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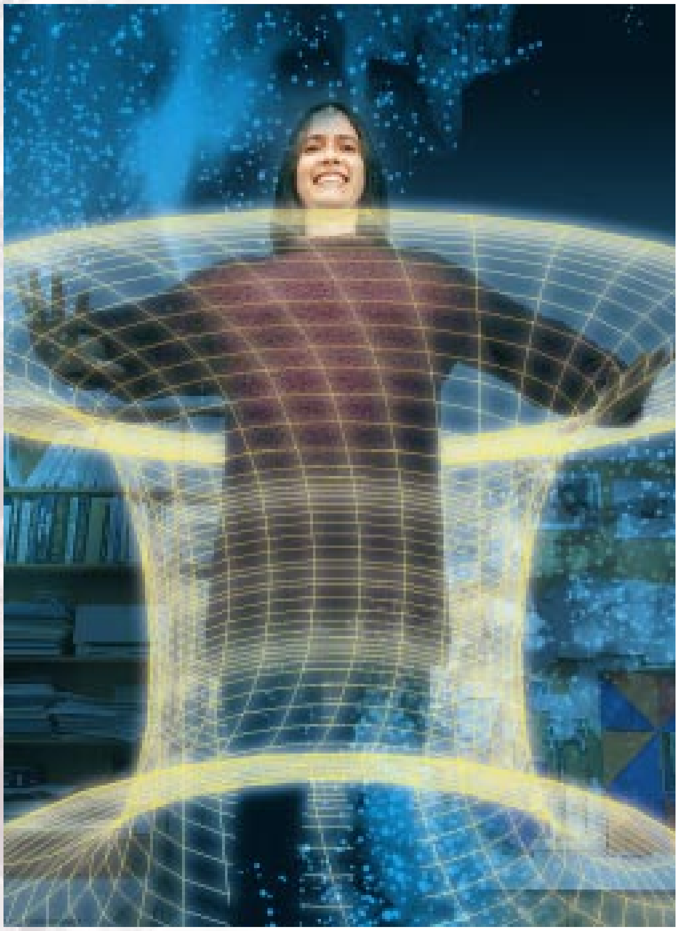
Closing the Hole in the Theory of Worm-Holes

Theoretical physicist Kristin Schleich's research poses fundamental questions about the universe and our place in it. To the non-physicist, just trying to understand the questions she ponders takes a quantum shift in perception.



Wireframe: Donald Witt

Associate Professor in Physics and Astronomy, and co-ordinator of UBC's Physics Olympics, Kristin Schleich's cosmos-shaking theorem disclaims popular notions about space, time—and travel—in the universe.

The study of cosmology, or the mechanics of the universe as a whole, is a mathematician's dream and a materialist's nightmare. Those still anchored to the earth by Newtonian notions of gravity as a force will find their perceptions shaken by work that Associate Professor in Physics and Astronomy Kristin Schleich is undertaking. She has recently proved a theorem that is considered a major result in the field of classical relativity. It could also make the writers of *Star Trek: Deep Space Nine* go back to the drawing board—or keyboard. Along with her research colleagues Donald Witt, who is also her spouse, and John Friedman, Schleich proved that worm-holes cannot exist outside black holes. (Obviously, this would have devastating consequences for a starship trying to slip through a worm-hole shortcut from one sector of the universe to another.)

Schleich does not conduct her research in a lab; it is based solely on mathematical theory. When trying to translate her work into a language of images and metaphors in order to explain it to the non-physicist, Schleich's enthusiasm and skill as a teacher help immensely.

"Einstein told us that gravity isn't a force, it is geometry," Schleich explains. In other words, Einstein's theory of general relativity replaces the idea that you have a gravitational force between two objects with the idea that the curvature of space-time causes the interactions we perceive as forces. For example, a space shuttle is not kept in its orbit by the earth's gravity; it is actually freely falling through the vacuum of space-time. It is the curvature of space-time produced by the earth's mass that causes the shuttle to orbit and return to the same point once every 90 minutes.

