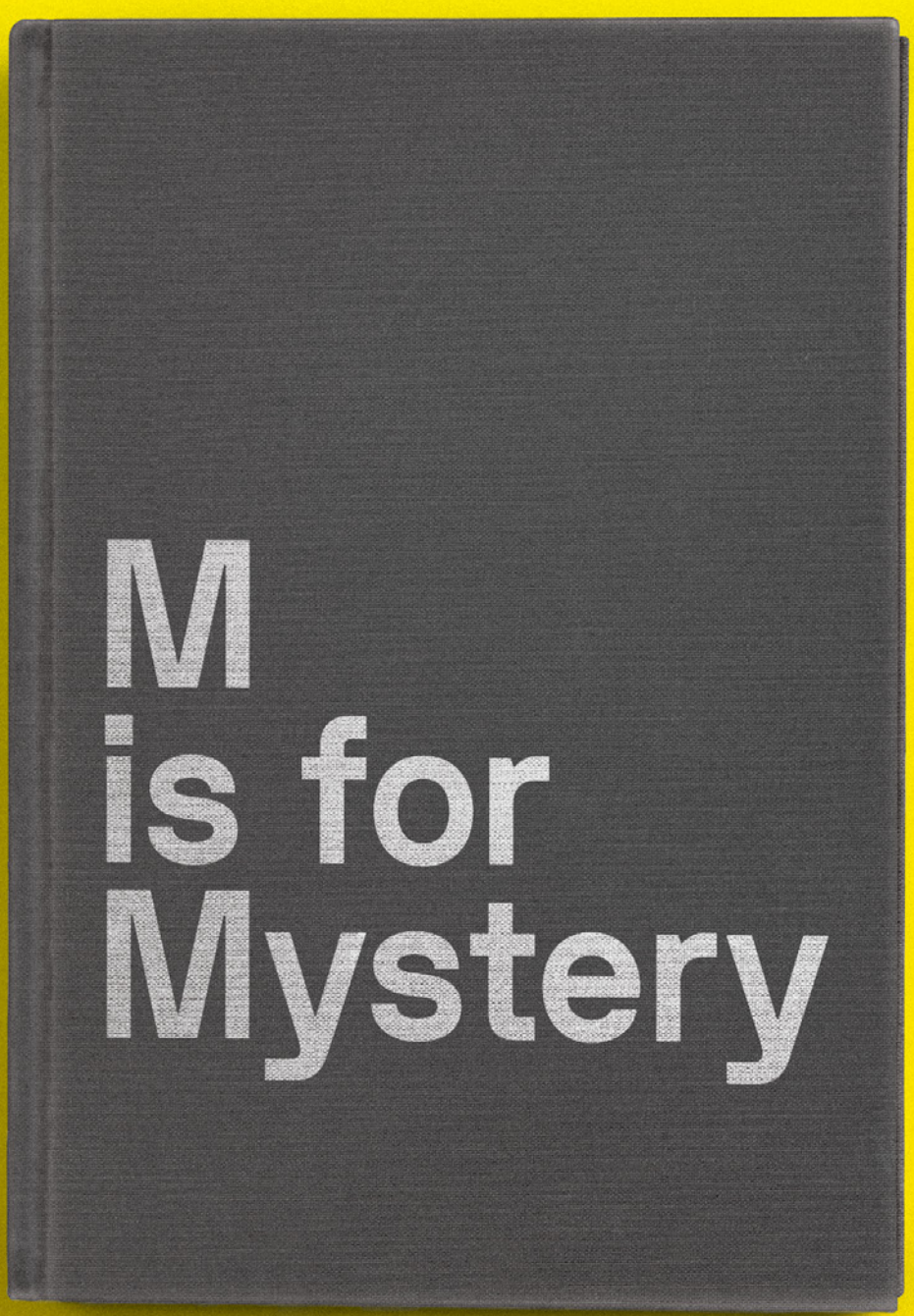
UofTMed

University of Toronto Medicine

Summer 2016



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M is for Mystery

Can't get enough? *Good*. There's more online!

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More Mysteries

Are you a mystery or a history buff? We have a challenge for you! Go online to help us determine the function of our antique medical instruments. Share your answers with us on twitter or instagram (@uoftmedicine) or email them to **medicine.magazine@utoronto.ca**. Guesses will be posted online. Can't wait to get started? Flip to page 18.

Secrets of WW II

Military history fans will love reading about U of T Professor Wilbur Franks and his anti-gravity suit (page 14). Check out even more archival photos online of Franks and the invention that saved many pilots' lives during World War II.

A Moving Tribute

Globe and Mail reporter Ian Brown, the father of a special-needs child, brought the house down with his tribute to Denis Daneman, the departing Chair of Paediatrics, at a recent SickKids event. Read what he said.

The *British* Connection

Do you know the mystery of the three paintings by Sir Frederick Banting? Read new details about Miss Nancy Archer, the works' original owner, and go online to see all three paintings.

Dial M for Medicine

"The world is full of obvious things which nobody by any chance ever observes."

— **Sherlock Holmes** in Sir Arthur Conan Doyle's *The Hound of the Baskervilles*.

What makes for a really good mystery? It isn't just an interesting question or sparring with a particularly evil villain. A good mystery is born from the tension that builds as our hero pursues the truth, often against the odds.

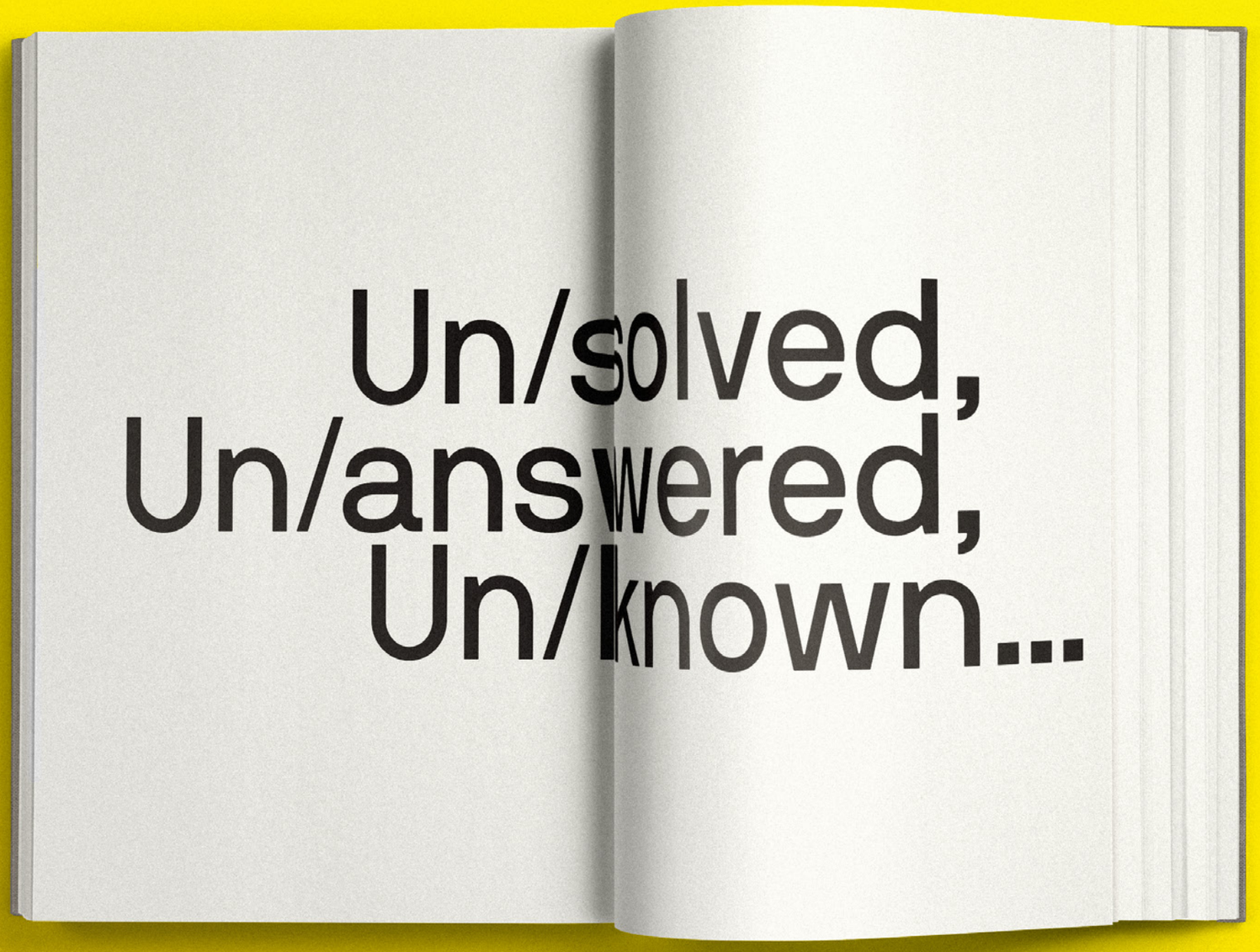
In many ways, that's what happens every day in the Faculty of Medicine. Our students and faculty don't just struggle with novel questions but pursue evidence through research and rigorous examination. They see their fair share of villains, sometimes in the form of devious pathogens, but more often revealed by a dog that doesn't bark, like from an Arthur Conan Doyle tale. Physicians and medical researchers are frequently confronted by mysteries that demand not just strong clinical and scientific skills but also a gumshoe determination to uncover the facts. We are both Sherlock and Dr. Watson.

