

Ideas on the Edge

Small World, Big Differences

THE YOUNG SCIENCE OF BIOPHYSICS ATTRACTED
MCMASTER UNIVERSITY RESEARCHER CECILE FRADIN
WITH THE PROMISE OF NEW DISCOVERIES.
NOW HER WORK IN THE MINIATURE REALM OF THE CELL
MAY HELP PRODUCE SOME BIG ADVANCES
IN HUMAN HEALTH.



CECILE FRADIN

As a young scientist looking at a career in physics research, Dr. Cecile Fradin faced a quandary.

“What I liked about physics,” says Dr. Fradin, “was that, potentially, you understand how the universe works. But my impression was that the important discoveries had been made a hundred years ago, and now we were just fleshing things out.”

And then there was the focus of modern physics on theory, and on dimensions of reality that tended either to the unimaginably small or the inconceivably large. “I like to see what I’m doing,” explains Dr. Fradin.

She found her calling in biophysics—a hybrid discipline that applies the principles of physics to biological functions.

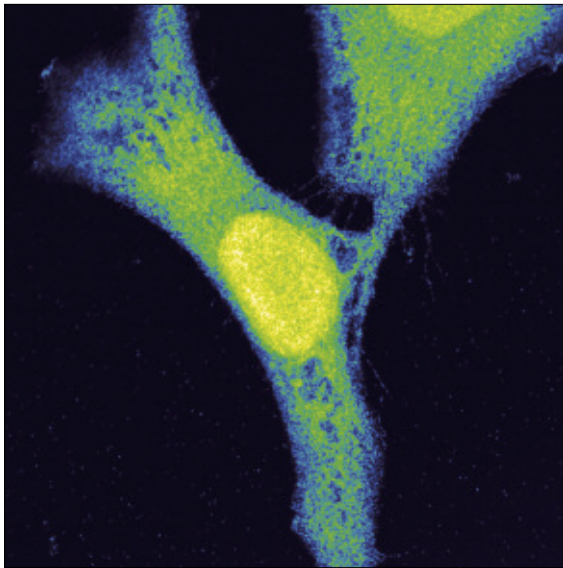
Because the field is

relatively new, major discoveries are still possible. And Dr. Fradin also found the prospects for experimentation more appealing. “This is an area where you can do microscopy and see your sample.”

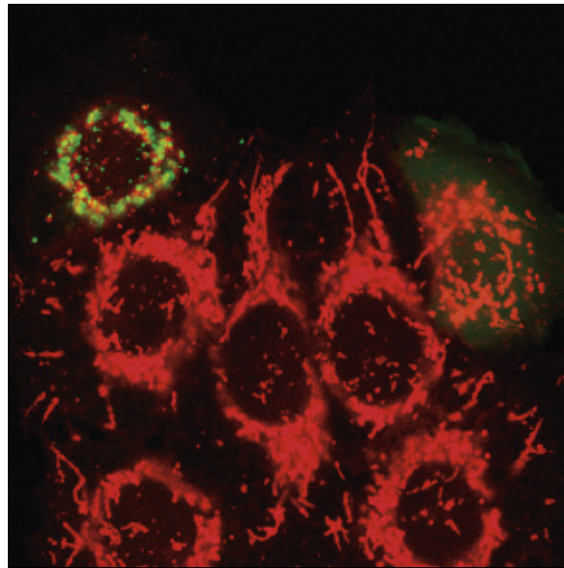
Dr. Fradin began her work at McMaster University looking at protein motion within a cell, and in particular how proteins move in and out of the nucleus. Her research led her to a collaboration with a biochemist at McMaster, Dr. David Andrews, on another aspect of protein motion—the movement of proteins in a cell during the

RESEARCH THAT MATTERS REAL-WORLD BENEFITS FOR ONTARIANS:

- potential for new diagnostic and treatment tools for cancer and other illnesses



An image of the Ran protein, which carries energy used for the transport of other proteins across the membrane barrier that separates the nucleus from the rest of the cell.



A cell, upper left, in the process of self-destruction—apoptosis. Green-dyed Bax protein has begun punching holes in the cell’s mitochondria, dyed red.

early stages of apoptosis, or cell death. Apoptosis is a natural process in the body for eliminating diseased or aberrant cells. When it fails, the result can be cancer.

test multiple potential therapies in advance, safely and quickly. Dr. Fradin is particularly focused on how to measure and maintain precise temperatures on microfluidic chips—essential for keeping the sample cells alive, but very difficult in such a highly miniaturized environment.

It’s the kind of challenge, however, that reaffirms her decision to work in biophysics. “If I was working in physics or engineering,” she says, “maybe I’d be making a better fridge. I’m happier doing something that has the potential to really make a contribution to human health, to humanity.”

Project: Optical Tools for the Study of the Dynamics of Biological Systems

Research Sector: Natural Sciences

Institution: McMaster University

Principal Investigator: Cecile Fradin

Trust Investment: \$242,000

CFI Investment: \$242,000

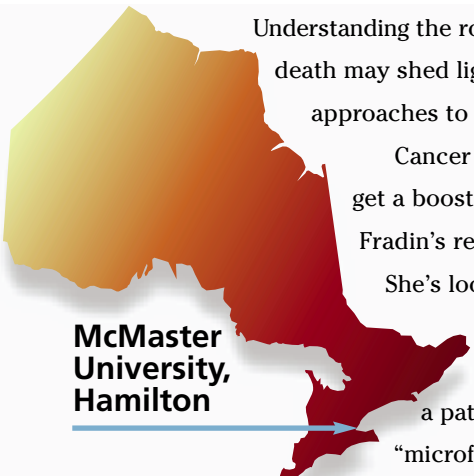
Total research investment from all sources: \$605,000

Understanding the role of proteins in cell death may shed light on new approaches to cancer therapy.

Cancer treatment may also get a boost from another of Dr. Fradin’s research projects.

She’s looking at how to introduce sample cancer cells from a patient onto a tiny “microfluidic” test chip.

Minute channels on the chip would allow the application of precise amounts of various drugs or other substances to the samples. The technology would enable doctors to



McMaster University, Hamilton



Ontario Innovation Trust

MaRS Centre, Heritage Building
101 College Street, Suite HL20
Toronto, ON M5G 1L7
416-977-9188 Fax: 416-977-9460
innovation@oit.on.ca
www.oit.on.ca

Infrastructure for Innovation About the Ontario Innovation Trust

The Ontario Innovation Trust was created in 1999 by the Government of Ontario to invest in research equipment and facilities at Ontario’s universities, colleges, hospitals and other non-profit research institutions. The Trust is governed by a volunteer Board of Directors, according to the terms of a Trust agreement established by the Ontario government. A small permanent staff looks after day-to-day operations.

Since its inception, the Trust has committed almost \$843 million to strengthen Ontario’s position in the global marketplace of ideas. This represents more than a third of the \$2.44 billion in total funding that has been invested in Trust-supported projects.