



## Campus cell biologist makes up for lost time

*Editor's note: This is the first in a series of occasional profiles highlighting the people behind the research happening at CU-Colorado Springs. If you have a research-related story suggestion, please e-mail University Relations at [ur@uccs.edu](mailto:ur@uccs.edu).*

Karen Newell likes to joke that the first words out of her mouth are usually: "Hi, I'm Karen - sorry I'm late."

Understandable. As a teacher; the mother of an 8-year-old; a wife; and a scientist searching for treatments for cancer, AIDS, multiple sclerosis, and diabetes, some days are absurdly busy.

But on a recent spring day, as a visitor popped into her office at the CU-Colorado Springs science building to discuss her latest research, Newell not only was on time, but her calendar was cleared for an entire hour.

She had something important to say and it couldn't wait.

"I want an institute," she said.

Specifically, she wants something called the Institute of Bioenergetics. Ideally, it would house a large number of scientists at CU-Colorado Springs dedicated to testing her theory that the immune system can be triggered to repair or regenerate diseased cells. It would also provide an opportunity for students to work on groundbreaking research; become a hub of scientific collaboration; and put Colorado Springs at the epicenter of biotechnology innovation, creating a major economic force in the region.

And the clock, she said, is ticking.

"Some days I feel I am so blessed to have stumbled into this; to have this knowledge," said Newell. "But other days I feel like I'm carrying around this urgency and it feels like the weight of the world on my shoulders."

It's an urgency that stems, in part, from a late start.

Newell - an assistant professor of biology who brings more than \$200,000 a year in grant money to the university to support her research efforts -

### At a Glance

M. Karen Newell, assistant professor of biology

M. Karen Newell moved to CU-Colorado Springs as an assistant professor in June 1999 after serving as an adjunct faculty member at the CU-Health Sciences Center and as an assistant professor at the University of Vermont College of Medicine. She previously was an assistant professor in the Department of Immunology at CU-Health Sciences Center.

She earned her Ph.D. in Microbiology and Immunology from CU-Health Sciences Center and a bachelor's in microbiology from the University of Texas, Austin. Newell went on to do four years post-doctoral work at McGill University in Montreal, work at Denver's National Jewish Center for Immunology & Respiratory Medicine, and taught at the University of Vermont College of Medicine.

Her awards include post-doctoral fellowships from the Medical Research Council of Canada and the Leukemia Society of America.

She operates three labs, supervises 35 undergraduate lab assistants, teaches advanced immunology, vertebrate embryology, and bacteriology, and is on the board of Dartmouth Medical College and CU-Health Sciences Center.

The result of Newell's metabolic research has netted a growing patent portfolio, which currently includes more than 20 filed patents; publication in more than 40 medical journals; National Institute of Health funding, and corporate sponsored research funding totaling about \$200,000.

almost didn't get accepted to graduate school.

It wasn't that her beginnings weren't auspicious enough. After graduating from the University of Texas at Austin with a bachelor's degree in microbiology in the early 1970s she immediately got a stint as a research technician at the prestigious cancer research center M.D. Anderson Hospital in Houston. It was a heady time, she said.

"It was frightening in one sense because everyone we worked with was terminal," she said. "But I was also really inspired. I worked like a maniac."

She maintained that pace until the demands of the laboratory and two small children proved to be too much. Newell took a decade off to raise two now-grown kids. She parented with the same passion she brought to science, she said. But it was a decision that nearly cost her a career.

In the world of science, a 10-year hiatus can be deadly.

The University of Colorado Health Sciences Center accepted Newell as a returning student, but with qualms. They admitted her on probation and offered no financial support until after her first semester.

It turns out their instincts were justified.

Newell flunked her first biochemistry exam, earning just 7 out of 100 points. "I'd forgotten everything but the structure of water," she said. "I could see my career flying in front of my face."

But what they didn't count on was her tenacity. Newell retook the exam, set out to prove everybody wrong, and was the first student in her class to finish with a Ph.D.

When it came time to settle on a thesis project, she had to prove everybody wrong again.

Newell's idea for her dissertation stemmed from a mistake. She misheard a colleague make a claim about intercellular communication. Proceeding with the wrong assumption, she stumbled into a new area of research - one that professors initially pooh-pooed.

"My research adviser gave me one year to prove it," she said. "And I proved it."

It was a finding so significant it became the cornerstone of her current work.

"I've always, always, seen things differently," Newell said. "I don't know if it's the 10-year gap or because I'm wired backwards but I've always been a peculiar scientist."

Her work centers around the nature of T-cells - also known as white blood cells, or helper cells, which became part of the national vocabulary when AIDS began making headlines in the mid 1980s - and how T-cells recognize other cells.

Specifically, Newell is in the business of learning how to teach T-cells to do their job on command.

It seems that one of the keys lies in cellular metabolism, or, the way cells utilize fuel for energy. Newell's research has revealed that by altering the metabolic makeup of a diseased cell, the immune system can suddenly "see" the disease and kick into gear. Molecules that were formerly invisible now can instruct T-cells to do their job, which is to repair, regenerate, or attract other cells to promote repair.

Newell's research into tweaking cellular metabolism also indicates that it's possible to direct the immune system to ignore certain tissues, suggesting possible treatments for multiple sclerosis and rheumatoid arthritis, two instances where the immune system mistakenly attacks healthy tissue.

If a cornerstone of T-cell recognition and what happens when T-cells recognize a tissue originated in her Ph.D. dissertation, then it was a discovery in the early 1990s while a post-doctoral fellow at McGill that cemented her reputation as a mover and shaker in the field of immunology.

"My 'claim-to-fame' paper described a possible mechanism for T-cell loss during the latency period of AIDS," she said.

The scientific community called her scientifically fearless. And it became one of the most heavily cited papers in AIDS research.

"I guess my finding was the result of looking at intercellular communication heretically," Newell concedes.

"When I take personality tests it turns out I'm very atypical for a scientist. I'm a highly divergent thinker, while most scientists are extremely left brained - rational and local, linear and focused."

One admirer, Dr. John Freed, a professor of immunology at the National Jewish Medical and Research Center, said this about Newell: "Karen is one of those rare individuals who combines creative enthusiasm with critical scientific logic. She has the ability to take observations from seemingly unrelated areas and apply them to her system building logical hypotheses and designing experimental approaches to test them."

What Newell needs most now is time. She needs help with her research and help publishing her findings.

"I can't write fast enough," she said. "I need an institute."

What she has, instead, are 35 undergraduate students working in her labs and a handful of post-doctoral researchers, committed to her vision.

The hour is up and now Newell is running late for a class where an auditorium full of vertebrate embryology students wait. As she gathers her class notes, a young student, with a baby in her arms, taps on the office door. She wants Newell to explain a biology paper assignment.

As she goes over the requirements, Newell tells the girl: "It only needs to be five pages long." The student shifts her weight and the infant gurgles. "But those five pages need to be action packed." The student nods her head.

Newell is almost out the door when one of her post-doctoral researchers needs to speak with her. It's urgent.

Finally, as she races down the hall, Newell mentions that she's flying out in the morning for Salt Lake City to deliver a paper at the University of Utah.

Did somebody say action packed?