This issue of *UofTMed* delves into the realm of mysteries to find the inherent drama that rests behind questions and examine how we persevere to reveal the answers. The process is sometimes frustrating and at other times exhilarating, but it's never dull.

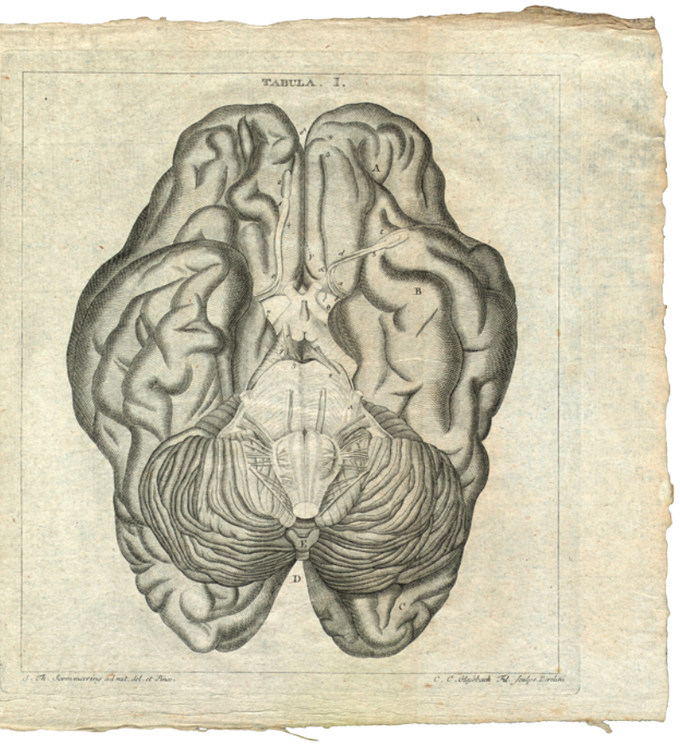
A mystery is rarely solved by revealing what's unknown. It's the careful re-evaluation of what's right in front of us that makes the truth self-evident. What I see when I look at the Faculty of Medicine is a community committed to uncovering facts — and by doing so, finding solutions to some of the most complex problems in science and medicine. And that, to anyone who observes us, is obvious.

Trevor Young
MD, PGME (Psychiatry) '88, MSc '89, PhD '95
Dean, Faculty of Medicine
Vice-Provost, Relations with Health Care Institutions

What makes for a great medical mystery? Seven faculty members share the unsolved cases that keep them up at night — and some of the great questions still unanswered in medicine.



By Heidi Singer



Resisting Our Genetic Destiny

Stephen Scherer
(MSc '91, PhD '95)
is Professor of Molecular Genetics and Director, McLaughlin Centre; Senior Scientist, The Hospital for Sick Children.

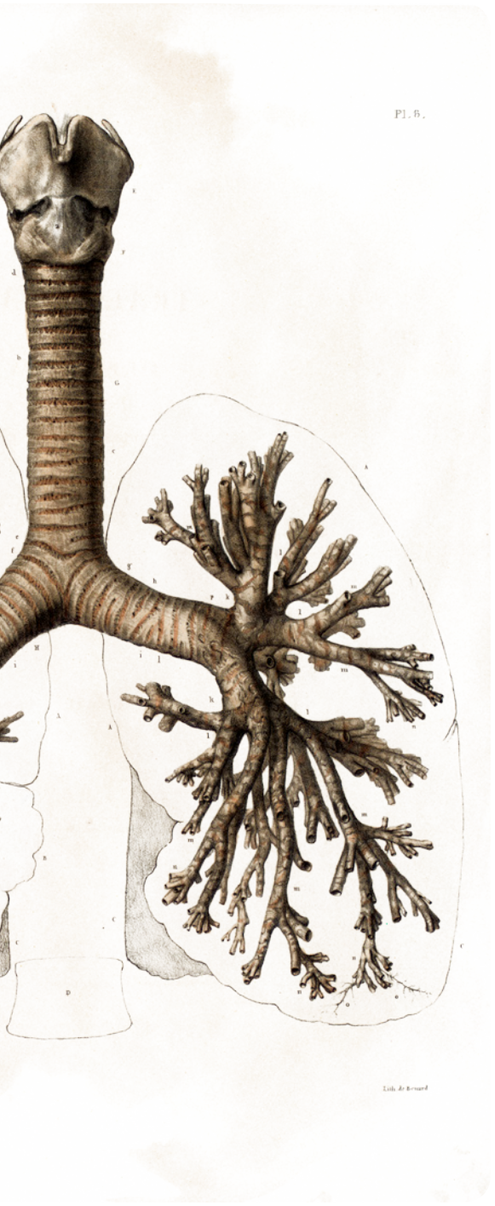
There are kids with autism who can cite every name, address and number in a phone book but have trouble tying their shoes. Sometimes I wonder which is the bigger medical mystery — their amazing memories and motor deficiencies, or everybody else's memory deficiencies but adeptness at other, perhaps simpler things?

Studying the genetics of autism brings up a very fundamental mystery: Why do some people who have massive genetic irregularities never develop autism (or other disorders), but their children do? This mysterious ability that some people have to resist their genetic destiny is utterly fascinating. Scientists all over the world are now combing through the genomes of healthy people, looking for those rare ones. These miraculous genomes have learned to resist adversity, so maybe they'll show us the way. Genetic "resiliency" is perhaps the biggest diagnostic mystery of 21st-century science — and potentially the key to solving our most complex medical questions.

Where Cancer Doesn't Tread

Penney Gilbert
is an Assistant Professor at the Institute for Biomaterials and Biomedical Engineering.

Why do our muscles almost never get cancer? This disease is infamous for becoming very invasive, travelling everywhere in the body — but skeletal muscle is never the place it goes. It's just this really interesting observation that people have made, and we don't have an explanation for it. As far as I can tell, nobody has dug down and figured out why, and there might be some important information to use in the fight against cancer. For example, there could be unique proteins in muscle that prevent tumour cells from wanting to put down roots in this type of tissue. Or it could be something fairly simple — muscle is always moving, so maybe it's difficult for cancer cells to enter this tissue.



Solving a 50-Year-Old Mystery

Richard Hegele (MD '84, PGME '89) is Vice Dean of Research and Innovation and a Professor in the Department of Laboratory Medicine and Pathobiology.

A few years ago, my lab discovered a crucial receptor for respiratory syncytial virus (RSV), which frequently causes the common cold and serious lung infections like pneumonia. Researchers had known about this virus since the '50s, but we hadn't made much progress on a treatment because nobody had identified the molecule that allows the virus to bind to the cell. We looked at our quest as a mystery that needed solving — and I believe that mindset helped us.

First we determined the virus sticks to protein, not sugars or lipids. But which one? The cell surface contains thousands of proteins so, we had to narrow it down. We separated cell surface proteins on a gel and got a common "hit" for all the cell types and RSV strains we tested. We identified the protein we thought was responsible for these hits, and after a series of experiments using different techniques, we established the evidence that this unusual molecule was indeed an RSV receptor. The answer wasn't intuitive, but came from a great deal of trial and error — gumshoe detective work that solved a 50-year-old mystery.

The main lessons were to keep an open mind, expect the unexpected and understand your tools. Basic scientists don't always see their investigations as mysteries to solve, but I think it helps to look at it this way because in any good mystery the culprit is never the one you suspect at first.

The Mystery of the Aging, Failing Brain

Graham Collingridge is Professor and Chair of the Department of Physiology.

Aging, failing brains are normal enough — anyone who lives a long time will probably feel this decline. Of course dementia is far more tragic than "normal" memory loss, but why should we lose any part of the thoughts and memories that make us human? I don't think it's a given that our brains should wear out like other parts of our bodies. Why should the aging process wipe out our very identities?

We've never solved this mystery, and as a result the medical landscape is littered with failed drugs to treat dementia. But recently, we have started to take a step back to understand the molecular basis of learning and memory. There have been great strides recently in this area. Now the challenge is to understand why and how these processes go wrong in conditions like Alzheimer's — and then develop treatments to alleviate and perhaps even cure these awful diseases.

That heartbeat was like a gift from God.

Under Pressure

A 64-year-old woman was carried into the emergency room one night screaming from abdominal pain. To my surprise, her belly was soft, ruling out most of the obvious causes. Her adult daughter was worried sick, and pushing hard for action. I felt the pressure to get it right. Blood tests showed elevated lactate, which meant somewhere in her body wasn't getting oxygen. I could order a CT scan, but radiologists always say if you don't know what you're looking for, you won't find it with a scan. Just when I'm trying to figure out my next move, she flips into atrial fibrillation. That's when I smile — now I know she's got a blood clot leading to an ischemic bowel.

I put her on blood thinners and send her off to the CT scan. Now that I know what I'm looking for, the scan confirms the diagnosis: it shows several feet of bowel that are deprived of oxygen and swelling up, causing intense pain. An interventional radiologist takes the clot out.

