

weillcornellmedicine

THE MAGAZINE OF
WEILL CORNELL
MEDICAL COLLEGE AND
WEILL CORNELL
GRADUATE SCHOOL OF
MEDICAL SCIENCES

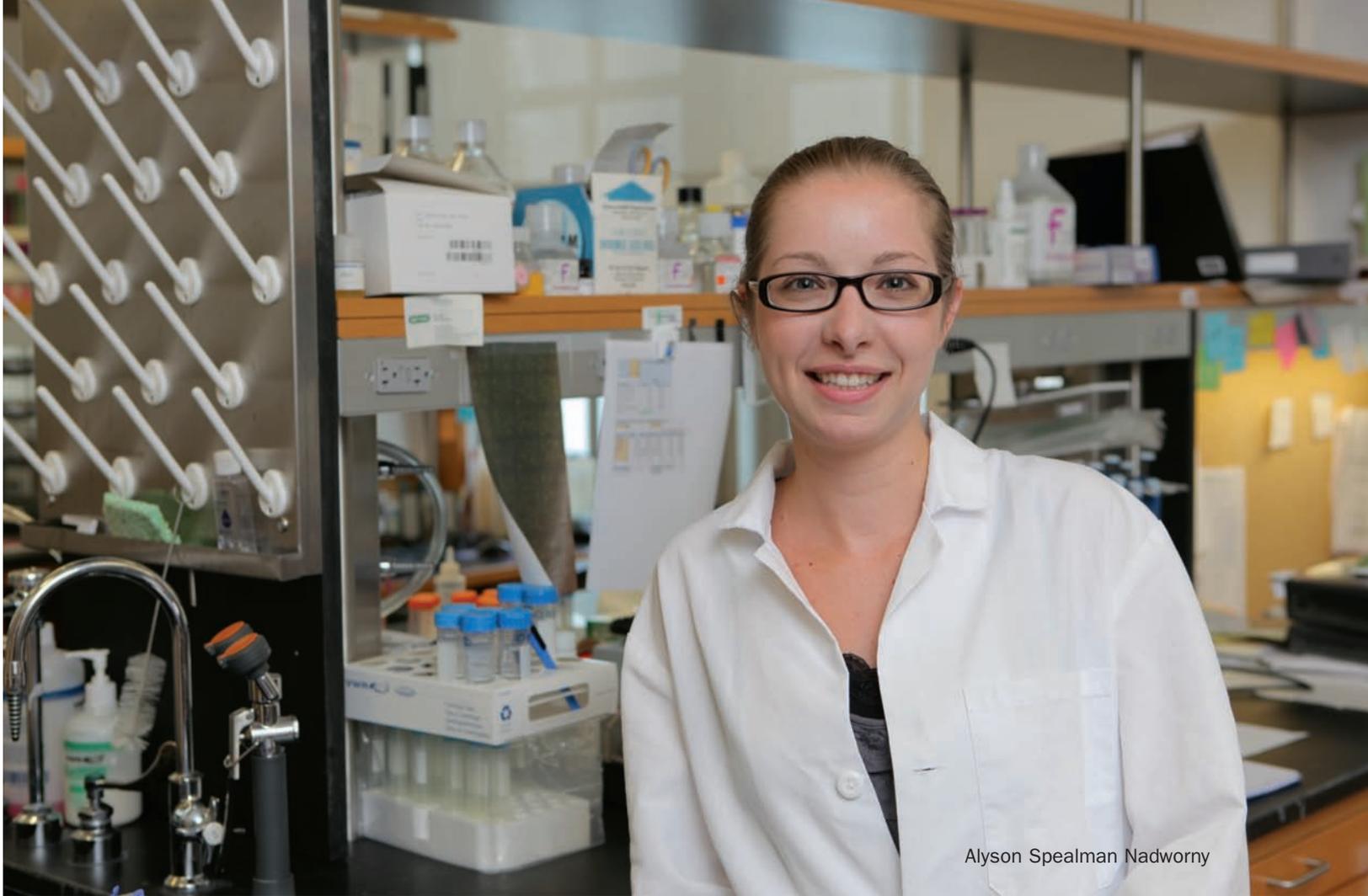
SUMMER 2011



Urban Explorers

Clerkships at affiliated hospitals give students a varied perspective





Alyson Spealman Nadworny

ABBOTT

Personal Growth

Under the mentorship of Medical and Veterinary faculty, graduate student Alyson Spealman Nadworny explores the potential for regenerating heart muscle

An injured starfish can grow new rays to replace those it has lost. A lizard will sprout a fresh tail if its original is removed, while larval salamanders can generate new eyeballs. But mammals don't fare so well in the realm of regeneration—especially in matters of the heart.