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Hochachka Receives Order of Canada

INTERNATIONALLY ACCLAIMED UBC ZOOLOGIST PETER Hochachka says he has had a “lucky” career. Obviously, more than luck has garnered him a Canada Council/Killam Memorial Prize, an NSERC Gold Medal, a Guggenheim fellowship, two Killam Research prizes, and the Fry Medal from the Canadian Society of Zoologists. Now he can add another accolade. Hochachka has been named an Officer of the Order of Canada for a lifetime of work that literally created his field of research.

Hochachka studies the metabolic regulation and biochemical adaptation of organisms to their environment, such as the unique adaptation of Sherpas from Tibet or the Quechua Indians from the Peruvian Andes to high-altitude, low-oxygen environments (see Synergy 2.2). He says his most serendipitous discovery was an MRS study of the Sherpa heart, which showed phosphocreatine/ATP ratios twice as low as in lowland inhabitants. In other words, a Sherpa’s heart gets more useful energy for the oxygen used. Hochachka’s most exciting discovery was finding an entirely new class of enzymes.

Hochachka's pioneering research in the metabolic and exercise adaptation of invertebrates, fishes, reptiles and mammals has brought UBC and Canada considerable acclaim. "The Order of Canada is a real honour—one of the high points in my life," he says.

White Dwarfs Shed Light on Dark Matter

FOR YEARS ASTRONOMERS HAVE BEEN grappling with a dark mystery. Given the measured speeds at which galaxies rotate, they should be spinning apart. Since clearly they are not, it means that we can only see about one-tenth of the mass of our galaxy. The unseen mass, or the glue that holds galaxies together, is called dark matter because it has remained undetected by any type of radiation or telescope—until recently.

Astronomer Harvey Richer and his team, which includes UBC astronomer Douglas Scott and researchers from Germany and the US, believe the answer lies in White Dwarfs, the burnt-out remnants of stars. After comparing images from the Hubble Deep Field—the deepest optical images of the universe—taken by the Hubble Space Telescope in 1995 and 1997, they found that five objects had moved over that period. The colour and brightness indicated these were most likely White Dwarfs. Although astronomers have known of their existence for 150 years, this is likely the first time that old White Dwarfs, formed near the beginning of the galaxy, have been observed. Given the extremely small volume of the Hubble Deep Field, the total number of White Dwarfs in the galaxy could account for about half of its mass.

Of course, there is a light and a dark side to every story. In order to confirm their findings, Richer and team had planned a third observation in December, 1999. Unfortunately, the Hubble Space Telescope, which has been operating with faulty gyroscopes, has been shut down. The replacement mission was set for December 7th and Richer’s project is at the top of the list once this is complete; but the window for observation closes on January 7th, 2000. Fortunately, if the mission is delayed, they have other images taken from the ground that may reveal even more White Dwarfs, says Richer.

MDRU—Discovering Pay Dirt

THE MINERAL DEPOSIT RESEARCH UNIT (MDRU), A JOINT initiative between the mining industry and UBC, is launching the second phase of a fund-raising campaign for the MDRU Endowment Fund. Since 1997, MDRU has raised over $1 million in corporate funds, which have been matched by a $1-million donation from the Faculty of Science. At a recent reception sponsored by the Vancouver Stock Exchange, the MDRU announced that listed junior mining companies can now acquire memberships through the issuance of shares from treasury. “This new initiative will make it easier for junior companies to share the benefits of MDRU membership,” says director Dick Tosdal.

The benefits include access to information, resources, international expertise, short courses, and the latest research. A recent donation to MDRU by Pat Sheahan of Konsult International will give members access to the world’s most complete private consulting library on diamonds and diamond-related rocks. MDRU projects also provide an opportunity for graduate students to work in the field. One MDRU team, supported by NSERC and eight public companies, is currently investigating the variety of gold deposits associated with granitic rocks found in Yukon and Alaska.

Now with 29 members, including corporate members from Europe and Australia, MDRU has helped UBC and Vancouver to be recognized as having some of the best mineral-deposit research expertise in the world.

Ambassadors in Action

As one of 6,000 undergraduates in the Faculty of Science, a student can often feel lost in the shuffle. When Dean Maria Klawe put out a call for students who might be interested in participating in the Dean of Science Ambassador program, over 500 students responded. For many, as for biochemistry student Jason Elliott, the opportunity to develop closer ties with a group of other dedicated undergrads was part of the motivation.