The things that ER physicians see are common occurrences. We solve mysteries mostly through pattern recognition. The first unusual pattern I saw in this case was pain out of proportion. But it wasn't until her heartbeat went irregular that I thought of a blood clot in the vessels of her intestines. That heartbeat was like a gift from God: it made me realize there was turbulence in the blood stream.

Detectives solve mysteries. But I don't imagine them becoming emotionally burdened by anxiety from their cases like doctors do with their patients. What if that woman had been close to death and I hadn't had much time to figure out the problem? Clinicians are never dealing with a sterile medical mystery. Panic and logical thinking never go well together.

Brian Goldman (MD '80, PGME '82) is an emergency room physician at Mt. Sinai Hospital, Assistant Professor of Family and Community Medicine and host of the CBC Radio show *White Coat, Black Art.*

Why Do Children Get Cancer?

Gino Somers (PGME '04) is an Associate Professor in the Department of Laboratory Medicine and Pathobiology, and the Division Head of Pathology at SickKids.

As a medical student, I used to think cancer was a disease of old people: your cells get old and don't divide as well and the DNA gets jumbled. But why do children get cancer? On an emotional level it's totally unfair; however, there are lessons here that can be applied to many cancers. In children, there's a fine balance between normal development and cancer. For example, some childhood cancers are caused by two chromosomes breaking and rejoining out of order, resulting in two normal genes being pushed together. These genes are essential for normal development, but putting them next to one another, "out of order" on the chromosome, is enough to push a very controlled process (normal development) to an uncontrolled one (cancer).

We still don't understand what's causing those chromosomes to break in the first place. Researchers are studying this question, and we're hoping that genomic sequencing and high-powered bioinformatics will help us solve this mystery.

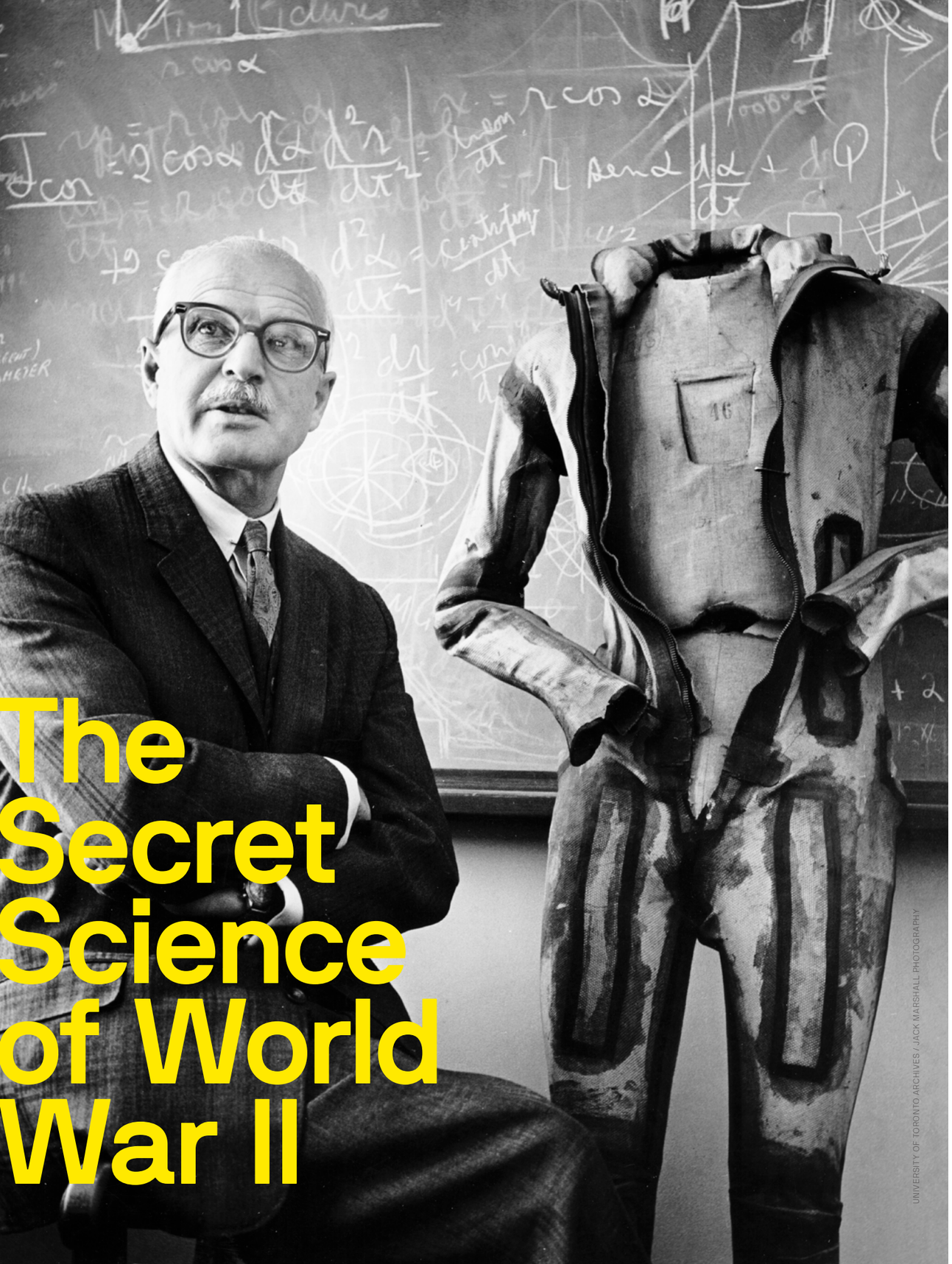
The Deep Sea of Possibility

Andy Fraser is a Professor at the Donnelly Centre for Cellular and Biomolecular Research and the Department of Molecular Genetics.

The world's oceans hold medical mysteries overlooked since the beginning of time — I think they hide life forms that could be the next frontier in understanding and curing disease.

The vast majority of this planet's biological molecules, up to 95 per cent, haven't been studied well, because we don't know how to grow them in a lab. But they have all kinds of interesting biological activities. For example, there's a single-cell organism that puts out a telescopic spike ten times longer than its body — a whole new life form. Scientists are only now starting to pull these fascinating creatures out of the sea, and they're finding that any crazy thing you can dream up, some species does it. For example, some don't make DNA transcripts — instead, they stitch together bits of RNA to form the proteins that control our genetic destiny. Who knows how this can be used for gene editing?

Over a billion years, evolution has figured out every way imaginable to play around with biological molecules. To fix what's wrong in our genes, we need to uncover the mysteries that are already in front of us, or hiding under water.



UNIVERSITY OF TORONTO ARCHIVES / JACK MARSHALL PHOTOGRAPHY

The Secret Science of World War II

When the pressure hit, Franks thought the suit would cut him in two.

Deep within a mysterious North Toronto building, Faculty of Medicine researchers developed the world's first anti-gravity suit.

By John Lorinc

In August 1941, moviegoers flocked to the latest Hollywood war flick called *Dive Bomber*, which hit theatres months before the bombing of Pearl Harbor. The film tells the tale of two men — a Harvard-educated doctor and a seasoned pilot — searching for solutions to the altitude sickness and blackouts that afflicted pilots on dangerous missions. The unlikely pair defied the skeptics and experimented with a "pneumatic belt" meant to keep blood flowing to the brain. The film, audiences were told, was dedicated to the cause of "aviation medicine."

Toronto audiences likely had no idea that the story was an almost eerily accurate retelling of the pioneering, super-secret aviation medicine experiments carried out by University of Toronto researchers at a Royal Canadian Air Force facility on Avenue Road north of Eglinton.

The facility was located on the grounds of the former Eglinton Hunt Club, which the RCAF bought for $50,000 to run its training programs. Inside, Professor Wilbur Franks (BA '24, MB '28), a U of T cancer researcher working for Sir Frederick Banting (MB '16, MD '22), used a human centrifuge to test the anti-gravity suit he'd designed for air force pilots prone to blacking out from intense g-force pressure created by tight turns and nose dives.

The suit, which he personally tested at Camp Borden west of Barrie, Ontario, and later at the Farnborough Airfield in England, was the first of its kind and established Franks as a pivotal figure in the history of aviation medicine. But its development exacted a heavy toll: Banting, one half of the team credited with the discovery of insulin, was killed in a crash in early 1941 in Newfoundland while heading to England to test Franks' invention.

So what exactly does an anti-gravity suit protect the body from? When someone is sitting at ground level, not moving, the earth's gravitational field exerts what's called a 1-g force, equivalent to the weight of that person. But when the same individual is being whipped around on a tight curve on a roller coaster, for example, inertia causes their body and blood to move along the original trajectory, resulting in a sudden increase in centrifugal force.

Scientists say that when this increased pressure is double the g-force of a resting body, the individuals' weight at that moment is effectively doubled. At a high g-force, the weight of blood may be several times higher than at rest. The heart, in turn, strains to pump the blood around the body, especially out of the lower extremities and into the brain. Under this g-force strain, an individual experiences reduced vision, temporary blindness and finally loss of consciousness — a condition known as static hypoxia.

