

## Message from the Chair: A Year of Reflection



*Yongmin Kim, Ph.D.  
Professor & Chair*

The 2001-2002 academic year was filled with milestones for the Department of Bioengineering. As the new 2002-2003 academic year gets under-

way, I think it is important to pause for a moment to reflect on the past and assess our position. What have we accomplished? What new challenges do we face?

The Department of Bioengineering has a long-standing reputation for its leadership and excellence in research, education, and entrepreneurship. The 2001-2002 academic year helped further cement that reputation.

We had a banner year in terms of our educational programs. The department produced 21 Ph.D., 11 MS, 13 MME (Master of Medical Engineering), 6 BSE (old inter-engineering undergraduate program), and 2 BS BIOE (new undergraduate program) degrees -- more graduates in a single year than ever before. Twenty-one Ph.D. degrees in a single year is a remarkable achievement from many perspectives. Part of that success should be credited to the faculty and students, but also to our Student Services team who dramatically improved and streamlined assistance to our student body.

Of particular note is the success of our newly implemented BS BIOE degree program, which began in Spring 2001. In just over a year, the program has already produced its first two graduates -- one year ahead of schedule! It is becoming a very popular major among

the undergraduate student population on campus. We now have 43 students enrolled in this new degree program, with each admissions cycle filled with more and more stellar applicants. Also, we are admitting some students directly from high school.

In addition to education, the department broke new ground and surpassed itself in terms of research funding. We already have quite a few federally-funded research centers, but last year we were able to forge new ground by creating the Singapore-University of Washington Alliance (SUWA) in Bioengineering. In May 2002, University of Washington President, Dr. Richard McCormick, traveled to Singapore to sign the alliance into action. This new alliance will further enhance our research in the areas of Distributed Diagnosis and Home Healthcare and Engineered Biomaterials and Tissue Engineering, establish Singapore as a regional hub of excellence in bioengineering research and entrepreneurship, and internationalize the impact of UW research and education. The Alliance will build on the department's and UW's reputation for collaboration across multiple disciplines and boundaries.

Our faculty members have been extraordinarily successful in competing for and successfully obtaining federal grants. This expanding external funding enables outstanding graduate and undergraduate student training in research. By the end of the year, our faculty received more NIH funding than any other bioengineering and biomedical engineering department in the nation (\$9.96 million), and total research funding from all other sources was \$20.7 million, a departmental record.

Our interest and participation in entrepreneurial activities is also another aspect of our program that sets us apart. We have been prolific in our inventions (362), patents (212), and license agreements (75), and in Summer 2002, Teranode Corporation spun out of the department's research in the area of computational bioengineering. With the creation of Teranode, the number of companies that have spun out of the department's research now totals 25.

None of our accomplishments over the past year would be possible without the hard work and high quality of our faculty, staff, and students. For example, several of our faculty were inducted into national societies, including the National Academy of Engineering, and many were invited to be keynote speakers at a variety of events both domestically and overseas. Our students also earned top honors at the Biomaterials Society national meeting, and one received the Outstanding Graduate Student of the Year Award from the National Society of Black Engineers.

It has definitely been an exciting year of change and growth for us. There are always new opportunities to seize and improvements to be made, so the coming year will find us working towards the next level of excellence in our research, education, entrepreneurship, and service. With so much happening in the department right now, I would like to encourage you to learn more about us by viewing a short video that highlights all our programs at <http://depts.washington.edu/bioe>.

Best wishes for the coming year,  
*Yongmin Kim*

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## Albert Folch, PhD: A Serendipitous Beginning

"I started as a physicist," says Assistant Professor Albert Folch. "I became a sort of engineer because I had to learn a lot of engineering to build instruments. Then I met my wife, who is an accomplished neurobiologist, and through her I learned to appreciate the complexity of living systems. Bioengineering, simply put, offers me the opportunity to apply my serendipitously-acquired engineering knowledge to address my serendipitously-acquired biological curiosity."



Albert Folch, Ph.D.

This serendipitous beginning to a young academic career led Professor Folch from his home country of Spain to the University of Washington via a postdoctoral fellowship at MIT in July 2000.

Folch is deeply interested in understanding how the brain develops its functions. In particular, his lab explores the growth of embryonic neurons and muscle cells as they grow to form connections with each other in a cell culture dish. "In vivo, the growth

of neurons is orchestrated by several types of molecules; however, present studies only probe one type of molecule at a time. We need more complex studies, which are too time consuming to do with traditional techniques," says Folch. In response, his lab is developing technologies that permit the investigation of large numbers of single cells in culture. In turn, these new technologies enable new investigations in neurobiology.