The students serve as mentors or hosts in science activities of their choice, including Science Fairs, the Euclid Mathematics Competition, and science recruiting in high schools. Elliot says the role of science emissary has another important benefit. “I think it will also help us to develop important interpersonal skills.” All Science Ambassadors receive free workshop training in areas such as public speaking, emotion management, and diversity awareness.

“We want to create an environment where students can become involved in the Faculty and the community, interact with students from other science disciplines, and feel that they have a voice in the university’s growth and change,” says Klawe.

Allen Ting-Chun Lee, a fourth-year student in the Physiology Honours Program, is looking forward to sharing his ideas and energy. “As an ambassador, I can help to promote the Faculty of Science in our community by letting others know about UBC’s programs and achievements,” says Lee. “Since this is my last year as an undergraduate, I think it is time for me to give something back to the Faculty.”

Kirsten Schleich; cont'd from p. 1

Topology is the property of a space that isn’t dependent on its geometry. “If I take a flat piece of paper and make it into a cylinder, a straight line drawn on the paper becomes a closed curve. That is a topological effect,” says Schleich. Worm-holes, which could provide a short-cut between distant points of space, would be one astonishing example. However, they are not evident now in our universe. Schleich’s topological censorship theorem shows that these classical topological structures collapse too fast for light to traverse them.

Is there no glimmer of hope for science fiction fans that worm-holes could exist? “A worm-hole traversable by a spaceship would need large sources of quantum matter with negative energy,” Schleich states. “However, such matter would also produce anti-gravity.” An improbable consequence of this type of matter would be a perpetual motion machine, which could produce infinite amounts of energy. “Clearly, this is not very likely to happen,” says Schleich.

Through her teaching and outreach activities, such as UBC’s Physics Olympics (see sidebar), Schleich’s enthusiasm helps her students and other young people to understand the universe on both a cosmological and practical level. “If you know how something works, then someone else can figure out how to use that for a beneficial purpose.” Such as finding a viable shortcut through the universe, perhaps.

UBC’s Physics Olympics

Every year in March, during an all-day Saturday event, grade 11 and 12 students from across the province gather to test their skill, stamina and strength—in battling conundrums of physics. For example, last year’s favourite challenge was the Paper Tower Event. Each team was given 10 sheets of letter-sized paper and asked to construct a weight-bearing tower at least 15 inches high. The goal was to construct the strongest tower with the fewest sheets of paper. The winning team used just one sheet to support a five kilogram weight.

“The students invest an incredible amount of creativity, interest and time to come up with wonderful solutions to practical problems,” says Kristin Schleich, Physics Olympics co-ordinator. The 1999 UBC Physics Olympics attracted 300 students from across the province. With 60 teams of at least five members each, teamwork is key to the entire event, notes Schleich.

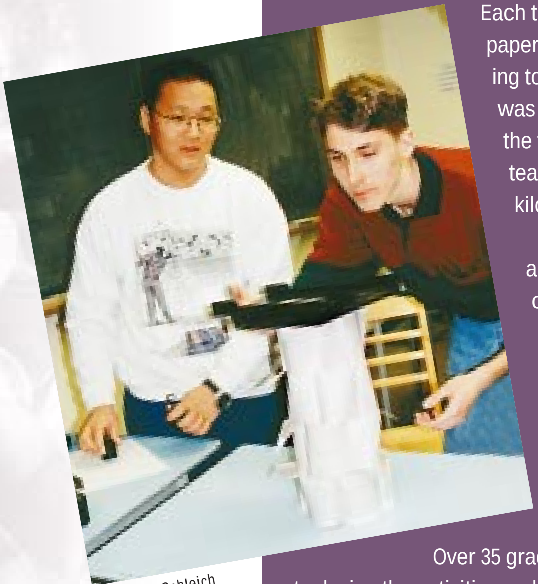


Photo: W. Schleich

Over 35 graduate and undergraduate students help to design the activities and promote the event. Last year they did it all on an operating budget of under $500. “What we try to do is come up with activities that use a knowledge of physics at a level appropriate to high school students, and which are different, challenging—and most importantly—fun.”