According to a 2004 article in the *Journal of Aviation/Aerospace Education and Research*, the increasingly powerful fighter planes that were being developed during the interwar period seemed to be causing more accidents with pilots blacking out at the controls of aircraft that were flying higher and faster than ever before.

In the late 1930s, with the war in Europe looming, Banting realized that aviation medicine could play a strategic role in a conflict that would see increased use of bombers and fighter planes. His interest wasn't incidental: Banting had served as an army surgeon in World War I and remained an officer in the reserves after the armistice of November 11, 1918.

Working with the RCAF, Banting moved to create an aviation medicine research team at U of T and tapped Franks, whom he'd met through a mutual friend of Charles Best (BA '21, MA '22, MD '25). At the time, Franks was doing cancer research, which involved the use of a centrifuge for samples. He had noticed that glass test tubes tended to shatter in the device. But when he packed the tubes in water, they were fine.

Franks and Banting were both fearless, and seized with a sense of mission.

Seconded to Banting's project, Franks began thinking about the significance of this modification of a testing technique, and realized the water around the tube created sufficient hydrostatic pressure against the tube to counter the centrifugal force. Perhaps, he thought, the same principle would apply to human tissue.

After experimenting with mice at the Banting Institute, Franks in 1939 began developing a rudimentary version of an anti-gravity suit, which was lined with fluid-filled pockets and designed to fit snugly around a pilot's legs and torso. To fund the research, Banting had approached an eccentric construction magnate named Harry F. McLean for a $5,000 grant. McLean, an aviation buff who once set out on a round-the-globe flying mission with his personal nurse, was known for wandering around in public, giving away large sums of cash or cheques.

Early in 1940, according to "The Remotest of Mistresses," Peter Allen's 1983 biographical essay on Franks, the researcher took a bespoke version of his invention to Camp Borden and went up with a RCAF pilot. Allen, a commercial flyer and accountant who first met Franks in the mid-1970s, writes that Franks had never even flown before, "much less endured high G aerobatic maneouvers." But he and Banting were both fearless, and seized with a sense of mission (they had enlisted after Canada declared war and were given officer ranks). "It was their mentality," Allen said in a recent interview. "They just did stuff that was risky."

"In the airplane, I was sitting down," Franks told Allen. "[W]hen the pressure hit, I thought [the suit] was going to cut me in two." Wing Commander D'Arcy Greig, an ace Royal Air Force pilot, also tested the suit during secret flights at Malton in early June 1940. He came to similar conclusions. Allen quotes Greig's report in his 1983 essay: "The suit in its present form is not a practical proposition."

Interestingly, German scientists as early as 1931 had arrived at a the same impasse with their own version of an anti-gravity suit for pilots. They opted to discontinue their research program.

Realizing that they needed to refine the invention, Banting and Franks persuaded the RCAF to partner with U of T and Victory Aircraft (later Avro) and build a human centrifuge at the Hunt Club facility in 1941. Jordan Bimm, a PhD candidate at York University now completing a doctorate on the history of aerospace medicine, says the centrifuge looked like a giant stand mixer, with an air-tight gondola that could hold one person. The gondola's temperature, air pressure and orientation could be altered, with internal sensors monitoring performance. (There are photos of Franks himself in the centrifuge, which was in operation until 1987.)

Franks reckoned it was possible to scale down the suit, so the coverage was limited mainly to the legs and buttocks. Bimm says Franks made numerous versions of the suit, up to "Mark 7." "They refined it many, many times." U of T historian Michael Bliss (BA '62, MA '66, PhD '72), in his biography of Banting, described him and Franks as "tinkerers." "They tried things," Allen says. "Sometimes it worked, and sometimes it didn't."

Following Banting's tragic death in February 1941, Franks finished developing the suit sufficiently, such that the Royal Air Force was prepared to use it in combat. But the Allies regarded the discovery as so significant that they didn't want to fly sorties over Europe, for fear of losing a plane operated by a pilot wearing the "Franks Flying Suit." If the Germans captured the flyer, the RAF thought they could reverse engineer it.

Instead, RAF pilots wearing Franks' invention were sent to North Africa to provide air support for US General Dwight Eisenhower's invasion of Algeria in 1942. The results, Bimm says, were mixed:"They found it difficult to move around." US researchers took over.

But senior American aviation medicine experts later told Franks his pioneering work was critical in the refinement of the technology. The work in Toronto, moreover, paved the way for the Canadian military's sustained investment in aviation research at CFB Downsview, which continues to this day. "That traces right back to the decision to make this a competency in Canada," says Bimm.

The military didn't declassify information about the Franks Flying Suit until the 1950s, and Franks himself remained a low-key medical researcher until the 1970s, when, Peter Allen heard him lecture at U of T about the invention. He decided to make it his mission to ensure that Franks was duly recognized for an achievement that has reverberated through the post-war history of military flight. "Franks was a very understated man," Allen reflects. "He just thought he was doing his job." ◘

Purpose Unknown

Help Us Solve the Mystery of These Medical Devices

Curated by Erich Weidenhammer
Photo by Jacklyn Atlas

A rich trove of curious medical devices is being stored in a back room of Sidney Smith Hall on St. George Street. Most were found in obscure corners and basements of Toronto research labs and hospitals, or passed on by collectors. Historian Erich Weidenhammer (PhD '14) and a small but passionate group of medical history buffs from various Toronto institutions shepherd the growing collection at the Institute for the History and Philosophy of Science and Technology. One day, they hope to turn it into a museum of medical instruments. Highlights from the collection are on display until spring 2017 on the third floor of Victoria College.

Each of the objects was once a mystery to identify — or still is. Tweet your guesses to **@uoftmedicine** or email us at **medmag@utoronto.ca**

See page 27 for clues.

Dancing in the Dark

By Erin Howe

With no explanation for her symptoms, Rachel became a mystery to her doctors — one of the 'medically unexplained.'

Tests and doctors' visits gave no insight into Rachel's chronic pain, muscle spasms and neurological symptoms. The 16-year-old had been a healthy, vibrant ballet dancer. The first signs of trouble came after Rachel fell and hit her back during an audition for a professional dance school a few hours from her home in central Ontario.

"Afterward, I started to have paralysis in my legs," Rachel recalls. "The longer I was sick, the worse I felt. But it seemed like most of the doctors just kept saying, 'I don't know.'"

Medical tests came back negative, revealing no clues. Specialists, chiropractor, osteopath and physiotherapist couldn't help. Nothing brought Rachel closer to a diagnosis or lasting relief.

"As time passed, it was scary," says Rachel's mother, Debbie. "As parents, we depend on the medical system and when the specialists couldn't figure it out, we thought somebody should have been able to."

'The symptoms are real'

When faced with enigmatic illnesses that appear to have no clear biological explanation, doctors may describe the unexplained, using expressions like "psychosomatic complaints," "functional" or "non-organic symptoms." But Claire De Souza (BSc '93, MD '97, PGME '02), an Assistant Professor in the Department of Psychiatry, says such language can be confusing for patients and their families because the terms are not diagnostic, and they can't be looked up and better understood.

"Framing an illness as a medical mystery isn't satisfying for young people or their families," says De Souza, who is also a Staff Psychiatrist and the Medical Director of the Consultation-Liaison Psychiatry Program at The Hospital for Sick Children (SickKids). "As healthcare providers, we need to convey to this population that we believe what they tell us and that we know they're not faking an illness or looking for attention. Their symptoms are real and have had significant impacts, and we can help."

As Rachel and her mother's search for answers continued, they began to feel the stigma and hopelessness that can accompany a medically unexplained illness.

"There was one specialist who said, 'This is not my department,'" recalls Rachel's mother. "He had my daughter stand on her paralyzed leg and fall repeatedly. We asked him for a referral and with his arms crossed, he said, 'Nope, that's not my job — I would see a neurologist or a psychologist.' But he wouldn't recommend anyone."

JACKLYN ATLAS

When answers remain elusive, De Souza advocates for a new way of approaching the patient assessment: the biopsychosocial model. Using this framework, biological factors like infections or injuries, psychological factors like perfectionism or a traumatic experience, and social factors like academic challenges, difficult peer relationships and family circumstances are all taken into consideration to understand a person's symptoms.

"There's still a tendency to think of assessing distressing and impairing symptoms using a biomedical approach," says De Souza. "When the tests don't reveal anything, these young people are moved through to psychiatry, creating a bit of a mind-body split. But children and teenagers can't be divided that way."

There's a growing recognition that medical mysteries can flourish in the gap between treating the mind and the body. A recent SickKids survey showed a widespread desire by physicians to do better at helping young people with both physical symptoms and mental health issues. And a town hall meeting at the hospital aimed at bridging the gap drew attendance from nearly every department.

Like De Souza, Antonio Pignatiello (MD '87, PGME '93), an Associate Professor in the Department of Psychiatry, is working to change the way medical professionals see children and youth with medical and mental health conditions.

In his role as Director of the Medical Psychiatry Alliance's Child and Youth Health and Family Services, Pignatiello is helping build a collaborative care model. The idea is to better equip physicians across specialties like emergency medicine and family medicine to treat physical and mental illnesses — including medically unexplained symptoms — simultaneously. At SickKids, these efforts include a somatic symptom consultation group to allow caregivers from various disciplines to share their expertise with each other. Teens and parents are also making suggestions for improvement.