In order to support his research, Folch applied for and received several research grants including the prestigious NSF Career Award in February 2001. He credits this early success to support from the department, the scientific community's interest in his specialty, BioMEMS, and the "merciless" critique of each proposal by his wife.

In addition to his research and grant writing, Folch also supervises seven graduate students, two postdoctoral fellows, one research assistant, and teaches two courses, BIOEN 302: In-

roduction to Biomedical Instrumentation, and BIOEN 455: BioMEMS. He enjoys the challenges of classroom teaching but has special relish for his role of advisor. "If teaching in the classroom is like coaching a bunch of kids to play soccer, teaching the students in your lab is like teaching your son or daughter how to play. I take responsibility and pride in their performance and intellectual formation," he explains. "The best part of my day is when I go to the lab and talk to my students to find out about their progress. My group is maturing to a point where I am actually learning from them as well and when that happens, it makes my day. It's sort of like the satisfaction of seeing your child kick the ball better than you, I suppose."

However serendipitous the beginning of his young career may have been, the middle and the end are sure to be filled with hard work and dedication. "I am very into doing science writing for the public as a side interest, but what I love most is doing research. I like the discovery experience – that exhilarating feeling you get when you see things that no one has seen before," he says. "I hope to do research until the day I die!"

## Lidstrom Named Howard Hughes Medical Institute Professor

Dr. Mary Lidstrom, Professor of Chemical Engineering and Microbiology and Adjunct Professor of Bioengineering, was named a Howard Hughes Medical Institute (HHMI) Professor on September 18, 2002.

The program was implemented to help close the gap between the traditional ways in which science is taught and the more modern, cutting edge ways of the research world.

"Research is advancing at a breathtaking pace, but many university students are still learning science the same old way – listening to lectures, memorizing facts, and doing cookbook lab experiments that thousands have done before," says HHMI Presi-

dent Thomas R. Cech.

In an effort to break this pattern, HHMI issued 20-\$1 Million dollar grants to professors at 19 different universities across the nation with the charge of taking innovation from their laboratories and translating it to the classroom.

Lidstrom has already been working on this very problem for the past two years via a federally-funded program. The funding from HHMI will give her efforts a major boost. Over the next four years, Lidstrom will use the \$1 Million to expand her current program, which includes a class designed in conjunction with UW instructors, including Bioengineering Professors

Paolo Vicini and Jeff Bonadio. The course, which is currently offered once a year, will soon be offered three times a year and introduces engineering students to biology from a systems-engineering point of view. Lidstrom will also work towards developing avenues in a variety of curricula through which students in all engineering majors can incorporate biology into their education.

"We will be providing opportunities for undergraduate research at the engineering-biology boundary," says Lidstrom. "The applications are tremendous, not only in the biomedical area, like genomics, but also in bioengineering, materials science, chemical engineering, and computer science."

## New Internship in Computational Bioengineering Yields Successful Results

The first Internship in Computational Bioengineering was hosted during Summer Quarter 2002 by the Resource Facility for Population Kinetics (RFPK), a research center within the Department of Bioengineering. Dr. Paolo Vicini, co-director of RFPK and Assistant Professor of Bioengineering, created and supervised the internship.

This new program was designed to stimulate interest in computational bioengineering among UW undergraduates. "In addition to making students aware of bioengineering as a major, we hoped to recruit students with computational interests to the BS BIOE program, and also encourage interested students from other departments to take computational bioengineering courses," says Kelli Jayn Nichols, Bioengineering Lead Academic Counselor. "And of course we were interested in providing a high-quality research experience to an undergraduate."

Forty-four students applied from ten different science and engineering departments. "I was surprised and very pleased by the high quality of the applicant pool," says Dr. Vicini. Each application was carefully reviewed and

the top four candidates were interviewed. Dr. Vicini selected Keith Craig, an undergraduate Electrical Engineering major. "Keith had strong math skills and a background in business as well as engineering. His clear interest in the position and level of maturity and experience made him the ideal candidate."

Vicini set Craig a complex task: to develop a preliminary pharmacostatistical model that would account for the breakdown in and effect on the body of LAAM (alpha-l-acetylmethadol), a drug with properties similar to methadone and used to treat heroin dependency. Craig assembled a collection of competing models that explained the observed time courses, then evaluated the models in terms of their explanatory power, and finally selected the best one. "I am very happy about the results of the internship. Keith's conclusions form a solid basis for further work on this data set. I am impressed by the dedication and high standards that he brought to the project, and I have become a strong proponent of undergraduate involvement in bioengineering research!" says Vicini.

Craig is also pleased with his experience. "I applied because I am interested in engineering applications in the medical field," he says. "I had a great experience and really learned how to approach a research problem. I always thought the task was to explain expected results. What I learned is that the more interesting problem is explaining the *unexpected* results."