Modifying a Virus to Fight Disease

Frank Tufaro, virologist and chief scientific officer for NeuroVir, is working to transform the herpes simplex virus into a biological tool to help fight cancer and to determine the function of genes.

WHEN WE THINK OF THE HERPES SIMPLEX VIRUS, "benefit" is not a word that springs to mind. Yet the properties that make it such an unpleasant and tenacious disease are exactly what interest Frank Tufaro and his team. "It is a very complicated virus, with a large genome and a two-phased life cycle," says Tufaro. Herpes simplex (HSV) shuts down the DNA activity of healthy cells and turns on its own elaborate program of gene regulation, activating at least five groups of genes sequentially after infection. After the initial outbreak, the virus lies dormant in the neurons until reactivated by some outside agent, such as stress or exposure to sunlight.

Most researchers have been trying to find ways to fight and control the virus. However, some—such as Frank Tufaro—have focused on how herpes could be used beneficially. Since HSV lies dormant in nerve cells without damaging them, and yet kills other cells, Tufaro has been working to modify the virus in order to selectively kill cancer cells. This research has proved crucial to developing a new treatment for primary brain cancer, a devastating disease for which there is no cure and only palliative treatment. In 1996, along with colleagues Max Cynader, head of the Brain Research Centre and Ophthalmology at UBC, and Michael Hayden, head of the Centre for Molecular Medicine Therapeutics and the Canadian Genetic Diseases Network, Tufaro founded NeuroVir Therapeutics Inc. to licence and develop commercial applications for this research (see sidebar).

Microbiology Professor Frank Tufaro and his team were recently awarded $600,000 in funding from the MRC for their work on EXT, a gene that is resistant to herpes infection and is also a factor in bone cancer.

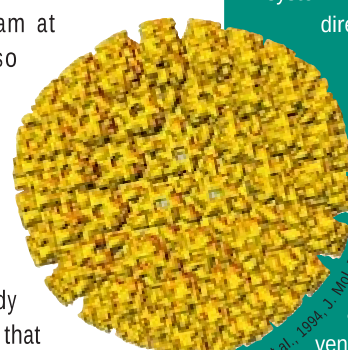
"Most people study viruses from the standpoint of what virus genes are needed for infection," states Tufaro. "We've taken the opposite approach by looking at what host factors are needed for the virus to be able to infect it."

Tufaro and his research team at UBC are also using HSV to determine the function of other genes. They isolated cells that are resistant to herpes and discovered certain ones to be missing a gene called EXT, which is involved in the synthesis of a sugar needed in order for the virus to stick to the cell and infect it. However, EXT had already been associated with bone tumours. "It turns out that certain cellular functions needed for herpes infection are also important in normal growth as well," says Tufaro. "The herpes virus helps us to characterize functions of certain human genes, such as ones associated with growth abnormalities and cancer."

As professor, chief scientific officer and father of two, Tufaro says his most difficult challenge is trying to be in three places at once. Does he miss bench work? "Yes, but I have an excellent senior research group and some terrific graduate students in the lab," Tufaro says. Soon he will be off again, this time to a conference in Europe and a meeting in San Diego.

NeuroVir—Fighting Cancer with Herpes

For the past four years, NeuroVir Therapeutics Inc., a UBC spin-off company now headquartered in San Diego, has been testing modified herpes simplex virus (shown below) in the treatment of cancer and other diseases. The company's first product candidate, G207, was approved by the U.S. FDA and underwent phase I clinical trials in 1998 for the treatment of incurable brain tumours, or glioblastoma multiforma. Now entering phase II trials, G207 has demonstrated considerable benefits in the treatment of cancer of the brain and central nervous system. It can be safely administered directly into the brain by injection, it targets only tumour cells, and it spreads effectively to surrounding cancer cells until it gets to the margins of the tumour and then stops.