"We want to provide better, quicker access to the most appropriate service in the most appropriate place at the most appropriate time," says Pignatiello. "Ultimately, we want people to be able to feel that no door is the wrong door for accessing the care they need."

Nearly a year after she fell ill, Rachel's symptoms grew worse. She had less control over her arms, slurred speech and a loss of vision. Again, her family took her to their community hospital, where she was admitted.

Within a few days, the doctor overseeing Rachel's case called the family together with a potential diagnosis: conversion disorder, a psychological condition that causes neurological symptoms.

Rachel's doctor had seen a case of conversion disorder before, which had left another young patient confined to a wheelchair for years. He wanted to help Rachel do better. In collaboration with De Souza and a team of local healthcare providers, Rachel was able to recover at her community hospital. Debbie credits the combination of help from De Souza, a physiotherapist and the family doctor with helping Rachel make a quick recovery.

From hope to recovery

After her diagnosis, Rachel's doctor told her she would make progress quickly. Before she left the hospital, the teen took her first steps.

"It was pretty awesome to start walking without the parallel walking bars," remembers Rachel. "I hadn't been able to walk in eight months. Even before that, my leg would spasm or give out. So I was really happy to start walking again."

Today, Rachel says she feels "100 per cent better" and is dancing once more.

With greater integration between specialties, De Souza and Pignatiello hope to create more happy endings for people whose mysterious illnesses might otherwise be considered "medically unexplained." M

KAREN NGUYEN (RENDERING)

Anatomy in the 21st Century

There's an art and a science to the study of anatomy, but for many medical students today, dissection is becoming a lost experience. Not so at U of T, where a major overhaul to the old basement Anatomy Laboratories will ensure real-life dissection continues its important role in medical education.

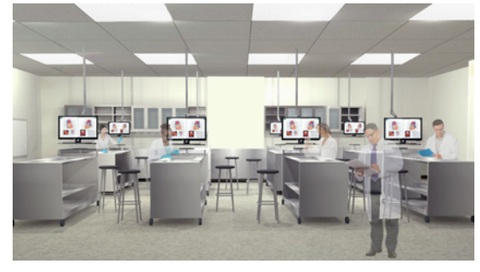
Set to begin this fall, the renovation will be the first since the 1960s. Gone will be the harsh fluorescent lights and 70s-era TV screens tucked into the corners. The new lab will feature 16 of the latest dissection tables, each with a computer screen. Each table will have a second level, doubling the capacity for dissections, and allowing the labs to be used by more students. And there will be easier access to professionally dissected samples for comparison.

"The best way to learn anatomy is through dissection," says Professor Cindi Morshead (BSc '86, PhD '94), Chair of the Division of Anatomy. "I lecture about the brain, but the best way to really understand its anatomy is when you see it up close and learn about the relationship between structures. I can show you a brachial plexus, but when I'm dissecting it, I have to take out muscle and bone. I learn how everything relates together. I see an extra layer of complexity."

Many medical schools now offer only professionally dissected body parts or even 3D digital models, says Morshead. But some medical students say they chose U of T in part because of its hands-on dissection program.

"Students often mention that these cadavers are their first patients," she says. "There's a lot of empathy to be learned from someone who gave them the gift of learning. It's quite profound and I think they always realize that."

To underscore the importance of its dissection program, U of T has agreed to match all donor funds for the new labs. The increased capacity comes at a crucial time. Curriculum changes starting in the fall will require lab access outside of normal teaching hours, as students integrate anatomy learning throughout their medical education, rather than in one block. M



Rendering of the future lab.

To learn more about supporting the campaign for the anatomy laboratory, please contact:

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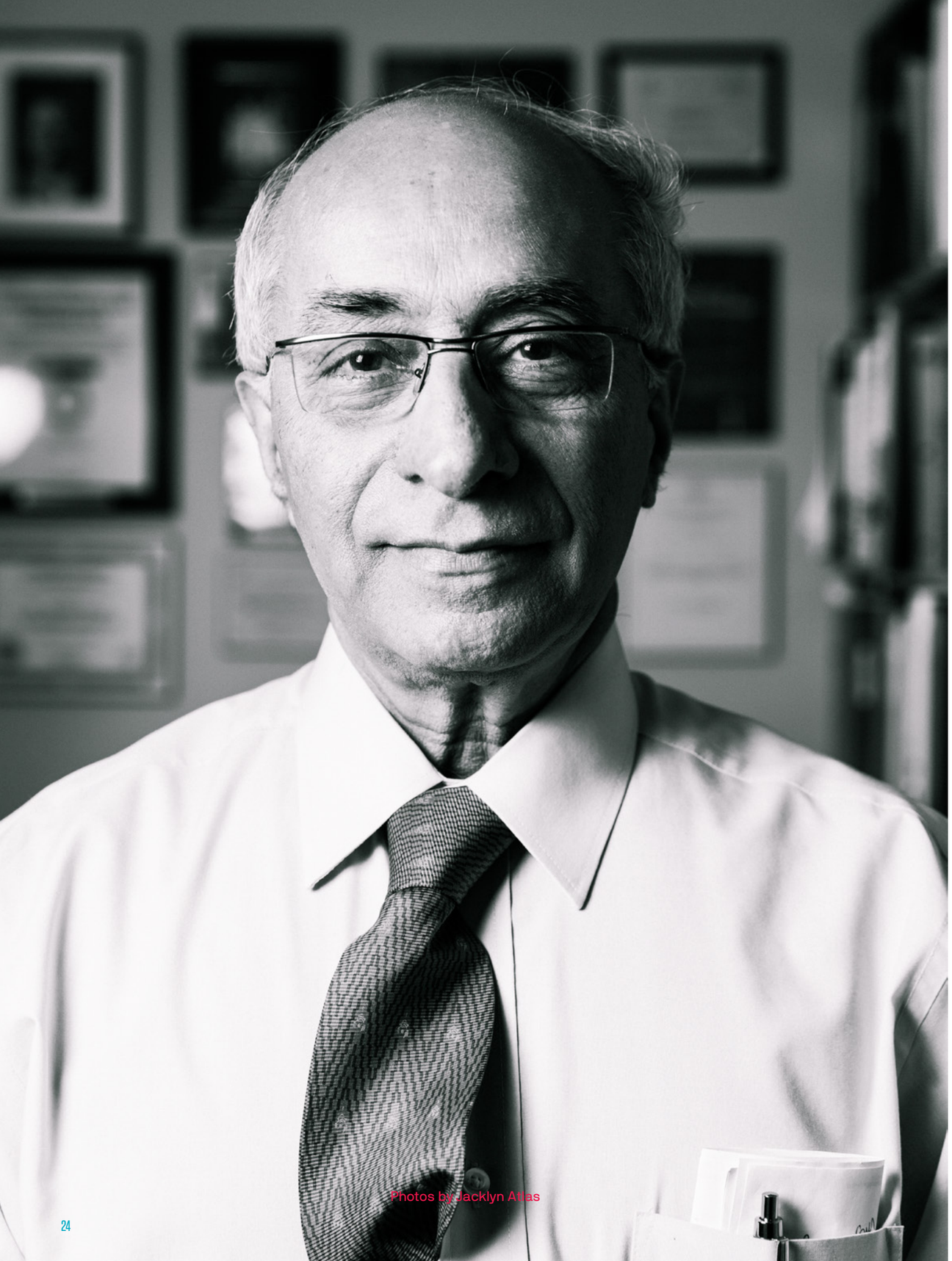

Photos by Jacklyn Atlas

Professor Butany

AND THE MYSTERY OF THE

Malfunctioning Heart Valve

By Carolyn Morris

The mechanical heart valve didn't look any different from the regular model when cardiovascular pathologist Jagdish Butany plucked it from the specimen container. He noticed a greyish white tissue along the outside of the ring, which is a sign of the host heart reacting to the valve. After seeing an X-ray of the device, he realized it was a model he'd never seen before, as it showed metal within the ring. He took it over to cardiovascular surgeon Christopher Feindel (PGME '85), who confirmed it was a new design.

It still had the two pivots that open to let blood through and close to prevent backflow. It still had the synthetic fabric along the edge of the ring, allowing the surgeon to stitch the valve into place. The only thing that made this particular model stand out was a layer of titanium, palladium and an outer coating of metallic silver applied to the sewing cuff, which was intended to prevent bacterial infection. At first glance, this would appear to be a normal, fully functional valve.

"So why do you think it failed?" Feindel asked. Today's high-quality mechanical valves should typically last decades — this one hadn't even made it six months before needing to be replaced.

"I'm not sure yet," Butany replied. It was the summer of 1998, and over the next few weeks the cardiovascular pathologist, a Professor in the Department of Pathology, saw another two, three, four more of these same valves come out — all less than six months after they'd been implanted.

Unlike surgery, which is an inherently dramatic medical specialty — with high stakes, tight timelines and intricate procedures — pathology takes place in the aftermath of the action. It involves careful examination and measured analysis. But it comes with its own brand of drama: the sleuth work of piecing together what happened and observing patterns.