When a heart attack blocks blood flow and oxygenation to portions of the organ, the starved cells ultimately die. Absent the capacity to produce fully functioning replacement parts, our bodies substitute inelastic scar tissue. The heart compensates for the scar's constrained

pumping capacity with a host of structural changes that boost the risk of future myocardial infarctions—responsible for one in every six deaths in the U.S.

Doctors currently have one treatment option to compensate for the muscle damage associated with a myocardial infarction: transplant a new heart. Graduate student Alyson Spealman Nadworny has dedicated her training to investigating an alternative approach, one that seeks to duplicate the stem cell potential observed in the developing mammalian heart.

In 2010, the American Heart Association saw

'She can take a problem and break it into components and work through them systematically. That skill, combined with her intellect, is very powerful.'

sufficient promise in the work to award Nadworny a two-year \$44,000 fellowship to fund her studies under the mentorship of Robin Davisson, PhD, who holds professorships in cell and developmental biology at Weill Cornell and in biomedical sciences at the Veterinary College in Ithaca, and Michael Kotlikoff, DVM, PhD, professor of biomedical sciences and dean of the Veterinary College. "We're trying to understand the mechanisms at work in the cells at the molecular level, so that other people—or even us in the future—can design drugs or therapies that target the things that we find are going wrong," says Nadworny, who expects to finish her doctorate this winter.

Early in the course of fetal development, embryonic cells differentiate to produce, among other varieties, cardiac progenitor cells. Later, those progenitor cells further differentiate into the three types that populate the mature organ: smooth muscle, endothelial, and cardiac. Shortly after birth, progenitor cells in the mammalian heart rapidly decline and can no longer support significant regeneration after injury. Nadworny has focused her investigations on the genetic switches and molecular signals that control the process of differentiation, with an eye to future therapies in which the genetic status of cardiac progenitor cells can be recovered. "It's amazing that we have the potential to figure out how these progenitor cells become the different lineages in the heart," says Nadworny. "If we can understand those pathways, we can offer some pretty amazing cures for people who have suffered a heart attack."

As an undergraduate at the College of William and Mary in Virginia, Nadworny expected to pursue a career in medical sociology. But when a family member introduced her to basic science, she had a change of heart. At William and Mary, she had focused on refining her ability to design and conduct an experiment as a research assistant in cognitive psychology, leaving her with very little molecular biology experience. "When I came to Cornell, I had never used a pipette or centrifuge," she says. "They were foreign to me." Most grad school admission committees were skeptical of Nadworny's plans given her lack of lab experience, but Kotlikoff invited her to join his research group. "We can teach someone lab skills," he says, "but it's hard to teach motivation—that was the key thing. Aly is very enthusiastic, and she's always exquisitely prepared. She looks at things not just from the focus of her own experiments, but also sees the big picture and integrates that into what she's doing."

The infinite possibilities for investigation in the life sciences can make meandering among research questions a constant temptation, says Davisson. Yet Nadworny's mentor notes that she possesses both extraordinary organizational skills and a great capacity to focus. "She's practical about what tools she has at her disposal, what the goals are, and how she's going to bring those tools to bear on the problem at hand," says Davisson. "She can take a problem, a project, or a set of experiments and break it into components and work through them systematically in an organized way. That skill, combined with her intellect, is very powerful."

Davisson credits that drive and intellectual firepower with keeping Nadworny at Cornell. Two years into her program, Nadworny was torn between continuing her studies in Ithaca and sharing a home in Manhattan with her fiancé, then a law student at NYU. Davisson, who has research groups at both the Medical and Veterinary colleges, had a long-standing research collaboration with Kotlikoff. Nadworny approached the two about moving her home base to Manhattan, under Davisson's tutelage. "Aly is a very talented student who wanted to balance her work life and her personal life," says Davisson, who has made promoting work-life balance and mentoring women scientists cornerstones of her service to the University. "When she came to me, I said, 'We're going to do whatever we can to make this happen.'"

Nadworny works on both campuses under Cornell's Graduate Linkage Program, which facilitates the mentorship and research training of graduate students whose mentors have collaborations that span Ithaca and Manhattan. Typically, students spend only a few months at a time away from their home base, working briefly in a lab on the other campus. Nadworny has blazed a trail with her extended stay, working out a range of bureaucratic kinks in the process. She remains enrolled in Ithaca, but spends the bulk of her time at Weill Cornell. Since Davisson splits her time between the campuses, Nadworny submits regular progress reports by e-mail and participates in Davisson's twice-weekly research group teleconferences; she also attends meetings of the research group overseen by Weill Cornell professor of cell and developmental biology Heidi Stuhlmann, PhD. "It's definitely not the normal graduate student situation," says Nadworny. "Robin and Mike would never let me flounder, but I didn't know I was capable of becoming such an independent scientist."

— Sharon Tregaskis