



Canadian Cancer Society

Bill Whelan's research offers renewed hope to prostate cancer patients.

An insider's view

Tiny sensors monitor treatment of recurrent prostate cancer

By Katherine Waller with files from Canadian Cancer Society and Dana Yates

Prostate cancer is the most commonly diagnosed cancer in Canadian men, accounting for almost one in four cancer diagnoses for men.

According to the Canadian Cancer Society, men who are diagnosed with prostate cancer have good odds of being successfully treated and ultimately surviving the disease. Of course, the prognosis primarily depends on three factors: the stage of the cancer when discovered, the Prostate Specific Antigen (PSA) test results and the Gleason score, which helps to describe the appearance of the cancerous prostate tissue.

Even when patients have undergone the standard treatments of hormone therapy, radiation therapy or surgery, the disease may resurface in some men and consequently become more difficult to treat. If Bill Whelan has anything to do about it, his groundbreaking research will return those patients to remission.

Dr. Whelan — an Associate Professor of Physics at Ryerson University and an adjunct professor of medical biophysics at the University of Toronto — is the project leader of the Optical Monitoring Program for Prostate Thermal Therapy, a new research initiative at the forefront of innovative real-time assessment of cancer treatments.

Based at Ryerson's Facility for Fundamental Biophysics Research and Development of Minimally Invasive Thermal Therapies — the first comprehensive facility of its kind at a Canadian university — Dr. Whelan and his research team at Ryerson and the Ontario Cancer Institute are developing a new optical technology for monitoring prostate thermal therapy. It involves inserting tiny, optical sensors into a patient. The patient would then undergo microwave thermal therapy, a new treatment that attacks malignant cells using heat. This therapy is currently being tested in clinical trials on patients with recurring prostate cancer.

To ensure that only the tumour itself is heated, Dr. Whelan is developing a computerized control mechanism that would continually adjust heat levels. Information from these sensors would be used to generate 2-D images showing when and where cell damage occurs.

Because unnecessary heating of healthy tissue can damage surrounding organs and cause unpleasant and uncomfortable side effects, research is now underway to determine the best ways to monitor and control the heat.

"Heat naturally travels. The optical sensors will provide information to (help us) decide when to stop treating to ensure that critical

continued on page 2

Health matters

Health and wellness are hot topics in the daily news. Whether it's health-care funding, breakthrough treatments or preventive medicine, health information attracts attention.

Academic discovery is a major source of health news. Through their research initiatives, universities invite us to see the world and live our lives in new and better ways. Ryerson University is no exception.

Our capacity to effect change through scholarly study, particularly in health-related fields, is growing. Moreover, Ryerson is leaving a distinct mark. Committed to being at the centre of contemporary issues, we are merging disciplines and reaching beyond ordinary research bounds. The results are evident throughout this issue of *Impact*.

Here's to your health.

Seeing (and hearing) is believing

Improving media for people with disabilities

By Gina Vaccaro

Many of us take the Internet for granted, but if web pages were written in a foreign language would they be as useful?

The Net can be a source of frustration for people who are deaf and use sign language. Accustomed to communicating through signs, they must switch to English when they surf the web. The experience, unfortunately, causes linguistic and cultural inequalities and, in some cases, a literacy barrier.

One person who wants to effect change is Deborah Fels of Ryerson's School of Information Technology Management. Her research provides people with disabilities greater access to media such as the Internet, movies and television programs.

Dr. Fels has a PhD in human factors from the department of mechanical and industrial engineering at the University of Toronto (U of T), as well as a master of health science in clinical engineering, also from U of T. Today, she works with six Ryerson master's students and a PhD candidate. Along with partners at the Canadian Hearing Society and the Adaptive Technology Resource Centre at the University of Toronto, they are developing Signlink Studio, a tool for those who communicate through American Sign Language (ASL). Signlink Studio makes it possible for websites to be tailored to the needs of deaf users.

