

At the Interface of Work and Play

As study buddies and roomies, three PhD students have become phenomenal friends.

By Sarah Achenbach

Any other time, it would be the beginning of a bad joke. What do Mrs. Claus, Army Barbie, and a biker chick have in common? If you're Meredith Bauman, Susan Napier, and Melissa Travers—good friends, PhD students, and decked out in those Halloween costumes—the answer is a lot, actually.

In fall 2003, when Bauman, Napier, and Travers entered the Whiting School of Engineering, they comprised half of the PhD candidates admitted to Chemical and Biomolecular Engineering. The list of similarities goes on from there. All three majored in chemical engineering as undergraduates. They are all smart, articulate, kind, and enthusiastic 23-year-olds who plan to graduate in 2008. (Bauman's energy level alone could generate enough power for the Homewood campus.) They love to play the board game *Cranium*, teaming up to beat (usually) their male friends and significant others. Hailing from very different states—Bauman's home is Neptune, New Jersey; Travers comes from Fayetteville, North Carolina; and Napier's hometown is Oceanside, California—they love exploring Baltimore together.

Like many friendships, circumstances brought them together. They met during an admitted applicant weekend sponsored by Chemical and Biomolecular Engineering in April 2003, and hung out together. Bauman and Travers were assigned as roommates for the weekend. "We were both really excited about Hopkins and had a lot of fun that weekend," recalls Travers. "We decided that if we came here, we should try to live together. Then we found out that Susan was enrolling, so we asked her if she'd like to live with us."

They chose a bright apartment across from the Peabody Institute in Baltimore's Mt. Vernon neighborhood, a location they selected for its proximity to the Inner Harbor and the Johns Hopkins shuttle. The overall interior design is Early Graduate Student: well-worn sofas, neglected plants on the patio, and very little on the walls. (Travers took her museum shop prints with her this year when she moved to another apartment.) She admits, "I am still here all the time." Bauman laughs as she surveys piles of catalogs and books. "We're not that neat," she says. "Our apartment usually looks like boys live here." Napier interjects: "Well, *clean* boys, anyway."

Early on, they discovered that what seemed natural to them was actually quite unusual in the graduate program. "Out of six incoming students, three of us were women," explains Napier. "The fact that we all lived together was even more unique." If graduate

students do live together, says Travers, it's often out of convenience or because they're in the same lab group. "We were drawn to each other and became friends," she adds.

Says Michael J. Betenbaugh, professor and chair of Chemical and Biomolecular Engineering, "These three women bring an amazing amount of positive energy to our department, both in their interests for the department as a whole and in their dedication and support of each other. They are some of our top students academically but they also have taken the time to make sure the department has a positive social atmosphere as well."

Case in point: the department's first-ever Halloween bash in October 2003. The department had sponsored a friendly competition among the graduate students for the best departmental happy hour. The three friends didn't hesitate when it came to choosing the party they wanted to host. "We got hay bales at a pumpkin farm and trucked them back in my car," Bauman recalls. "We bought dry ice in little cauldrons and made everyone dress up." Bauman went

as Mrs. Claus, Napier as Army Barbie, and Travers as a biker chick. Napier adds, "People told us

that it was the best party they had ever been to at Johns Hopkins." They won the competition, with the prize being one of their favorite activities: going out to lunch, this time with the department.

They have assumed other leadership roles as well. Bauman was honored last fall as one of the first two

Schwarz Instructors in Undergraduate

Chemical Engineering Laboratory (see page 32), and Napier is the 2004-05 student representative to the Whiting School's Graduate Committee.

While they definitely heed the warning of "all work and no play," their friendship plays a pivotal role in their work. "Our first year, we were all taking the same core classes and all three of us would stick together," says Bauman, who graduated from the University of Virginia. Travers, a North Carolina State University grad, agrees: "When something was really, really hard, we worked together and made sure everyone understood." Napier also went to college in her home state, studying chemical engineering with an emphasis on bioengineering at the University of California, Los Angeles. "I thought graduate school would be more about setting yourself apart," says Napier. "But I've learned that using your friends as resources is much better than doing it all by yourself."