His experience was so interesting that Craig is tempted to switch to the Bioengineering major. "I want to make sure that I get a bachelor's degree in an area that I can see myself working in for the rest of my life. After my bachelor's, I plan to go to medical school – and graduate school in BIOE is still a possibility."

Dr. Vicini plans to offer the internship again in Summer 2003. His success should pave the way for other departmental internships, including a new one in E-Medicine, also to be offered Summer 2003.

The department is pleased to expand on its current internship programs and thrilled at the opportunity to provide undergraduates with high quality exposure to the field of bioengineering.

## Call for Applications: New Tenure-Track Faculty Position

The University of Washington's Department of Bioengineering invites applications for a new tenure-track faculty position. The department enjoys a world-class interdisciplinary setting between engineering and medicine, with full access to premier research programs and cutting-edge instrumentation facilities across the institution. Applicants with expertise in any of five major education/research thrust areas are sought: Distributed Diagnosis and Home Healthcare, Engineered Biomaterials and Tissue Engineering, Molecular Bioengineering and Nanotechnology, Medical Imaging and Image-Guided Therapy, and

Computational Bioengineering. In addition, applicants with other research interests that will enhance the impact of our department on the field of bioengineering will be considered. New faculty will find a collaborative university culture with access to multidisciplinary centers of excellence in biomaterials and tissue engineering, nanotechnology, biological systems analysis, biomedical surface analysis, and genomics and proteomics.

Applications at the Assistant Professor level are particularly encouraged, although more senior appointments will be considered. Review of applications begins immediately and will continue until the position is filled. Ap-

plicants should submit a curriculum vita, list of publications, statement of interest and goals, proposed initial research program, and the names, addresses, and e-mail addresses of 5 references to: Professor Patrick Stayton; c/o Heather White; Department of Bioengineering; University of Washington; Harris Hydraulics Lab, Room 309; Box 357962; Seattle, WA 98195; USA.

The University of Washington is building a culturally diverse faculty and strongly encourages applications from female and minority candidates. The University of Washington is an Equal Opportunity/Affirmative Action Employer.

## Alumni Spotlight: David Basiji, Ph.D.

When I first meet David Basiji, bioengineering alum and Chief Technology Officer of Amnis Corporation, he is sitting in front of a camera preparing to be interviewed by a UWTV production crew who are doing a short film about the Department of Bioengineering. As the camera rolls and the interview begins, the director asks, "So David, can you explain to me what is bioengineering?"

There is a long pause. A smile breaks across his face until he is laughing and saying, "I have no idea what bioengineering is!"

He is clearly kidding and quickly launches into an explanation so thoughtful, that when he is finished, the director turns to me and says, "Well, I think that covers that question, don't you?!"

A few months later, when I asked him for a subsequent interview, I found out the more focused definition of bioengineering. "I love the requirement in bioengineering that you be a generalist -- able to understand problems in biology, and then develop the hardware, software, mechanics, optics, etc., necessary to address those problems", he says.

Basiji, who left the department after completing a Masters degree (1993), and a Ph.D. (1997), began a start-up company just after graduation. "Encouraged by some early commercial interest in my Ph.D. research, I helped form a start-up company to try and bring the technology to market. Unfortunately, the company folded after about a year when we all realized there wasn't really a market for what we were doing", he remembers. "We did see an opportunity in cellular imaging, however, and it seemed logical that once the genome was analyzed and the proteome was farther along, systems biology would really come into its own".

After researching existing cellular imaging technology and assessing what was missing, Basiji and his partners

came up with an idea for their own cellular imaging tool, and founded Amnis Corporation in 1999, which is located in downtown Seattle.

This new analysis tool, called ImageStream, combines multiple forms of microscopic imaging with the speed of flow cytometry to allow scientists to observe events occurring inside and on the surface of cells at rates exceeding 100 cells per second. The applications for this new tool in the biotech industry are endless. "I like to think we've got something pretty fundamental that could greatly advance basic research, drug discovery, and clinical diagnostics", says Basiji.

Both he and Amnis are closely tied to the Department of Bioengineering through their work with Cell Systems Initiative (CSI), a research group within the department. "Dr. Bob Franza, Director of CSI, has always been an enthusiastic supporter of Amnis' approach to cellular analysis. The close relationship and synergism between Amnis technology and CSI research has naturally led to collaboration between our organizations", says Basiji. "I received a great education from the Department of Bioengineering, and want those who come after me to benefit from my experience. It feels good to still be working so closely with UW."

The feeling is mutual.