Hyperlinks are the web's building blocks. Embedded in text, they enable users to move seamlessly from one web page to another. ASL-based web pages, however, have no text so hyperlinks are not an option. Signlink Studio links can be added in videos containing sign-language content.

"People ask why we don't just put text on a page and this is a common misconception," says Dr. Fels. "ASL is the foundation of deaf culture just as English is the foundation of our hearing world. Putting English text on a Signlink page would be like finding a language you don't speak on every web page."

Sensitivity to the needs of those with disabilities coupled with drive and determination has led Dr. Fels to even more projects. Her team has worked with Toronto production company Smiley Guy Studios to test audio captioning on the animated comedy *Odd Job Jack*. Also called video description, this service adds audio

explanations to TV programs and movies. These descriptions clarify elements about scenes, characters or settings that blind users might miss.

Dr. Fels has uncovered fascinating details about audio captioning. For example, audiences find third-person narrators more trustworthy and first-person narrators more entertaining.

Dr. Fels' research is supported by Science and Engineering Research Canada (NSERC), the Social Sciences and Humanities Research Council of Canada, Canadian Network for the Advancement of Research, Industry and Education (CANARIE), Heritage Canada, Communications and Information Technology Ontario (a division of Ontario Centres of Excellence Inc.), the Ontario Media Development Corporation, marblemmedia, Smiley Guy Studios, the Canadian Hearing Society and the Canadian Centre on Disability Studies.

To reach their intended audiences, services such as audio captioning require commercial partnerships, and Dr. Fels intends to attract that interest. For her, though, improving media for people with disabilities is part of the big picture. "As an engineer, you have a responsibility to make things that help people."

To experience Signlink Studio, visit www.aslpah.ca.

A world of possibilities: research by Deborah Fels will make media more user-friendly for people with disabilities.



Dario Ruberto



Forefront

by Dr. Judith Sandys

Associate Vice President Academic
(Research and International Development)

Health and wellness a fertile field of Ryerson research

An exciting development in Ryerson's maturing research enterprise has been the emergence of health and wellness as a major theme, not only in our explicitly health-oriented professional schools, but also in disciplines spanning the social sciences, humanities, business, science and engineering.

Our growing strength in health-related research flows naturally from our tradition of responding to critical contemporary issues and needs. The health field offers many challenges and the search for effective health solutions needs the engagement of researchers in many areas. At Ryerson, the search has become a meeting point for many cross-disciplinary interests, generating both internal collaborations and highly valued external partnerships. Of course, given the range and quantity of health-related research being conducted at Ryerson, it is beyond the capacity of this column to mention all of the projects. A few examples will have to suffice.

Our contributions to health knowledge and advancement, as eclectic as Ryerson itself, are making a difference in the lives of Canadians. Ryerson science researchers are developing new diagnostic and therapeutic technologies — assistive devices to improve the quality of life for people with disabilities — and computer modelling tools for such medical applications as the design of better bone/implant systems and novel cancer treatments. Our biomedical physics research group is one of the fastest growing groups of its kind in the Canadian university sector. Our researchers are probing for fundamental knowledge about the determinants at work in AIDS, bone disease, E. coli epidemics and other health ravages.

Within the social sciences, Ryerson researchers are addressing a number of complex health issues, ranging from an exploration of the impact of a group intervention strategy on the self-concept of young women with chronic, progressive kidney disease, to how best to provide midwifery services within rural populations. And within the humanities, Ryerson scholars are helping to increase our awareness of how moral, social and cultural frameworks affect our perspectives on health and disease.

This issue of *Impact* introduces you to a few of these researchers. Our featured subjects include Mario Estable, who has discovered a protein that can repress HIV viral replication by 50 per cent; Sri Krishnan, whose innovations in analysing signals originating in various body parts may allow for the early detection of knee injuries and throat cancer; Michael Finn, whose study of 19th-century concepts about hysteria and possession is a fine example of how a humanities-based approach to health research can enlighten contemporary medical practices; Judy Rogers, who is working to improve maternity care in rural and remote Ontario communities; and Deborah Fels, who is developing tools to make the Internet, television and movies more user-friendly for people with disabilities. Last, but not least, we profile Bill Whelan, whose progressive research and development in the treatment for prostate cancer has produced encouraging results. The potential for discovery in his work is so great that he is hoping to start clinical trials within the next two years to create a therapy that will be accessible to all cancer patients.