This approach was particularly helpful when all three took Michael E. Paulaitis's "Advanced Thermodynamics" course their first semester. "We had a hard project on programming," recalls Bauman. "So we all put in our limited knowledge and combined it," and did quite well.

Paulaitis, professor of Chemical and Biomolecular Engineering and of Biophysics, praises their intellectual tenacity. "The three of them typically dominated [class] discussions," he says. "Although

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Three Chemical and Biomolecular Engineering doctoral students—(from left) Meredith Bauman, Melissa Travers, and Susan Napier—quickly bonded after their first meeting, at the department's admitted applicant weekend.

they have very different personalities as students, they were competitive and always projected their individual ideas and opinions in class, regardless of what the other two thought. The friendship is special, though. I think it's a combination of their scholarly abilities and just being nice, enjoyable people to be around."

The three roommates excelled last spring in the oral qualifying examinations, thanks to each other's help, snack food, and a large dry erase board. To master the material in several textbooks, they set up mock oral exams in their dining room. A critical component of the exam is the student's ability to explain an answer, something their unorthodox study method addressed. "While Melissa was eating her peanut butter, I'd ask her questions," says Napier. "She would practice her answer on the board and present the problem to me and Meredith." Napier notes that each of them had meltdowns during that period. Bauman's sense of humor helped. "I'd say to them, 'It's 5 a.m. and we're still awake, so let's have cookies,'" she laughs.

They decided not to confer with each other when choosing a lab group for the duration of their doctoral studies. "We didn't want to sway decisions one way or the other," says Bauman. "We ended up not having the same first choice at all." Napier joined associate professor Konstantinos Konstantopoulos's lab group and researches cell adhesion molecules involved in cancer metastasis to create

more effective drug therapies and cancer detection technologies. Post-Hopkins, she plans to continue in biomolecular engineering. In professor Denis Wirtz's lab group, Travers investigates cell adhesion molecules on the single-molecule level using live cells. Her future plans include becoming a professor or a researcher in industry or government.

"The fact that we're doing different things now is helpful," explains Bauman. Her lab group with Betenbaugh attempts to engineer cells by altering their DNA and expressed proteins to try to prevent programmed cell death. "If I don't know how to start something in lab, and I'm telling Susan, she'll say 'Oh, we do that every day in our lab.' They have equipment that I can use and because of our friendship, I don't feel bad asking a favor." After earning her doctorate, Bauman plans to head south and work as a researcher or head a biotech or pharmaceutical company laboratory.

Once a week, the three students head to a favorite lunch spot or find a new one. "We always see each other, even with me living in a different apartment," says Travers, adding, "If I wasn't getting married, I would still be living with Susan and Meredith." Adds Bauman, "People didn't believe that we would still be such close friends once we got to different labs." Yet despite their different schedules, labs, and advisers, the bonds of their friendship remain strong.

Student Inventors Compete in Singapore

By Bob Gray

Their low-cost cushion with sensors to prompt better posture proves they're no slouches when it comes to ingenuity.

“I’m one of those people whose mother was always telling them to sit up straight,” laughs Yen Shi Gillian Hoe ’04. That is exactly what judges did at the international Start-Up @ Singapore business competition (www.startup.org.sg/) last May when she and fellow inventors Bhuvan Srinivasan ’04 and Elbert Hu ’04 unveiled their plan. Their project, the Interactive Posture Analyzing Cushion (IPAC), is an innovative—and elegantly simple—device for improving and maintaining good posture.

As Biomedical Engineering seniors at the Whiting School of Engineering, the three first teamed up during a January 2004 Intersession course called “Honors Instrumentation.” They had three weeks to design, research, and build a prototype of a functional medical device.