Pathologists are like scientific detectives, investigating biopsies, lab tests, organs, tissues or blood samples to guide treatment decisions — or in the case of autopsies, to determine the cause of death and potentially prevent the same fate among the living. In addition to forensic pathologists finding clues in "who-done-it" cases — as sensationalized by CSI-type TV dramas — pathologists have explained countless medical mysteries, such as why mixing blood from two people would cause it to clump (incompatible blood types), or how a young and otherwise healthy teenager could drop dead playing sports (heart muscle diseases and cardiac structural abnormalities). Now Butany wanted to figure out why these silver-coated valves were failing so quickly.

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In a pathology laboratory at Toronto General Hospital, Butany uses small metal forceps to hold the human heart-valve leaflets in place over a brown paper towel so he can measure them with a plastic ruler. He works on a white plastic cutting board at his lab bench, his audio recorder nestled in a container marked "gauze" next to a blue basket holding his workload — specimen containers with pink lids housing formalin and pieces of tissue removed from patients' hearts.

It's Butany's job to make a final diagnosis after heart surgery — by examining the natural valves removed during the operation to insert a prosthetic valve. Often, in older patients, the aortic valve will have become thick and stiff with calcium and phosphate deposits, causing strain on the heart and eventually heart failure. Others get into trouble due to a congenital heart defect in which two cusps of the valve are fused together. In some cases, an infection such as rheumatic fever — rare in

Canada but still an issue in developing countries — can cripple the valves of the heart. Butany recognizes the signs of these conditions, and describes them in meticulous detail. But he's especially intrigued whenever he comes across a mechanical valve among his specimens.

"Many pathologists wouldn't pay much attention to these," he says, "but I have a special interest."

An understatement.

Butany is one of only seven or eight internationally renowned experts in the pathology of prosthetic heart valves. Outside his office at Toronto General Hospital hang four framed photos of his mechanical valve collection, arranged artistically by his students. Inside, among certificates, awards, conference nametags and microscopes, he keeps a Ziploc bag containing a historical evolution of prosthetic valves — ball-in-cage models from the 1960s, valves with a single tilting disc and various adaptations of the gold-standard bi-leaflet device.

So when he began coming across the silver-coated valves back in the summer of 1998, he paid special attention. When patients are neglecting their blood thinner, blood clots can form on the leaflets and hinges, preventing them from closing completely. This is something Butany sees quite often, but it wasn't the case with these valves. Instead, the leaflets seemed to have good mobility. It was along the outside edge of the valve, where the heart tissue connects to the sewing ring, that he found clotting or greyish white tissue from host response. He speculated that the silver — known to have antibacterial properties, but also to be toxic to cells in certain conditions — was perhaps causing toxicity in the heart muscle and that blood was leaking around the outside of the ring. The damage he found, known as a paravalvular leak, could potentially happen with any prosthetic valve, although these were particularly large leaks. But the biggest indication of a problem was the sheer number of these Butany began seeing.

"I went to talk to the surgeons, to ask what was going on," he recalls. "They said, 'Nothing. I took one out — what's the problem?'"

"But in the last five years you never took one of these out a month after the surgery. And at the same time several of your colleagues have taken one out too," Butany remembers saying. "Too many of these are coming out — and too soon."

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"Any one of us might not notice the trend," says Feindel. "You might see one valve come out, then not see it for a year. Jagdish was getting them from different surgeons, though, and started to notice something was wrong. He started to see a pattern."

As the numbers of silver-coated valves removed early continued to climb, Butany began campaigning to get the manufacturer and public regulatory authorities to pay attention. The cardiac surgeons he worked with regularly at the University Health Network stopped using them.

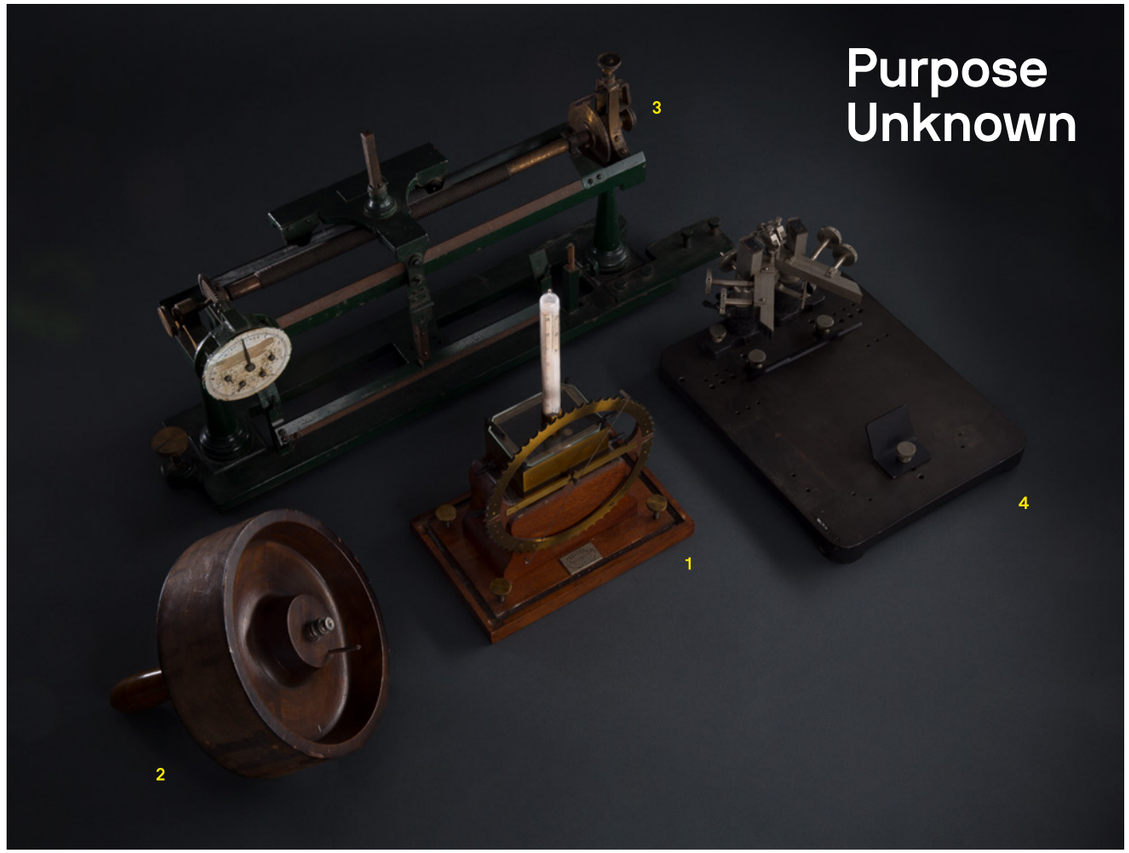
"Normally in science you would look at a series of cases before making a big decision," says Feindel, who stopped using this model of valve after taking just one out too soon. "But if something dramatic happens, and there are other choices — other good options — you would just move on. It's the power of an anecdotal case."

The examples soon piled up and grew into hard data. In the fall of 1999, the UK's Medical Device Agency issued an advice notice warning against the valve, based on Butany's findings as well as the concerns of a surgeon in Wales. Regulators in Australia and New Zealand followed suit soon after. And finally, in January 2000, a multicentre clinical trial led by the manufacturer was stopped early after a significantly higher proportion of the silver-coated valves leaked and had to be removed early. The manufacturer pulled the valve from the market — after 36,000 had been sold worldwide. In Canada, the ensuing lawsuits were settled in 2014.

At Toronto General Hospital, Butany's collection of explanted silver-coated valves ended up climbing to 19. Since the prostheses that "survive" the first year seem to have a similar performance as other valves — he's not sure why certain patients react to the valves while others do not — Butany believes the worst is over.

Just like the keen observation and steady perseverance involved in detective work, Butany's role as a pathologist was key in solving the complex case of the malfunctioning valve. While surgeons were busy with the multiple challenges of their work, Butany was carefully putting together the pieces.

"I was the first person to say, 'Hey, there's something wrong with this,'" he says. "It was a terrible experience. But at least the surgeons I work with took it seriously. And it was great to be validated and great to have the valve taken off the market." M



SNAPSHOTS

Continued from page 19.

1. Electrostatic Generator?

This is a very strange-looking 19th-century instrument — completely inscrutable to me. There's something resembling a clock mechanism at the front. It has electrical leads, and also what looks like the stem of a thermometer or barometer emerging from the top. It was acquired from a collection run by a local group of physicians, who listed it as an "electrical generator." Since people became able to work with electricity in the 18th century, they have used electrical generators in all sorts of healing schemes. This seems old for an instrument used in Toronto. It may have been an antique that a doctor picked up in Europe.

2. Paper Cutter?

This is interesting. It could be for trimming paper to size for use in a kymograph or EEG. I have no idea how it was used. I've never seen anything quite like it.

3. Polio tool?

Our best guess so far is that this is polio-related because it appears to measure lung capacity. It was built in the early 20th century. There's a long history of studying respiratory diseases and developing vaccines here at U of T, so this makes sense. It's laid out like a kymograph: long with a central spindle. But it also has these strange gauges on it that suggest that its users were reading information in real time. It's a strange object.