Zhou et al., 1994, J. Mol. Biol. 242 p456-469

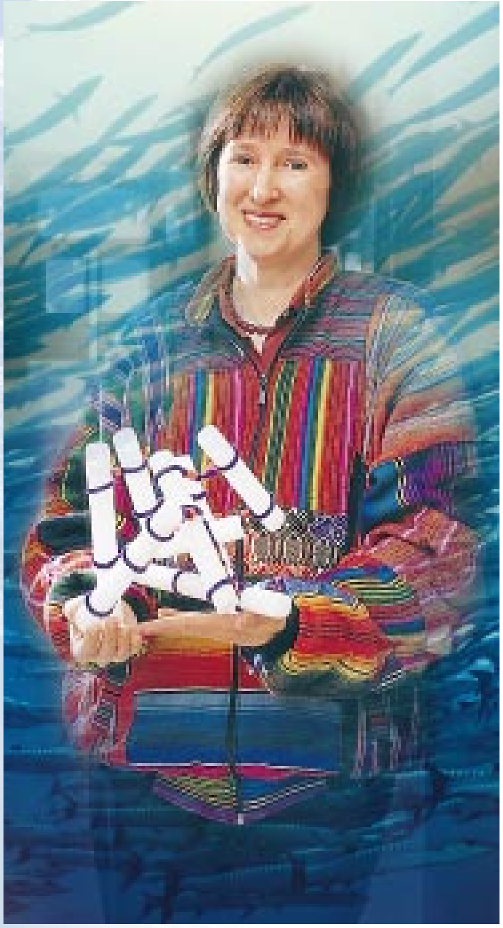
"Recently NeuroVir scientists and collaborators have shown that we can actually cure animals by intravenous delivery. The selectivity is remarkable," says Frank Tufaro, NeuroVir's co-founder and chief scientific officer. The company is currently working with the Memorial Sloan Cancer Center in the U.S. on a promising clinical trial of NV 1020, another product to treat colorectal cancer that has metastasised to the liver. NeuroVir is also investigating other ways to use modified HSV to treat secondary cancers and other neurodegenerative diseases.

Understanding Complex Systems

Mathematical biologist Leah Keshet is one of a growing number of interdisciplinary researchers who use mathematical modelling to help solve some of science's most puzzling questions.

WHAT KEEPS A SCHOOL OF FISH OR A SWARM OF BEES together? What forms or breaks up a string of molecules? What controls the shape and movement of a cell? Why do nerve cells degenerate and die in diseases such as Alzheimer's and ALS. The common link in these questions is that they all involve highly complex systems. Leah Keshet uses mathematical tools such as differential equations and computer modelling rather than in vitro experiments to try to answer them. Keshet says her binary love for both math and biology is inherited. "My mother was a biologist and my father is a mathematician. I was fascinated with both areas and eventually wound up in the middle."

Her initial research involved modelling the way that actin filaments—components of the cytoskeleton or the structural scaffolding of cells—interact to form different kinds of structures, such as bundles, loose networks, or gels, and what role this plays in disease. In cancerous cells, the actin cytoskeleton is one of the cellular components that can be severely affected, resulting in the abnormal motion of these cells. In cystic fibrosis, cells spill out very long actin filaments that produce a heavy mucus in the lungs. "Polymer chemistry has traditionally been dominated by physical chemistry and thermodynamic techniques." Keshet notes. "I look at these problems from a kinetic and differential equations perspective."



MITACS team leader, Mathematics Professor Leah Keshet holds a model of an actin filament network.

Keshet's research is not confined to the microscopic aspect of biology. She and associates Alex Mogliner and Danny Grunbaum have also been looking at a much larger picture—the complexity of swarming behaviour in animals and insects. They use mathematical models to shed light on what keeps a swarm or flock together, what governs its shape, and why it can travel for long distances without losing individuals. This research has implications for behavioural ecology, conservation of natural resources such as fish, management strategies for bee farming, and pest control.