What's your frequency?

An emerging technology that could change how diseases are diagnosed

By Gina Vaccaro

Imagine detecting knee injuries without invasive surgery, or diagnosing throat cancer through the human voice. As futuristic as those ideas sound, they may soon be a reality, thanks to people like Sridhar (Sri) Krishnan, Associate Professor and Chair of the Department of Electrical and Computer Engineering.

Dr. Krishnan studies signals and their frequency characteristics, a field that lends itself to a variety of applications. That's because almost every phenomenon or event has a frequency spectrum associated to it. And, while this area has been well researched, it's no exaggeration to say Dr. Krishnan is moving it forward in new and radical ways.

Traditionally, signals such as sound, temperature and even the sun's rays, have been studied with analytical tools. These determine the frequency bandwidth (high and low points) occupied by a signal.

Dr. Krishnan, however, has added another variable to the assessment tool kit. Using time as a measurement, he can study time-varying frequency behaviour of a signal. Down the road, his research could enable events of interest to be spotted accurately. That capability will be essential in medical diagnoses and other areas.

In Dr. Krishnan's research, every instant of a signal is assigned a numerical value to represent its individual characteristics. Computers use these numbers to generate a Time Frequency Distribution (TFD), an accurate, 2-D illustration of the frequency and its variation over time. "Seeing a comprehensive picture is vital," says Dr. Krishnan. "The best way for humans to understand, analyse and absorb complex phenomena is to give them an easy to understand visual representation."

Based on that work, Dr. Krishnan founded Signal Analysis Research (SAR), a group comprised of two sub-groups, miSAR and MISAR, each with their own fields of study. miSAR — medical image and signal analysis research — studies low-frequency signals emitted by the human body. In contrast, MISAR — or multimedia information and signal analysis research — studies high-frequency audio and video signals.

The miSAR group collaborates with clinicians from various hospitals. The partnerships provide the group with vital patient data that may change how injuries and diseases are diagnosed.

Knee joint arthritis and sports-related knee injuries, for example, could benefit from a TFD analysis. Currently, most cases of knee joint arthritis are diagnosed through arthroscopy, an invasive procedure in which the cartilage surface is inspected with a fibre-optic probe. TFD would enable a doctor to visualize the frequencies emitted by the knee bending and unbending and diagnose the exact angle of the injury. Thanks to Dr. Krishnan and his signal analysis research, the need for arthroscopy as a diagnostic tool could eventually be eliminated.

Cancer is another biomedical area in which miSAR's work has demonstrated enormous potential. There are



Dario Ruberto

Sridhar (Sri) Krishnan's work with frequencies may revolutionize how sports-related knee injuries and knee-joint arthritis are diagnosed.

distinct signals in the voice of patients with throat cancer. By comparing the signals to those of healthy subjects, Dr. Krishnan has achieved an impressive 95 per cent accuracy rate in non-invasively detecting cancer.

His other research group, MISAR, is making strides with TFD in the area of multimedia information and content retrieval. One example is an intelligent Internet search engine that can locate "key words" in multimedia and video files by classifying their audio signals. Such a retrieval process would make traditional text matching obsolete.

MISAR is also making an impact with copyright protection and the ability to "watermark" music or video files. While customarily used on paper documents, a watermark for audio or visual material embeds data into a signal, preventing others from accessing and pirating the material. The novel TFD-based approach developed by Dr. Krishnan's group would hide these multimedia watermarks in a unique, robust and imperceptible way.

