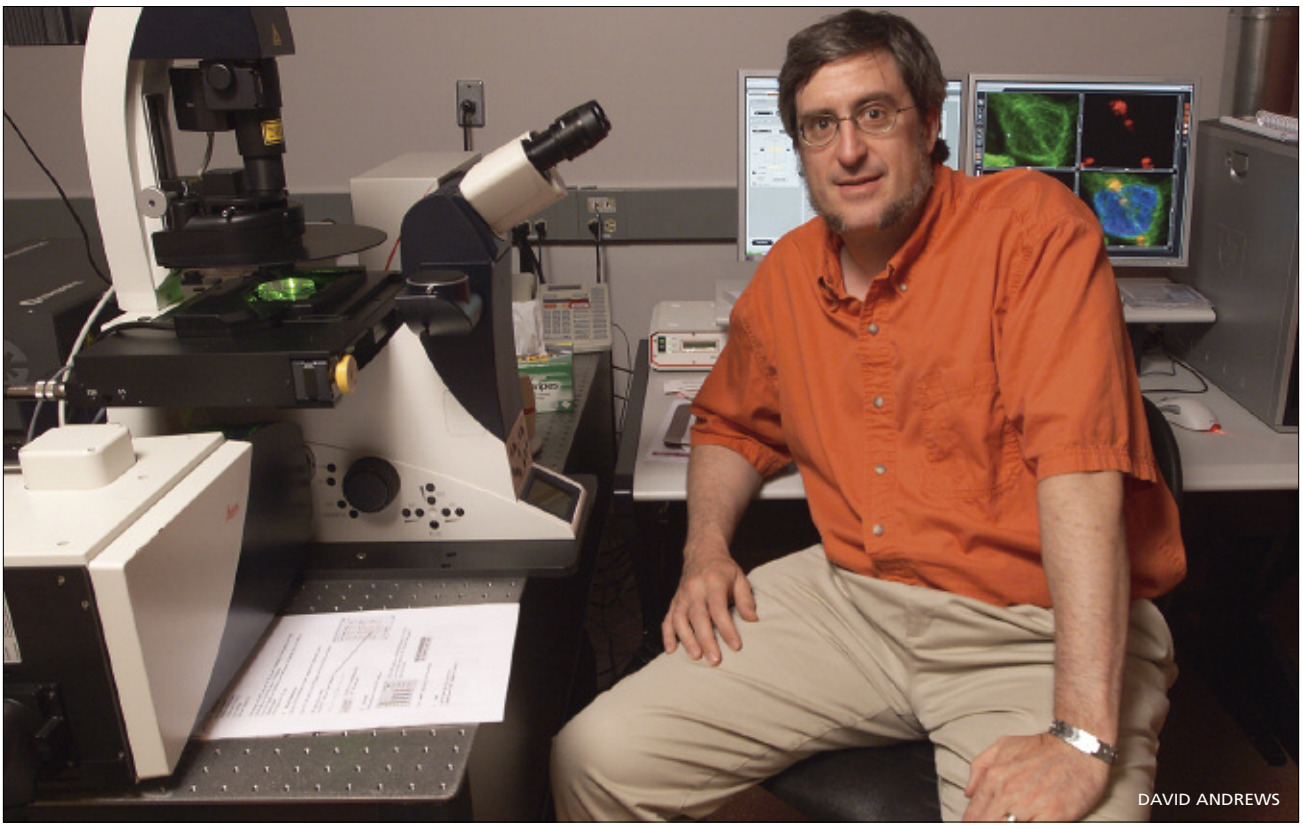
Ideas on the Edge



DAVID ANDREWS

A Marriage Made in Hamilton

BY COMBINING TECHNIQUES AND TOOLS FROM PHYSICS, CHEMISTRY AND BIOLOGY, MCMASTER RESEARCHER DAVID ANDREWS IS SHEDDING NEW LIGHT ON THE CELL AND HOW IT WORKS.

What do you get when you cross a microscope, a laser, a spectrometer and a robot?

There's no punchline—and even if there was one, it would only be funny to the owner of a Ph. D. But back in the late nineties, McMaster biochemist David Andrews thought the combination of technologies might reveal a lot about how cells work.

At the time, it was standard practice for chemists and physicists to investigate a substance by "exciting" its molecules with laser light and analyzing the resulting burst of fluorescence for clues about composition. At the same time, biologists were using fluorescent dye in order to track the activity of cells under a microscope. "What I wanted to do," explains Dr. Andrews, "was to take those instruments being used in chemistry and physics departments and attach them to those microscopes."