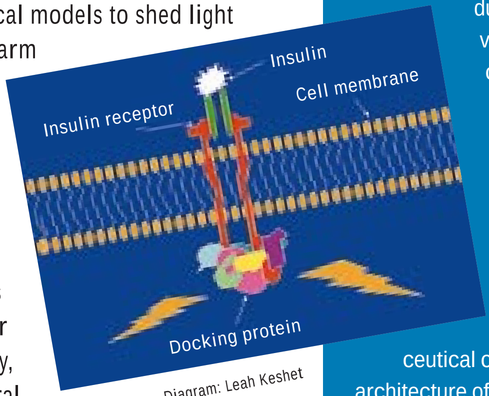


Diagram: Leah Keshet

In addition to her research and teaching, Keshet is actively involved in curriculum development. She is helping to develop calculus courses for life sciences students, and she is one of the creators of Calculus OnLine. Keshet also designed and co-taught courses in Science One, UBC's innovative multi-disciplinary program for first-year science students.

When not teaching, developing courses or solving complex mathematical problems, Keshet says she enjoys spending time with her two young sons. "They both have wonderful energy and ideas." This obviously influences her approach to life and work—interactive, curious, and open to possibilities.

MITACS—Using Mathematics to Fight Disease

An exciting development for Leah Keshet and her math-bio colleagues Robert Miura and Yx Li was the announcement of major funding by the federal government for The Mathematics of Information Technology and Complex Systems (MITACS), a new Network Centres of Excellence (NCE). This initiative, of more than $14.5 million over four years, will bring together 175 researchers at 22 Canadian universities to develop new mathematical tools for Canadian industry. Keshet heads one of the biomedical MITACS teams.

In one of the recently funded MITACS projects, Keshet is studying signal transduction, the process of converting hormonal signals to cellular response which involves a complex biochemical cascade. Leah Keshet is trying to determine what happens when this complex interaction goes awry. She is working with Kinetek, a Vancouver-based pharmaceutical company, to model the architecture of these cascades in order to analyze the effects of hormonal signals and try to understand their role in diseases such as diabetes and cancer.

Another MITACS project is her work with associate Chris Shaw, student Magdalena Luca, and post-doctoral fellow Alexandra Chavez-Ross on neurodegenerative diseases such as Alzheimer's and ALS. In collaboration with industry partner In Silico (Boston), they are trying to discover how microglia (the brain's "immune cells") affect the balance between healthy and stressed neurons, and how excitotoxins (molecules that mimic some neurotransmitters) cause neural stress and degeneration.

Cheaper, Faster, Smarter DNA Sequencing

Biophysicist Andre Marziali is one of UBC's innovative young scientists whose work spans more than one discipline. His instrumentation design is revolutionizing DNA sequencing technology.

UNTIL A YEAR AGO, UBC GRADUATE Andre Marziali was leading a team of Stanford engineers and physicists in the development of a highly integrated, modular system for large-scale DNA sequencing. When asked why he returned to UBC, Marziali said the decision was easy. "My wife and I are both from BC and we love it here. I also really missed teaching," he admits. "At Stanford I was solely involved in engineering instrumentation. Here I also have the opportunity to teach and pursue my own research."

In his modular system, different instruments automatically perform the steps required for DNA sequencing. By moving 100 sample plates per day from instrument to instrument, with each plate holding 96 samples of different DNA strands, the system achieves a daily throughput of up to 10,000 samples. Stanford University, with support from the US National Institutes of Health, funded the development of the technology which has since been commercialized by Genemachines Inc.

"The thermal cycler I am building at UBC is the next step in completing this system," says Marziali (see sidebar). The second generation of this instrumentation will be used in the BC Cancer Agency's Genome Sequencing Centre.

With over 3 billion base molecules in the human genome, at a cost to sequence of $.50 per base, the Human Genome Project (expected to be complete by next fall) has become one of the most costly medical research undertakings in history. Marziali's goal is to reduce the cost of sequencing from $.50 to $.01 per base. The potential benefit to the genomics community is tremendous. These cost reductions will allow researchers to sequence other mammalian, plant and pathogen genomes, with the goal of understanding human gene function and our environment.

Assistant Professor of Biophysics and Biotechnology Laboratory Associate Andre Marziali is working to improve the way DNA is sequenced—and the way physics is taught.