4. Micromanipulator

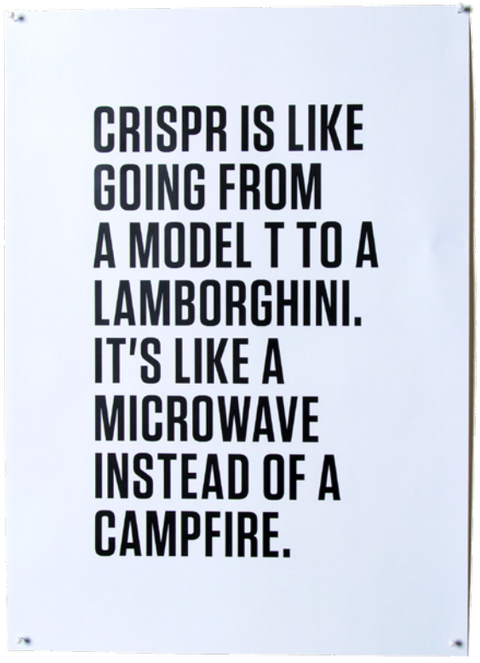
A micromanipulator is an instrument for manipulating microscopic objects — something like a dissecting microscope, but for much smaller objects. The technology first appeared in the mid-19th century. The micromanipulator's essential feature is a very precise mechanism. This one is based on screws and levers. This is a rare treasure, and I've done a lot of research on it. It was purchased for the School of Hygiene shortly after it opened in 1927. It's a versatile instrument, but this one was certainly used to gather individual bacteria for growing single-cell cultures.

‘Might I remind you, Mr. Strauss, that you may have CRISPR, but we certainly have you.’

By Stephen Strauss

Stephen Strauss, former longtime *Globe and Mail* science writer, has seen many supposedly game-changing breakthroughs come and go. Now, with the gene-editing technology CRISPR, Strauss wonders if he’s finally found the real deal.

Photos by Jacklyn Atlas
Illustrations by Luke Pauw



This is a story about CRISPR, the gene editing technology that promises to help solve the ancient mysteries of the human genome and finally put an end to disease. But, if I may, it's also a story about a younger and far more optimistic Stephen Strauss — the science reporter who once passionately argued with a skeptical editor at *The Globe and Mail* about the promise inherent in our genes.

It was 1989. Tiananmen Square and the fall of the Berlin Wall dominated the headlines. *The Globe* was looking for pieces on the most important scientific developments of the decade, and I kept saying to the doubter that we had, had, had to include an article on the genetics revolution. We had, had, had to talk about the tsunami of change that polymerase chain reaction, a gene duplication technology, had begun unleashing and undoubtedly would continue to unleash in ever greater waves.

I argued it was obvious from what had already transpired that in short order we were going to see diseases like cystic fibrosis cured by genetic manipulation; we were going to see world hunger eradicated by genetic modification in agriculture; we were going to hear a genetic explanation for exactly how and why we humans and chimpanzees were intrinsically different, and we were probably going to see a truly scientific return to the debate about improving people through genetic manipulation.

The doubter relented and *The Globe* eventually printed a piece on genetics as "the eye of biology's hurricane."

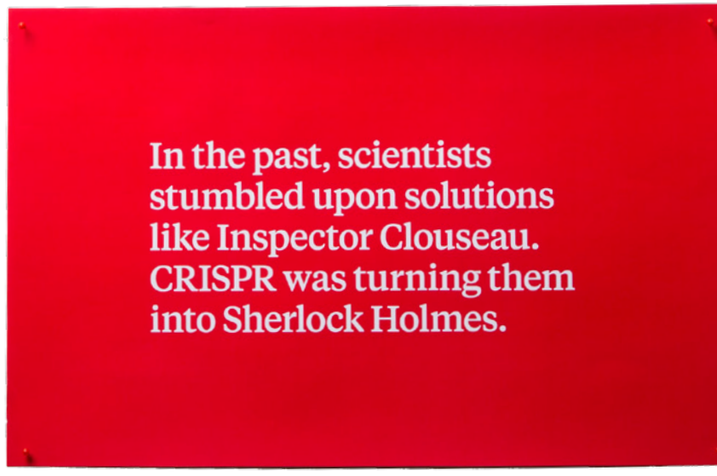
And then wariness set in. Just two years later, I was already writing a piece about how the great Toronto genetic breakthrough of the 1980s, the discovery of the cystic fibrosis (CF) gene, had turned from the promise of a quick cure into a genetic swampland. The more geneticists looked at the genes, the more they came to realize that people who had CF often had individualized genetic differences. Former U of T Genetics Professor Lap-Chee Tsui, one of the original discoverers of the CF gene, told me it was now more accurate to talk about "cystic fibroses" and not "cystic fibrosis." Then we realized that individualized genetic differences were found in most diseases and conditions — particularly in cancer.

But assuredly it was going to get better, I kept telling myself. Surely after the human genome was completely sequenced, my 1989 hymn to genomics was going to be sung worldwide. Some scientists had predicted that by 2010 we'd have routine genetic tests and the beginnings of gene therapy, and that genetic medicine would be part of every family doctor's arsenal. By 2020, many thought, gene-based designer drugs would be available for conditions like diabetes, Alzheimer's disease, hypertension and many other disorders.

What had occurred was a "genomic bubble." Mutations — deletions, duplications and other DNA changes — were found in ever-increasing numbers and we didn't know what they meant. "One of the most common findings we have is what is called a 'variant of unknown significance,'" Ronald Cohn, an Associate Professor of Molecular Genetics and SickKids researcher, would sagely tell me.

And then came CRISPR, the much-hyped gene editing tool discovered in 2012 and now the subject of a pitched intellectual property battle between heavy scientific hitters in the US. I was prepared for circumspection when I interviewed U of T Medicine researchers about CRISPR. I expected to be cautioned about the disappointments of the past. In my mind, as I sat in lab-side offices often full of photos of kids in hockey uniforms, I thought they too would want to avoid what I had taken to calling the Tsunami of Genetic Over-Enthusiasm.

And I was wrong.



What I got instead was a deep and almost unbridled excitement.

Compared to previous genetic manipulating technologies, CRISPR "is like going from using a Model T to a Lamborghini to do the same thing," says Alan Davidson (BSc '83, PhD '91), a Professor of Molecular Genetics who studies CRISPR in bacteria, as well as viruses' ability to circumvent its actions. "It's like a microwave instead of a campfire. CRISPR is not so much a eureka moment as a eureka technology."

Cohn, who is using the technique to look at muscular dystrophy, went further: "CRISPR is the most important technology that I have encountered in my scientific career thus far."

Why are genetic scientists, who themselves have had to live through the genomic bubble's era of disappointment, so excited about CRISPR?

CRISPR allows them to address two quite different issues. They can use the gene strands, which bacteria harness to attack invasive viruses, to quickly and cheaply cut or mute genes or gene sequences that might be related to a disease or condition. Do that and you could determine what action a specific gene or gene mutation gives rise to — without traditional methods that are slower and more costly.

Consider a December 2015 paper by Jason Moffat (PhD '02), a Donnelly Centre investigator. His lab used CRISPR to turn off each of the 18,000 or so genes in a cancer cell, one by one. That helped Moffat and his team determine that about 1,600 of them were important for the proliferation of cancer cells and could be targeted in future anti-cancer drug development.

But what was almost equally amazing as the finding itself was how easy and inexpensive it was to run the experiments.

"Before CRISPR, editing the human genome was challenging. It was slow and cumbersome," Moffat said. "And CRISPR is so cheap. Depending on what you are trying to do, creating a clone cell and edited clone can cost less than $100."

In the past, using other genetic manipulation technologies, the price of doing that would have been upwards of $5,000. It could have taken a graduate student his or her entire thesis to try to figure out what one gene mutation did, as opposed to the year or so that Moffat took to look at 18,000 genes.

As well, since CRISPR could remove damaged genes and put healthy genes back, it also carried the almost instantaneous possibility of clinical application. Indeed Cohn has just published a paper showing that he could use CRISPR to remove a duplicate gene associated with a type of muscular dystrophy found in a boy in England — and in so doing potentially have a cure for that strain of the disease.

"CRISPR is a search tool," Professor Yvonne Bombard, Assistant Porfessor at the Dalla Lana School of Public Health, remarked to me, "but given its ability to target, edit and modify genes of interest in that search process, CRISPR is itself really the detective."

I couldn't recall any development I had reported on in the past where I felt as much absolute excitement from scientists in the field.

Then I corrected myself — there was one.

Cold fusion was going to create an energy revolution that would eliminate the use of fossil fuels. And then I recalled the day I was sitting in an American Physical Society meeting in Baltimore, hearing scientist after scientist present research data showing how they had tried to recreate cold fusion in their labs and failed.

I remember at the time not just thinking — but absolutely whole-body feeling — that cold fusion wasn't real. Its proof was a scientific error; its notoriety was a Tsunami of Physics Over-Enthusiasm.

But after my conversations with the geneticists, CRISPR seems on a path precisely opposite to cold fusion's eventual deflation. Instead of new research continually saying it doesn't work or was flawed, the scientists are telling me CRISPR does work and works amazingly well. Rather than being the 21st century's cold fusion, CRISPR is perhaps the true eye of biology's hurricane.

