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### A Different Light (Students)

Tim Obermiller

*Illinois Wesleyan University*, [iwumag@iwu.edu](mailto:iwumag@iwu.edu)

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## Students discover the hard work, and rewards, of lab research

By Tim Obermiller

### A Different Light

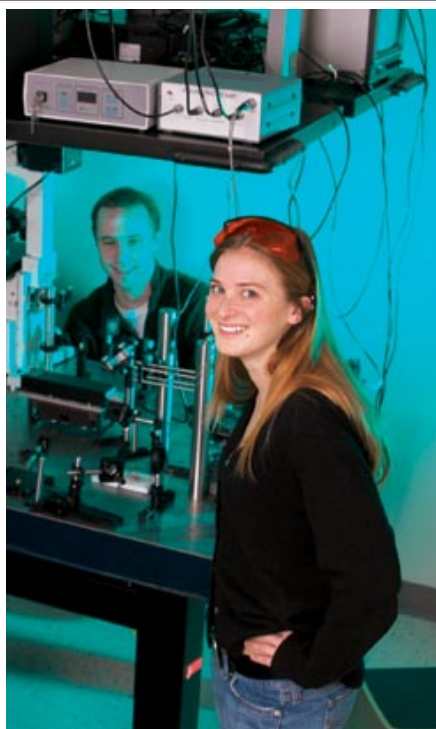
A revolving light, like the kind you see atop police cars, is attached outside the door of Gabriel Spalding's lab in the Center for Natural Science. It serves as a warning sign for visitors to keep out—and as a vivid reminder that what's going on inside is not child's play.

The light flashes when the lab's laser is in operation. This laser's maximum output is 5.5 watts. That doesn't sound like much when compared to, say, a 100-watt light bulb, but most of that bulb's power is expressed as heat "and this is all light, all concentrated," Spalding says of the laser, which he commends as "our workhorse. It really has a lot of power." When operating at full capacity, the laser could cause blindness to a person not wearing safety goggles who stared directly into the light. The beam itself can burn flesh.

Andrea Bulkley, a sophomore who is part of Spalding's research group, says she respects the laser's power but isn't apprehensive about working with it. "We have very careful safety procedures, so it's not a problem." Still, she recalls that when she took her family on a tour of the lab, the laser quickly aroused her mother's protective instincts.

Despite their initial concerns, her parents left with a positive impression, Bulkley says. "It's a little hard to explain to people what we do here (in the lab), but it helps when you can actually see it."

When Spalding came back from his sabbatical in Scotland last autumn, the lab was dusty with disuse. Bulkley and the other students rolled up their sleeves with Spalding to tidy up in preparation for the months ahead, which they spent setting up the complex optical tweezing array that by February was finally assembled and ready for use.



Bulkley (above, with Forster) says she now has a keen appreciation for what it takes to do research. *(Photo by Jamie*

Stukenberg)

It was Bulkley's first experience in a research lab. In the task of arranging the optical array — a labyrinth of lenses and mirrors that alternately expand and contract the laser light — she worked by trial and error. "When you move one part (of the array), pretty much everything has to shift. So we had to do a lot of measuring and remeasuring until we had it where we want it." Bulkley says she enjoyed this process "because I just like putting things together — I've always liked doing that. I think we all do, because we're physics majors. We like messing around with things."

Jason Forster, who is a junior physics major, likes Spalding's lab for the same reason. "It's nice because it's very hands-on. There's a lot of pieces and parts to put together and manipulate and that really helps you stay interested. If I were doing pure theoretical research in front of a computer I'd go crazy."

Forster was also attracted to this research, he says, because it fuses his twin interests of biology and physics. He's especially excited about an upcoming project to collaborate with a Northwestern University professor who has asked Spalding's group to use its array to analyze the forces necessary to stimulate inner-ear hairs. This research may lead to the improvement of cochlear implants for the hearing impaired.

Bulkley is eager to work on the same project, partly for personal reasons: her sister has a hearing loss.

Right now, Bulkley's work in Spalding's lab is voluntary. "Eventually maybe I'll be doing it for credit. But right now it's better if I'm not, because there's less pressure. If I have a busy week and maybe have to shift some hours, Gabe is very understanding. He has high expectations, but he also expects us to have a life outside the lab." For Bulkley, that life includes taking several non-science courses: she enrolled in a jazz history class this semester, and last May she was part of the first IWU travel course to Cuba, led by History Professor Michael Weis.

Although Bulkley is a physics major, she is also taking several biology classes, and right now plans to become a physician, following in her father's footsteps. Forster wants to study biophysics or biomedical engineering in graduate school, continuing the work he's started under Spalding.

As he looks to a future career in optical physics, Forster says that Spalding has aided him in focusing on his goals. "He's got his own ambitions but he's very intent on helping us advance in physics also." Spalding has helped students find internships at prestigious research universities, and several undergraduates working in his lab have been published as coauthors in major scientific journals.

Forster realizes that the lab's research has important, even life-saving, implications, but it's not something he considers much in his daily work. Still, "sitting at breakfast or something, I definitely do imagine the possibilities," he says.

For Bulkley, Spalding's lab has opened her eyes to the labor that goes into doing good science. "It's given me a lot more appreciation for people who do research, because it's really hard. People may read about an important discovery and think, 'How wonderful,' but they may not understand the amount of time and thought and planning that went into making it happen."

But Bulkley has found something even more important in the lab. "Not saying that other professors and their students don't have this — but from my own experience, I feel like this is much more of a family. These are my friends, we're working together, and it makes it that much better."

Bulkley is impressed with the fact that Spalding gives students who work in his lab a key so they can come and go freely. Sometimes, she says, she likes to go there after hours to study because it's quiet and she feels at home there. "I think Gabe really wants us to feel like this is our lab and our laser and our research. And because it

feels like it's your own, it's that much more important to you. It feels even more like something you're really proud to be part of."