Supported by Science and Engineering Research Canada (NSERC), Communications and Information Technology Ontario, the Microelectronic Network and VitalSines International, Dr. Krishnan mentors seven master's students and two PhD candidates. Since 2001, three of his students have won best paper awards at international conferences and one received a Governor General Gold Medal for thesis work on the watermarking of music files. Dr. Krishnan is also a recipient of the 2004 - 2005 Research Excellence Award from Ryerson's Faculty of Engineering, Architecture and Science.



Canadian Cancer Society

Bill Whelan and his team are testing a promising new approach to monitoring prostate cancer treatment. From left, Madhu Jain, MSc student, Electrical and Computer Engineering, Ryerson; Alex Vitkin, Team Co-Leader and Senior Scientist, Ontario Cancer Institute; Bill Whelan, Team Co-Leader, Associate Professor, Department of Physics, Ryerson; Carl Kumaradas, Assistant Professor, Department of Physics, Ryerson; Arthur Worthington, Senior Research Technician, Department of Physics, Ryerson; Lee Chin, PhD candidate, Medical Biophysics, University of Toronto; and Mark Gertner, Research Scientist, Ryerson.

An insider's view *continued from page 1*

structures, like the urethra, are not damaged and that the prostate cancer doesn't recur," says Dr. Whelan. He hopes his optical sensors can be tested in a clinical trial with microwave thermal therapy within the next two years.

If Dr. Whelan's optical sensors prove to be a successful companion to microwave thermal therapy, he hopes his treatment will benefit all prostate cancer patients not just those whose cancer has returned.

Although several research institutes around the world are currently studying laser thermal therapy, the work of Dr. Whelan's team is on the leading edge of this field of research and development. "We were the first to publish on optical monitoring for thermal therapy (in the journal *Physics in Medicine and Biology* in 2001)," Dr. Whelan says.

His research and development continues in Ryerson's Thermal Therapy Facility. Here, researchers have the resources to design software and optical fibre technologies, and use "tissue phantoms" (gels with properties similar to human tissue) to create and evaluate prototypes.

When preliminary testing of the optical-monitoring strategy is complete at Ryerson, the tools and technology will transfer back to Dr. Whelan's laboratory at the Ontario Cancer Institute for animal testing and pre-clinical evaluation.

Steady progress in this area is being made. Although the researchers are focused on treating prostate cancer, they expect thermal therapy will be a viable option for those with other cancers, including metastasis of the liver.

"The future of thermal therapy lies in the ability to deliver and monitor the treatment with technologies that are accessible to all cancer patients," says Dr. Whelan.

His research is funded by the Canadian Cancer Society, Science and Engineering Research Canada (NSERC), the Canada Foundation for Innovation, Ontario Innovation Trust, National Cancer Institute of Canada and the University Health Network.

What lurks beneath

Literary spiritualism provides clues about 19th-century France

By Melissa Whetstone

Evil spirits, hypnotism and madness may be elements of a psychological thriller, but for Michael Finn of Ryerson's French and Spanish Department, they are important components of his research into 19th-century France.

Dr. Finn is studying the medical world's influence on French literature between 1880 and 1900, a period when medicine focused largely on hysteria and the female psyche was in the public eye. For example, there were famous female mediums and a number of women were patients of doctors specializing in medical hypnotism.

"At the time, the medical community thought women were more prone to mental instability than men, because of their emotional nature," says Dr. Finn. "This idea had a huge impact on female creativity."

In his upcoming book, centred around the French novelist Rachilde, Dr. Finn will showcase the struggle of creative women during this era when gender roles were strictly defined.

The book will provide both a portrait of 19th-century French society and a fresh take on the familiar sub-

ject of gender identity. "It will address issues that have resonance with our 21st-century debates over the impact of scientific and medical advances on perceptions of sickness, wellness and their relation to creativity."

Conducting research in Paris libraries, Dr. Finn discovered personal correspondences of Rachilde, the nom de plume of the French author Marguerite Eymery and decided to focus his study on her. Though not a writer in the class of French novelist Marcel Proust, to whom Dr. Finn devoted a previous book, Rachilde's rebellious life and sometimes disturbing works enabled Dr. Finn to explore the societal rules that defined late 19th-century France.