Another area of Marziali's research is nanopore detection of DNA molecules. In regular sequencing, dyes are attached to large groups of DNA molecules (10^9 to 10^{11}) in order to detect them by fluorescence. To produce that many identical molecules is time-consuming and costly. Since nanopore-based DNA detection would allow scientists to examine individual molecules, it has the potential to revolutionize the process of sequencing. It would also allow for the use of less expensive enzymes in the process of replication. "It could lead to technology that can sequence entire genomes in a few days rather than a few years, and at a much lower cost." says Marziali, who credits NSERC for funding the project.

An innovator in the classroom as well as the lab, Marziali is developing a robotics course which will be added to the curriculum in the summer of 2001. His "peer instruction" teaching methods, pioneered by Eric Mazur at Harvard, have received unanimous praise from the students and are now being adopted by other faculty members for teaching first-year courses. "When I received feedback from several students that this method of teaching actually keeps them awake in class, I knew I was on the right track," Marziali laughs.

Sub-Microliter Thermal Cycler

The latest instrumentation under development by Andre Marziali and his lab at UBC is proof that small is beautiful—and cost efficient. While Marziali's sample preparation system has dramatically increased the efficiency of DNA sequencing, technology in detecting DNA strands has also become much more sensitive. "Right now there is a mis-match between the instruments that do the thermal cycling to produce strands of DNA, and the sensitivity of the instruments that detect them," he states. "The sub-microlitre thermal cycler we are designing will take advantage of this increased sensitivity."

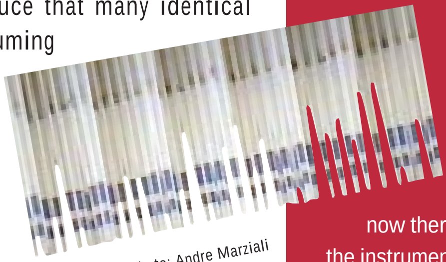


Photo: Andre Marziali

Currently, over 90 percent of each DNA sample manufactured for sequencing is discarded. At $1.50 per sample and with labs running 10,000 to 20,000 samples per day, this is a sizeable portion of sequencing costs. The thermal cycler would be able to scale down sample production from 5 microlitres to 500 nanolitres, reducing cost by a factor of ten. (A raindrop is 50 microlitres.) "The potential benefit to genomics research for cancer, drug development and basic science is extremely exciting," says Marziali.

Cures from the Sea

The mysterious properties of marine organisms and their potential in the treatment of disease are what intrigue marine natural products chemist Raymond Andersen.

As a graduate student at Berkeley in the late sixties and early seventies, Raymond Andersen was interested in chemical physics. But the turmoil of anti-war demonstrations, and the implication of chemical physics in the arms race, steered Andersen in the direction of natural products chemistry. Andersen was part of the first team to work with internationally acclaimed chemist John Faulkner at the Scripps Institution of Oceanography, where they pioneered the field of marine natural products chemistry.

The intriguing thing about marine organisms is that many make rare molecules, called secondary metabolites, that are usually found in only one species in the world. These molecules have very complex structures, a low molecular weight, and are often biologically active. Yet they are all unique—and no one can say for certain what their function is.

Professor Raymond Andersen and colleagues are one of a few elite research teams in the world to be granted access to the US National Cancer Institute's Open Repository of Natural Products Extracts for the study of anti-cancer agents.

"When I came to UBC twenty-two years ago, the study of secondary metabolites in marine organisms was very new," says Andersen. At first, he was interested in the chemical ecology of these molecules, or what they do for the organism that produces them. Over the years Andersen realized that marine secondary metabolites have important medical applications. Andersen's lab works in collaboration with Michel Roberge in Biochemistry and Ed Piers in Chemistry to discover new lead structures that can serve as models for medicinal chemistry and drug development. One of their first compounds, which was extracted from a sea sponge, produced a substance that turned out to have anti-asthma properties (see sidebar). "It is an incredibly fascinating field because it is so broad. We do everything from basic, fundamental research to dealing with lawyers and licensing agreements," says Andersen.

The second group of compounds, called hemiasterlins, contain only three amino acids. These tri-peptides are highly modified or previously unknown—and they all have very potent antimitotic properties, or the ability to arrest cells in the stage of mitosis. (UBC is on the verge of signing a licensing agreement for them with pharmaceutical company Wyeth-Ayerst.) There are related anti-cancer drugs on the market, such as Taxol, but after a few treatments cancer cells can develop a resistance to them. A synthetic analogue of Andersen's original sponge compound kills even Taxol-resistant cancer cells.