Using easy-to-buy, energy-efficient parts, the IPAC was, according to Hu, designed to fit a niche between “expensive ergonomic chairs and non-interactive software alarm systems” currently available for improving posture. According to their IPAC business presentation, 80 percent of Americans experience back pain, and ergonomic hazards account for 35 percent of the Department of Defense’s \$600 million bill for civilian workers’ compensation.

Says Hoe, “Knowing what we did about sensors, we figured we could create a device that doesn’t force you into a posture, as expensive chairs do. We were looking for a less expensive and more flexible solution.” The resulting device features a seat and back cushion with built-in sensors and microcircuitry that wirelessly communicates with a tabletop box with LED displays. The displays alert users when their posture is poor and when they need to get up and stretch.

After the IPAC won “best in class” for technical excellence, the team was encouraged to develop a business plan for transforming its good idea into a great product. Their plan took third place in the annual Business Plan Competition sponsored by the Center for Leadership Education, and at the Greater Baltimore Technology Council Mosh Pit business plan competition. With support from Murray B. Sachs, Massey Professor and director of the Whitaker Biomedical Engineering Institute at Hopkins, the team decided to search for more competitions to test its idea.

“We looked on the web and found tons” of international venues, explains Srinivasan. “The one that was closest to the time we were working on the device was Start-Up @ Singapore. The top prize was \$30,000, and that was very interesting,” he says. The competition attracts college teams, start-up companies, and others.

Their team applied and made the semifinals at the international competition. That’s when Biomedical Engineering really backed them. According to Hu, “There is no way we could have gone without the department. They paid for our airplane tickets, and they were all so supportive.”

Preparing for a competition on campus or in town is one thing. “When it came to going all the way to Singapore, presenting in front of judges we had never met, it was like being thrown out of our cocoon,” says Srinivasan. “If it had not been so extremely exciting, I would have broken down from nervousness.” All of them had been in Singapore before. Srinivasan, a native of India, attended high school in Singapore, where his parents still live. Hoe was born there but grew up in the Philippines. Hu was born in America but lived for many years in Taiwan, where his family is from. He had visited Singapore “once or twice for track meets during high school,” he says.

During their whirlwind trip halfway across the globe, they had little time to be nervous. According to Srinivasan, whose mom and dad provided them with lodgings in Singapore, “To this day, my parents claim they never saw me in May...and that I still owe them a visit.”

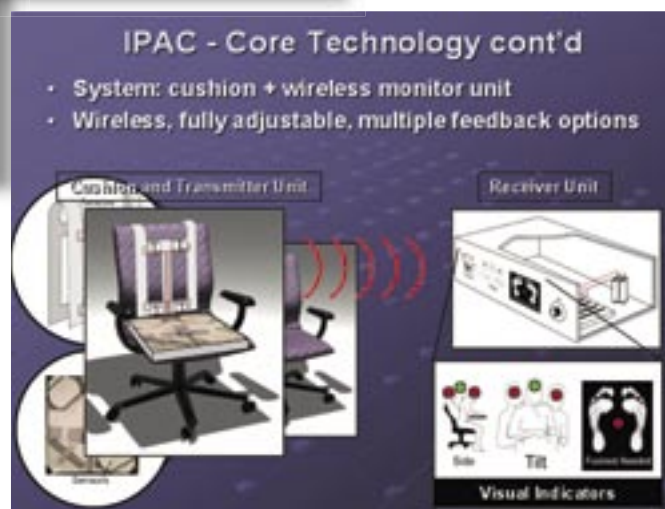
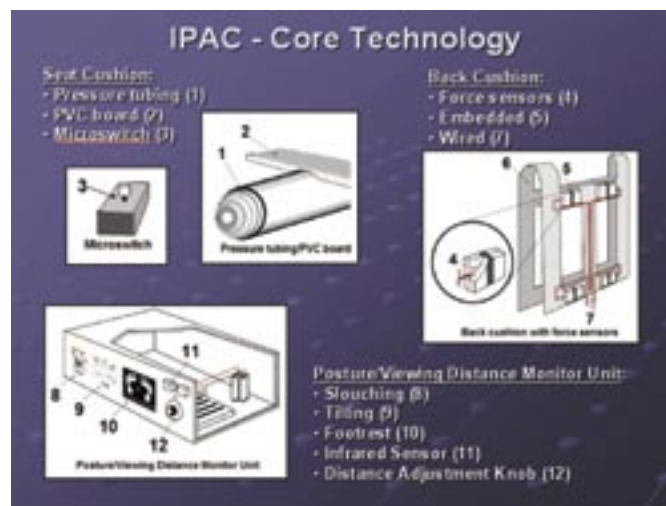
“Right after finals,” Hu relates, “we hopped on the plane to Singapore.” They missed Senior Week’s activities, but he wouldn’t have had it any other way.