Rachilde's childhood was extremely troubled. Her father reminded her constantly that he would have preferred a son and her mother, a spiritualist and a practitioner of the Ouija board, believed Rachilde's writing was the work of an evil spirit living within her.

The stress of Rachilde's adolescence led to terrible nightmares and a series of suicide attempts. Dr. Finn says her writing, with its anti-realism bent and recurring theme of spiritual-

ism, was an attempt by Rachilde to use her creativity as an outlet. "She tried to exorcise her medical and 'spirit' problems through literature, but at the same time she liked to jar her reader with bizarre narrative twists." In reading Rachilde's 65 novels, Dr. Finn developed a better understanding of the forces that existed in French society at the time and how they bound artists such as Rachilde. His research also enabled him to study hypnotism and its link to the theory of dual personality – another topic of great medical interest in late 19th-century France since it led to the discovery of the unconscious by Freud.

Dr. Finn has received funding from the Social Sciences and Humanities Research Council of Canada (SSHRC), the Ryerson SSHRC Incentive Fund and the Camargo Fellowship. Currently, a three-year SSHRC Standard Research Grant, awarded in 2004, supports his research.

Melissa Whetstone is a Journalism student at Ryerson University.



Michael Finn unlocks the mysteries of the 19th-century female psyche in his upcoming book.

Dario Ruberto

'(In 19th-century France) the medical community thought women were more prone to mental instability than men, because of their emotional nature.'

Slowing down a killer virus

A newly discovered protein could help millions with HIV

By Danielle Grogan with files from Gina Vaccaro

In a perfect world, HIV would never develop into AIDS. Someone with the virus would simply take a pill and recover, like we do for bacterial infections by taking antibiotics.

While this treatment has yet to be discovered, researchers like Mario Clemente Estable of Ryerson's Chemistry and Biology Department are making progress in solving the HIV puzzle.

The HIV virus is like a stealth photocopier. In its early stages, it integrates with the DNA inside T-cells,

the guardians of the immune system. Here, the infected cells begin to reproduce billions of viral copies that will infect new cells within the blood stream. Despite the immune system recognizing and valiantly fighting the virus, after an average of 11 years the body's natural defenses become too weak to prevent the onset of AIDS, and the body becomes vulnerable to opportunistic infections such as pneumonia, tuberculosis or cancer.

Dr. Estable, however, has discovered, cloned and named a protein – Major CDK9 Elongation Factor (MCEF) – that can repress HIV viral replication by 50 per cent in

tissue culture. Dr. Estable wants to determine how MCEF enters a cell's nucleus, as well as how it functions, binds and interacts with DNA.

"If we can block HIV at the point when genetic information is transferred, the virus can be silenced," says Dr. Estable. Furthermore, he says slowing the duplication process would enable the body to kill any remaining infected cells.

Although existing medications also hinder HIV replication, history shows that the virus inevitably mutates and becomes drug-resistant. As a result, the 37.2 million adults and 2.2 million children currently

living with the HIV infection, and the over 16,000 people who are infected daily, are condemned to join over 20 million who have already died from AIDS. Dr. Estable hopes with further exploration of MCEF, ways to modify the protein to target all mutant HIV strains will be found.

Dr. Estable's MCEF research is currently underway at Ryerson's Molecular Retrovirology Laboratory, where he is assisted by graduate students Maksymilian Niedzielski and Gladys Mok. Together, they are studying how MCEF progresses when introduced into human skin cells; research that will provide a greater understanding of MCEF's potential and limitations.