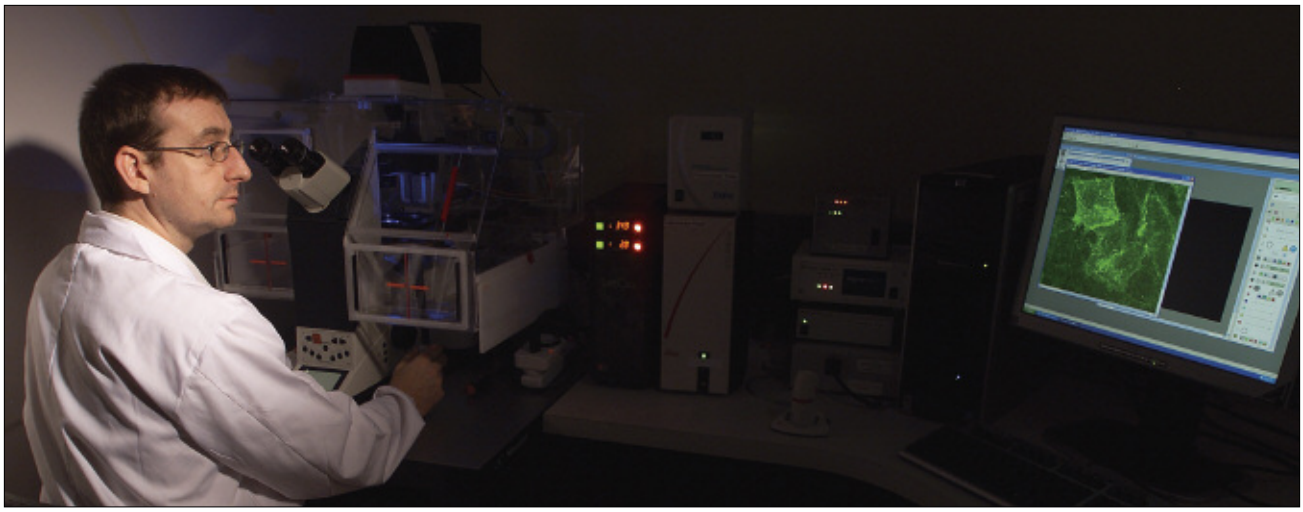
Flash-forward to the present, where Dr. Andrews presides over the McMaster Biophotonics Lab—built and equipped in part with the support of the Ontario Innovation Trust. The facility implements the marriage of technologies he envisioned, and is indeed revealing a lot about how cells work—knowledge that has significant applications for human health.

RESEARCH THAT MATTERS

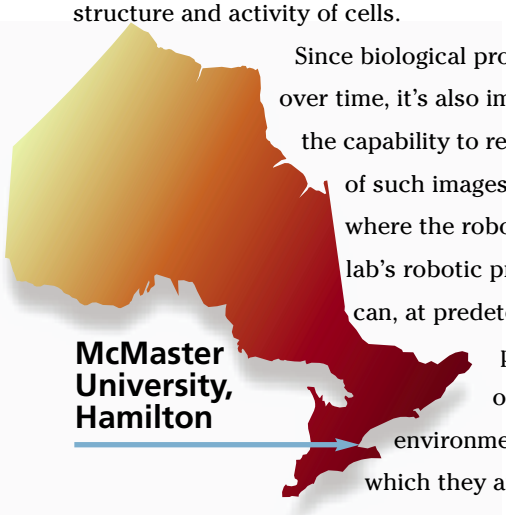
REAL-WORLD BENEFITS FOR ONTARIANS:

- new understanding of cell biology, leading to a variety of new and improved medical treatments

Dr. Andrews and his colleagues begin their investiga-



tions by tagging cell components with dyes or genetic material that makes them fluoresce in response to the flash of a laser. A spectrometer analyzes this "echo" of light in terms of intensity, colour and duration—then translates the data into incredibly detailed and information-rich images. Under the informed eye of a biologist, the imagery can yield unprecedented insight into the structure and activity of cells.



Since biological processes unfold over time, it's also important to have the capability to record a sequence of such images. And here's where the robot comes in. The lab's robotic preparation system can, at predetermined intervals, pull cultures out of the controlled environment chambers in which they are growing, image them, and return them to the growth chambers—all without cross-contamination or human handling.

Dr. Andrews is using the facility to explore how proteins move to the correct "targets" in a cell—the places they need to be to do their jobs—and how this protein targeting is involved in a cell's built-in capacity to self-destruct if it becomes unhealthy. The ultimate quest here is to create drugs that can repair this safety mechanism in cells where it's been disabled—in other words, cancer cells.

The lab serves many other scientists at McMaster as well, enabling them to pursue a range of research subjects that include Huntington's disease, antibiotic resistance and even cellular activity in soil. Scores of visiting researchers from other universities also use the facility every year.

It's all vindication of Dr. Andrews' original hunch that a marriage of technologies would produce a wealth of insights. As he says now, with a certain understated satisfaction: "We're learning a whole bunch of new things."

Project: Centre for Functional Genomics and Chemical Genetics
Research Sector: Life Sciences
Institution: McMaster University
Principal Investigator: David Andrews
Trust Investment: $3,020,431
CFI Investment: $4,383,153
Total research investment from all sources: $10,957,882

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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.