"David's work at Amnis is a natural consequence of his versatility, curiosity, creativity, technological prowess,



David Basiji, Ph.D.  
BIOE Alum 1997

and (what is just as important in the world of start-up companies) his leadership skills. The technology that he is pursuing is novel and enabling for a wide range of studies of biological cells. I look forward with great excitement to his future accomplishments with Amnis", says Vice Chair of Bioengineering, Professor Paul Yager, who was also David's Master's thesis advisor.

Though it has not been very long since graduation and the birth of Amnis, so much has been accomplished and things are moving forward. "We believe we can advance the power of Amnis technology and applications by two or three orders of magnitude", he says. "Our team is incredibly creative, hardworking, and fun. There's a conviction that if we do a good job, we'll not only earn a great return for our investors, but in the process, significantly improve human health. I can't imagine a more rewarding thing to do".

As the interview draws to a close, and I think about all we've talked about, it is clear that David Basiji and Amnis are on the verge of something big.

And just for the record...he knows exactly what is bioengineering.

## Congratulations !

Chimbaugona Mkandawire, Ph.D. (11/02)

## Faculty and Students Retreat to Fort Worden

The 10<sup>th</sup> Annual Bioengineering Retreat, sponsored by the Bioengineering Graduate Student Association (BESA), was held October 12-13, 2002 at Fort Worden State Park on the Olympic Peninsula.

Activities began on Saturday morning with a welcome from Dr. Yongmin Kim, Professor and Chair of the department, who updated attendees on departmental funding and goals for the coming year.

Dr. Kim's welcome was followed by keynote speaker, Mr. Thong Le, Business Development Associate from Washington Research Foundation, who spoke on, "Venture Capital and the Current State of Biotechnology". The talk included a venture capitalist's perspective on biotechnology along with a current review of the biotechnology market.

One of the main objectives for the annual retreat was to welcome the incoming class of graduate students. Since some of them had only just arrived in Seattle, everyone participated in an ice-breaker that required each person to share an unknown fact about themselves with the group. One of the most unforgettable answers was from Associate Professor, Dr. Michael Regnier, who announced that he "doesn't eat meat without feet!"

Each year, the retreat features a faculty panel so that new students can get a feel for all the different kinds of research opportunities within the department, and current students can hear about exciting projects happening in labs other than their own. This year, the faculty panel consisted of one professor from each thrust area of research. Professors Pat Stayton (molecular bioengineering), Paul Yager (D2H2), Paolo Vicini (computational bioengineering), Xingde Li (medical imaging and image-guided therapy), and Viola Vogel (nanotechnology) answered both tough and fun questions about curriculum, research, as well as their personal motivations for getting involved in the field of bioengineering.



2002-2003 BESA Officers (from l-r): Greg Boggy, Tony Norman, Jason Hwang, Kareen Kreuziger, Jennifer Patterson, Elena Garcia, Wayne Kreider, Bert Tanner

Following the faculty panel, Drs. Regnier and Vogel presented research from their laboratories, which lead to many interesting questions about muscle mechanics as well as effective methods for shaking bacteria off lettuce!

The retreat was also a great time for students and faculty to relax and enjoy the beautiful setting at Fort Worden. With a brisk wind, sunny weather, and a clear sky, attendees spent time exploring Port Townsend, walking along the beach, hiking around the WWII bunkers at Fort Worden, playing soccer, volleyball, Frisbee, and football. Late that afternoon, students and faculty enjoyed a bonfire near the mule barn, and after a full day of panels, presentations, and exploring, a warm fire complete with roasted marshmallows and S'mores was the perfect way to end the day. To close out the festivities, everyone attended a party that evening, where PhD candidate, Arthur Chan, acted as DJ, and students and faculty danced, sang, and socialized into the night.

The following morning was filled with student research presentations by Arthur Chan and Tim Strovas, who

presented their research on high intensity focused ultrasound therapeutics and metabolic monitoring, respectively.

Overall, the retreat successfully accomplished its purpose of being an opportunity for faculty and students to learn from an industry keynote speaker, share research and ideas in a variety of formats, and build camaraderie. We all had a great time and hope to see you again at next year's retreat!

Sincerely,  
**2002-2003 BESA Officers**

**Produced by  
UW Department of  
Bioengineering**

Box 357962  
Seattle, WA 98195-7962  
Tel: 206.685.2000  
Fax: 206.685.3300  
<http://depts.washington.edu/bioe>  
[bioeng@u.washington.edu](mailto:bioeng@u.washington.edu)

**Yongmin Kim, Ph.D.**  
Professor & Chair

**Marguerita Jensen**  
Administrator

**Neela Das**  
Managing Editor & Reporter



75-5305

University of Washington  
Department of Bioengineering  
Box 357962  
Seattle, WA 98195-7962

# Thank You

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