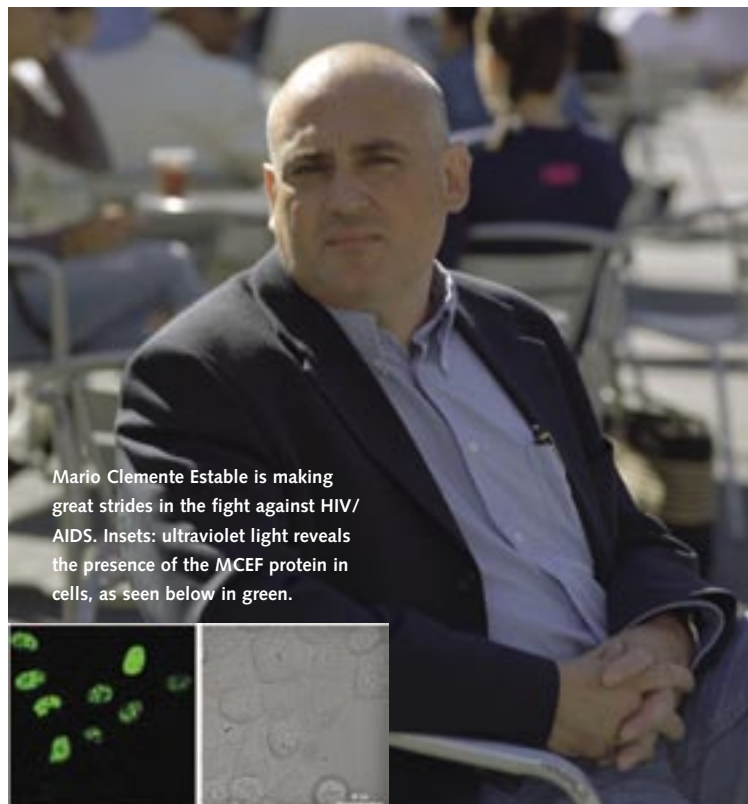
In a related project, Dr. Estable and colleagues from the University of British Columbia and the Rockefeller University in New York City are

exploring factors that trigger HIV out of its dormant state. Their findings were published in the April 2005 *Journal of Virology*.

In still other related research projects, Dr. Estable has teamed up with Mario Monteiro from the University of Guelph in search of a potential vaccine for illnesses such as SARS.

Dr. Estable's work is funded by Science and Engineering Research Canada (NSERC), the Canada Foundation for Innovation, Ontario Innovation Trust, the Ontario Research Fund, the Canadian Foundation for AIDS Research and various internal grants through Ryerson.

Danielle Grogan is an alumna of Ryerson's School of Journalism.



Mario Clemente Estable is making great strides in the fight against HIV/AIDS. Insets: ultraviolet light reveals the presence of the MCEF protein in cells, as seen below in green.

Dario Ruberto

Three generations of research and discovery

By Gina Vaccaro

With his discovery of the MCEF protein, Mario Clemente Estable continues a family tradition of academic inquiry and achievement that began with his grandfather in 1922.

The first Clemente Estable (1894-1976) – a Uruguayan primary school teacher and natural sciences professor – received a Fellowship from Spain to study in Madrid with Don Santiago Ramón y Cajal, the 1906 Nobel Laureate in Medicine for research that founded modern neurobiology.

Clemente returned three years later to Uruguay where a Biological Research Institute was created under his direction in 1926; and with support from the Rockefeller Foundation, created the first full-time research positions in Uruguay. From this Institute, he authored over 100 publications that trained dozens of investigators. The Institute is now named in his honour

and enjoys international recognition. Clemente also created an education system for primary schools and today 19 primary schools in Uruguay are named after him. Throughout his career, Clemente received many national and international accolades, including the Legion of Honor of France.

Clemente's son, Juan, followed in his father's foot steps. Juan and his wife, Rosita, studied and worked at the National Institutes of Health, the Armed Forces Institute of Pathology, Stanford University and the National Aeronautics and Space Administration-Ames Research Centre. They had eight children and settled in Quebec as pathology professors at Laval University where they published over 150 research papers. Now retired, Juan and Rosita work with a foundation to promote the values of Clemente Estable; and follow the career of their son, Ryerson researcher Mario Clemente Estable.