Another collaborative project is the study of compounds known as G2 cell cycle checkpoint inhibitors. Cells undergoing mitosis, or division, usually have two "checkpoint Charlies," known as G1 and G2 checkpoints, which can stop the cell cycle and repair any DNA damage before the final stage of cell division. However, 50 percent of all solid cancer tumours are missing the tumour suppressor gene P53, which means that they are missing the G1 checkpoint, or the first point to repair DNA damage. So, if a G2 checkpoint inhibitor were used along with traditional methods of cancer therapy (such as radiation, which involves DNA damage) the cancer cells would have no repair mechanisms. The result would be more effective, less invasive treatment.

"This is where cancer research is going now," says Andersen. "We are trying to discover chemical ways to treat cancer that take advantage of well-documented differences between cancer cells and healthy ones."

Photo: Tom Carefoot

Marine Sponge to Anti-Asthma Drug

In one of the biggest deals signed by a Canadian biotech company, a synthetic analogue based on Raymond Andersen's compound, contignasterol, is now undergoing phase I clinical trials in Europe. The trials are being conducted by Inflazyme, a Vancouver-based company, in collaboration with Hoechst Marion Roussel. The compound was discovered in extracts of the sea sponge *Petrosia contignata*.

"There was an element of serendipity because we started out looking for cytotoxins, not anti-asthma drugs," notes Andersen. What they found was a marine secondary metabolite that had chemical and structural properties never seen before. Eventually, UBC was granted worldwide patent rights for contignasterol, the first example of a new class of steroids. Andersen is enthusiastic. "It has many advantages over current anti-asthma drugs in that it's orally active and does not cause the same toxicity as traditional steroid medication."

UBC Receives Royalties from Research

Under a license agreement with Forbes Medi-Tech, UBC recently received its first milestone royalty payment of $250,000 for the use or sub-license of Phytrol™, a cholesterol-lowering food ingredient developed by James Kutney in the Department of Chemistry. The Faculty of Science will receive $50,000 of these funds on an annual basis.

Physicist Walter Hardy wins Killam Prize

One of this year's three $50,000 Killam prizes, awarded by the Canada Council for the Arts to acknowledge distinguished lifetime achievement, was presented to Physics Professor Walter Hardy for his contribution to the field of high-temperature superconductivity.

New Director for Science One Program

Douw Steyn, associate chair of the Department of Earth and Ocean Sciences and of the Atmospheric Sciences Program, has been appointed the new director of Science One, UBC's innovative interdisciplinary program for first-year science students. Dr. Steyn takes over from founding director Jülyet Benbasat, who will continue in her capacity as associate dean of Science, Academic and Curriculum Services.

Zoologist named 3M Teaching Fellow

Zoology Associate Professor Lee Gass was recognized as one of the top ten Canadian university educators by 3M Canada Inc. and the Society for Teaching and Learning in Higher Education. This spring, he also received the University's Killam Prize for Excellence in Teaching. Gass helped to develop Science One as well as Science First, a series of independent noon-hour lectures for undergraduate students.

More Stellar Physics Students

Martin Adamchy, a PhD student in semiconductor physics, won the 1999 Erich Vogt Award as the top BC Science Council GREAT fellowship winner in the province. Fellow UBC physics student Douglas Scott is spending the fall term at the University of Toronto on a fellowship from the Canadian Institute of Theoretical Astrophysics.

Young Appointed New CIAR Associate

Jeff Young, Physics and Astronomy professor and director of the Engineering Physics program at UBC, has been appointed an associate of the Canadian Institute of Advanced Research (CIAR) program in Nanostructures. This program will address issues related to the development of devices for future-generation computers and communications systems.

Julia Levy receives OLSC Merit Award

Dr. Julia Levy, president and CEO of QLT PhotoTherapeutics and former UBC researcher and professor, has recently been awarded the Ottawa Life Sciences National Merit Award for her contribution to biotechnology research and development.

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