also answer for the openness and reproducibility of the discovery process and the confidential nature of the research in the military and in the industry was somehow a frustration for me, although I totally understand the need for secrecy in these settings. One thing I very much enjoy in my academic career and that I try to convey to my own students is that doing scientific research is like exploring an largely uncharted territory in the hope of discovering a treasure: finding the treasure is a very worthy goal indeed, but getting there is at least half of the fun (and virtually all of the effort, so we’d better do it well).

**You have been successful in recruiting undergraduates to work on projects with you. Can you describe a couple of projects that undergraduates are working on?**

First I would like to say that UTK undergraduates have a well-deserved first class reputation that extends well beyond the Tennessee and Southeast borders. Hence, part of what attracted me to UTK was the possibility to do quality work with undergraduates, which has a dual teaching/research interest for me. **And I have not been disappointed.** Some of my undergraduate students are working on fundamental and methodological aspects of computational biophysics, and some are working on more applied projects. My lab has a strong interest in the dynamics of methyl-rich amino acids side chains and their contributions to the structure, function and dynamics of proteins. One of my undergrads works on a very fundamental description of the mechanics of methyl rotations, mapping the effect of methyl groups’ environment using quantum-chemical approaches. A second undergrad is working on the dynamics of methyl groups in proteins, in particular HIV protease, studying how variations in methyl dynamics affect the binding of anti-HIV pharmaceuticals. I have several other important projects in collaboration with BCMB colleagues where undergraduate research plays a key role, and I am very pleased with my students’ work in all those projects. There are very important and positive things happening now at UTK now that aim at recruiting excellent graduate students and also to keep more of our top undergrads here in grad school. The SCALE-IT program for instance has been instrumental in having my senior undergraduate student deciding to stay in graduate school here rather than leaving for Vet school. This makes investing in undergraduate research all the more interesting for my lab.

**Finally I’d like for you to tell us a little about your family.**

I am married and we have three young boys aged 11, 9 and 4. My wife Laurence and I have been together since high school, so I like to see this long interaction as an irreversible process. All praises go to her, I am very grateful for her infinite patience and support in addition to all the work she does to keep the troops in line. Our boys are our joy. I wish I could design some kind of machine to capture even a tiny fraction of their energy: we would solve all current and future energy crises without having to rely on bio-fuel research. They’re having a great time in Karns Elementary School and they definitely enjoy the move from the north pole-like Midwestern weather to sunny Tennessee.
We are proud of the accomplishments of our graduates and our current students. The above chart indicates that a degree from our department has prepared students for a variety of career tracks. BCMB is a challenging major requiring a significant commitment of time and effort.

Where do our graduates go?

The BCMB contribution to undergraduate science at UT

The chart below shows a distribution of B.S. degrees awarded by the College of Arts and Sciences in the spring of 2008. Of the 161 degrees awarded, 86 were to BCMB graduates. The 113 graduates from the three departments in Biology, including BCMB, Ecology and Evolutionary Biology and Microbiology, represented about seventy percent of the total from Arts and Sciences and exceeded the 111 who graduated that semester from the College of Agriculture and Natural Resources. At any one time, the faculty in BCMB work with and educate between 65 and 70 percent of the total undergraduate biology majors in Arts and Sciences. This is reflected in the numbers of undergraduates doing research in our faculty members’ laboratories and the numbers enrolled in our upper division courses.
How do you get involved?

Your gifts make a difference! Over the years, we have been fortunate to receive generous donations from a variety of supporters, including former graduates, corporate sponsors, and philanthropists. These gifts keep the donors involved in the mission of the BCMB department,

These gifts have made it possible for us to offer three new undergraduate scholarships for the 2009-2010 academic year. Three Research Incentive Awards have been made to faculty who propose pilot projects that promise to lead to extramural grant funding from national agencies. The gifts sponsor graduate fellowships that support dissertation research on cutting-edge topics in modern biology. As you see from our article entitled, “Celebrating Excellence,” we held a departmental awards reception to recognize our top students, faculty and staff. We were able to provide $17,000 in scholarships, fellowships, and awards at this event.

There are many different forms of gifts that can be made. We receive both large and small sums that can be made as one-time undesignated gifts to our BCMB enrichment fund. With a contribution of $25,000 or more, an endowment can be established for which the principal is invested and interest earned becomes available for departmental use. Endowments can be specified for use according to the donors’ wishes and they can be given over a 5-year period. Some examples include endowments specified to benefit graduate students in BCMB, to fund faculty research, or to sponsor undergraduate scholarships. All of the gifts to BCMB are coordinated through the development offices at UTK, and appropriate tax benefits are always considered. For more information about gift giving to BCMB, please contact the Department Head, Cynthia Peterson (cbpeters@utk.edu, 974-5148) or Randy Atkins in the College of Arts and Sciences Development Office (matkin11@utk.edu, 974-2365).
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