Special delivery

Midwifery study could give rural mothers more health-care options

By Janet Gunn

After nine months of waiting, it's time for baby to arrive. But instead of packing an overnight bag, an anxious mom-to-be is packing a suitcase of belongings and will soon board a plane. Leaving her other children behind, she will fly to the nearest hospital where she can give birth.

Leaving home for maternity care is a reality for many Canadian women living in remote northern communities and a growing trend for expectant mothers in rural areas where local maternity units have closed.

"In British Columbia, for example, 13 rural hospitals have closed their maternity wards since 2001 because they don't have the resources to keep them open," says Judy Rogers, Director of Ryerson's Midwifery program.

She believes the crisis stems from the current organization of maternity care and the challenges of the obstetrics profession. "Ontario has approximately 500 obstetricians attending births, and it is one of the least popular career choices due to its demanding hours and high litigation risk," she says. "The decline in family physicians providing maternity and birthing care is also well documented."

Although midwifery only officially joined Ontario's health system in 1994, Prof. Rogers believes it has a positive contribution to make. The profession is growing and she has seen its value first hand. Beyond her role at Ryerson, Prof. Rogers has practised midwifery for 27 years in Ontario, Nunavik (northern Quebec) and England. "About five years ago, I attended a conference on the future of maternity care in Canada and that was when the seed for this research was planted. I had to delve further into the literature and focus my attention on what could be done."

With support from the Ontario Primary Health Care Transition Fund and Ryerson's Faculty of Community Services, Prof. Rogers began to

research maternity care in rural and remote communities. More than halfway through her study, she sees inter-disciplinary maternity care — a team of midwives, family physicians, hospital and community nurses working together — as a possible solution to the challenge of delivering maternity care to rural and remote areas. She is also looking at the additional problems facing Aboriginal people and how health-care professionals can deliver services closer to First Nations communities.

"What immediately became apparent is that we need more collaborative care," says Prof. Rogers. "Maternity care does not hinge on one profession. Nurses, midwives and family physicians share overlapping

Leaving home for maternity care is a reality for many Canadian women living in remote northern communities.

skills in labour and birth, so my hope is that we can develop sustainable models that are not dependent on individual care providers, but on an interdisciplinary team."

Six communities are participating in the project to develop these models: the northern communities of Kenora, Hearst and Moose Factory, as well as Alliston, Cornwall and Winchester. Each community has a team of health-care providers and local representatives identifying strategies, resources, strengths and barriers to developing a feasible collaborative-care model. The six teams will share their information and recommendations.

While each team is conducting its own community research, Prof. Rogers and her colleagues are distributing questionnaires and conducting interviews with care providers and focus groups with various stakeholders



Dario Ruberto



Rural and remote communities will benefit from Judy Rogers' work to promote midwifery care.

— such as childbearing women and their families — to determine views on maternity care. She will share these findings with the community teams to help them develop interdisciplinary maternity care models that suit each location.

"It wouldn't work for experts to go into each community with a solution. People need to develop their own solutions and own them from day one," says Prof. Rogers. "It's exciting because many participants feel passionate about the work. These people are struggling to keep their communities viable because often, without

maternity care resources, young families will not locate there, which hurts the community's economy."

The project's preliminary findings reveal common themes. "There is a feeling that the scope of midwifery practice needs to be widened and that midwives should be able to provide similar care during birth as a family physician," reports Prof. Rogers. "Feedback also indicates that women don't want maternity units at their local hospitals to close. They want more choices and findings suggest there may be more ways nurses and midwives can work together."

Optimistic about the results, Prof. Rogers looks forward to holding a joint conference in 2006 with two other project groups also focusing on maternity care. Ultimately, she expects her work will strengthen communities and empower them to sustain local maternity services. "I know it will not happen overnight, however I would like to see the development of pilot projects and for people to say 'let's try them out.'"

Janet Gunn is an alumna of Ryerson's School of Journalism.

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impact

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