“What had taken us days to create, we had to put back together in less than one hour.”

—Elbert Hu ’04



Taking third place in the annual Business Plan Competition on campus last April prompted three Biomedical Engineering seniors to try their luck internationally. Presenting their plan for IPAC (Interactive Posture Analyzing Cushion) are (from left) Elbert Hu, Bhuvan Srinivasan, and Yen Shi Gillian Hoe. In Singapore, they had to hustle when their business modeling software locked up.



Slides from the three students' PowerPoint® tell of the technology behind their interactive cushion. It can be retrofitted to chairs instead of having to buy expensive ergonomic ones. Its “friendly feedback/reminders” can help office workers prevent lower back pain, the second leading cause of absenteeism from work.

Every minute leading up to their presentation, they continued to work on getting it together and refining their ideas. “There was not much time for sightseeing,” Hu explains. “We had heard the judges were very interested in biotechnology because Singapore is seeking to become a hub of biotech for Southeast Asia. We were working on ways to push those aspects of the plan.”

As they hurried to make final changes in the last hours before their presentation for the panel of judges, they experienced every high-tech visionary's worst nightmare.

“We were finishing up at sunrise,” Hu recalls. “We kept thinking of more ways to sell the product and target additional customers.

We developed multiple versions of the product for corporate customers and individual customers. The plan was getting more complicated and branching out.” Srinivasan was crunching numbers as Hoe created new PowerPoint® slides to explain the charts and graphs. Then their business modeling software locked up. There was nothing to do but reboot, which dumped all of the valuable statistics, charts, and graphs.

“Bhuvan maintained his calm,” Hu says. “What had taken us days to create, we had to put back together in less than one hour.” The final half-hour before their appearance, they were at Srinivasan's father's office, plugging in the last figures, adding new information, and frantically finishing slides. “And then we ran to the competition with the presentation completely recreated,” he recalls.

In the end, their IPAC idea did not win the top prize. Hu speculates that this might have been because “Asian audiences don't really have the regulatory climate that we have here, so appreciation of the importance of the IPAC” may not have been as great as the team anticipated.

But the experience was not wasted on the participants. Hoe says, “We all had a great time and truly appreciate the University's sponsoring us. It feels like they really want to support new ideas, that they encourage students to extend themselves just as far as they will go.”

All three demonstrated their ingenuity with other projects as well. Hu and Hoe (now graduate students in the Whiting School) as undergraduates were part of a Whiting School student team that invented a medical device to precisely measure the conductivity of a pregnant woman's cervical tissue, thus preventing premature delivery. Hoe also was on the student design team that invented an unobtrusive wireless device to measure the amount of force a physician or midwife uses in delivering a baby. Now being tested at the Johns Hopkins Hospital, the device could help identify the safest method for delivery in complicated births. And Srinivasan was part of student research team that mapped the interaction of molecules within a cardiac cell; understanding these microscopic movements could lead to predictions of what's happening in the heart. The students presented their findings at two prestigious computational biology conferences. Srinivasan was delighted to find how much support Hopkins gives to undergraduates who undertake research.