In the past, these scientists said, they had often stumbled upon solutions like Inspector Clouseau. CRISPR was turning them into Sherlock Holmes, "trying to recreate what the criminal did and then reverse it," according to Moffat. "The investigation — that is what drives us to do science — the finding of the unknown, the trying to figure out what is going on, that is what pushes most of us."

As I listened to them, I felt my decades-old cloud of wariness and skepticism about the promise of genetics begin to lift. It felt like I was back at *The Globe*, back with a new doubting editor, hymning to him or her about a 2016 world where genetic knowledge was going to use CRISPR to make medicine and agriculture and evolutionary biology and human society itself different.

And I inwardly smiled and said to myself: *Maybe I was right in 1989, but was just too early to know it.*

Image credits.

Berlin Wall photo: iStock.

Death of Sherlock Holmes courtesy of the Toronto Public Library.

Stephen Strauss c. 1989 courtesy of *The Globe and Mail*.

"Reconciliation will take some time."

So concludes the summary preface of the 2015 final report of the Truth and Reconciliation Commission of Canada. With its 94 explicit "calls to action," the TRC has prompted many organizations — including the University of Toronto — to re-evaluate their relationship with Canada's Indigenous communities. President Meric Gertler and Provost Cheryl Regehr (MSW '80, PhD '96) have struck a steering committee to help coordinate U of T's response. The committee includes U of T Medicine's Professor Lisa Richardson (PGME '0T5, '0T8), Co-Lead of Indigenous Health Education. An interim report is expected by July 1, with final recommendations due by December 31.

The TRC's final report included specific references pertaining to medical training. This includes recognition of the value of Aboriginal healing practices, as well as increased training in Aboriginal health and cultural competency. The Faculty of Medicine's Undergraduate Medicine Education (UME) program has accepted these recommendations and is working to implement them.

In its formal response to the TRC report, UME said it "accepts the challenge to do what it takes to move forward and develop practitioners with the skills and tools allowing them to participate in a way up the mountain in a new era of reconciliation."

To read UME's complete response, visit **uoft.me/UME-TRC**.

TOM SANDLER

ALUMNI PROFILE — CAROLYN BENNETT

The Accidental (Political) Tourist

By Carolyn Morris

With files from Alan Christie

She was one of the few women in her medical school class, graduating from U of T in 1974. And one of very few female hockey players. As Minister of Indigenous and Northern Affairs, she's become one of the most prominent political leaders in Canada. Carolyn Bennett (MD '74) didn't set out to be a politician; she just started fighting for things she believed in. And for people whose voices too often go unheard.

"My voice became clear in the fight to save Women's College Hospital," she says. In 1989, she successfully opposed a merger and helped preserve the unique nature of the hospital's services, which focuses on patients becoming full partners in their care. She also saw it as a fight to keep social determinants of health front and centre. "Fighting for that hospital was the beginning of my political career."

But she didn't know it yet. When the Ontario Liberal Party approached Bennett — then a faculty member in the U of T's Department of Family and Community Medicine — to run in the 1995 provincial election, she explained that she didn't know anything about politics.

"I was told what I'd done with the hospital was political," she says. "I have always called myself an accidental political tourist, just fighting for something I believe in — in particular fighting for people who don't have their own voices."

After losing the provincial race in 1995, Bennett won in the federal riding of St. Paul's in downtown Toronto in 1997, and has been re-elected six times since. As chair of the Liberal women's caucus, she supported a national action plan to address violence against women and helped create a Women in House program seeking to elect more women to the House of Commons.

In 2000, she wrote a book called *Kill or Cure* about Canada's healthcare system. She argued for more health prevention — "more health and less healthcare." And she's spoken to medical students across the country about keeping Canadians physically, mentally, emotionally and spiritually well. Not just patching them up.

Soon after becoming minister last fall, Bennett announced a federal inquiry into the estimated 1,181 murdered and missing Indigenous women and girls. She's starting by listening to the families of victims.

"They have been pushing for over a decade for a national public inquiry," she says, "not just to seek justice for the victims but for us to put concrete things in place to stop this tragedy from happening to other families."

Fighting for meaningful change has been the hallmark of Carolyn Bennett's political career.

Ground-Breaking Research and News-Making Faculty

By Julia Soudat

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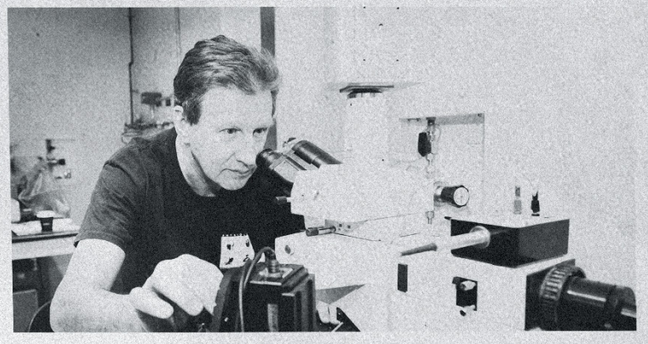

And the Brain Prize Goes to ...

Professor **Graham Collingridge**, Chair of the Department of Physiology, was among three recipients of the prestigious Brain Prize for his research into the mechanisms of memory. Collingridge's research focuses on long-term potentiation (LTP), a cellular mechanism that supports the life-long plasticity of the brain. His research and discoveries have enhanced the understanding of memory: how memories are formed, retained and lost. These discoveries are crucial to treating diseases such as Alzheimer's and have already contributed to the development of a medication that slows down the progression of the disease. The prize was awarded by the Grete Lundbeck European Brain Research Foundation in Denmark.

Cancer-Fighting Dream Team

A cancer "Dream Team" led by U of T researchers is taking on the stem cells that drive tumour growth in brain cancer. With $11.7 million of funding by Stand Up To Cancer Canada, the team aims to develop new treatments to prolong the lives of those living with the brain cancers glioblastoma and posterior fossa ependymoma.

"Our knowledge is at a turning point, with important new discoveries in recent years about the mutations behind cancer," says **Peter Dirks** (PhD '97, PGME '97), the Neurosurgery and Molecular Genetics Professor who leads the project. "We've also learned a lot about the cell types that drive tumour growth. That should allow us to identify precise drugs to shut down these cancers."

She's an Open Book

University of Toronto scientist **Rachel Harding** is one of the first known medical researchers to share her lab notes in real time. In February, Harding began uploading all of her raw notes to her blog, LabScribbles, in an effort to collaborate more closely with other scientists and accelerate research into Huntington's disease.

Although extensive research into Huntington's disease has been going on for decades, the mechanisms behind the neurodegenerative disorder remain somewhat of a mystery. While it is known that a mutation in the huntingtin gene leads to cognitive and physical decline, "the encoded protein is very large — significantly larger than most other proteins in the cell — and difficult to isolate and study," explains Harding, a post-doctoral fellow with the U of T-affiliated Structural Genomics Consortium.

Harding hopes to leverage the powers of teamwork by opening her notebook to scientists and patients alike. "This is what research is really like," she says. "It's not so much about big breakthroughs and polished results, but about incrementally getting closer to an answer."

Meet U of T Medicine's New Chief Diversity Officer

The challenge in front of **Lisa Robinson** (MD '91, PGME '92) is a familiar one.

"When I graduated from U of T in 1991, there were two Black students in my class — and I was one of them. It's 25 years later and the numbers are the same," says Robinson, the Faculty of Medicine's first Chief Diversity Officer. Dean **Trevor Young** announced the position in January 2016 to provide focused leadership for change.

"The Faculty of Medicine needs to better reflect Toronto, the most diverse place on the planet," says Dean Young. "Dr. Robinson has the skills, the drive and the evidence to break down barriers and help move the needle for young people from all backgrounds."

Robinson adds this role to her responsibilities as Division Head of Nephrology at SickKids and as a Senior Scientist at its research institute. It's probably no surprise that the clinician-scientist is taking a research-based approach to her work tackling the perennially low representation of students and faculty from Black and Indigenous communities — among other groups. Robinson is gathering data that will help her and others in the Faculty understand what influences students, where students are being drawn from and identify the best strategies for inclusion from across North America.

"There is often an opinion expressed that you have to sacrifice quality in order to ensure diversity. But that's just not true and numerous studies — especially from the United States — have shown that you can actually improve quality and diversity at the same time," Robinson says.

University of Toronto has committed to continuously collect race-based data from its students, a move that will help improve the information available, although the Faculty of Medicine has some related data.

"We're situated in one of the world's most multicultural cities. We need to look more like the community we serve," Robinson says.

"We're situated in one of the world's most multicultural cities. We need to look more like the community we serve."

Collaborating to Fight Common Cause of Kidney Disease

A team of U of T scientists teamed up to work on preventing, slowing, stopping and maybe even reversing kidney scarring caused by diabetes. This type of scarring can lead to organ failure, which requires dialysis or a transplant. The work is part of a partnership called the Centre for Advanced Therapeutics in Diabetic Kidney Disease (CAT-DKD), funded by a grant from the Banting and Best Diabetes Centre.

The team is working on measuring which genes the body activates when scarring in the kidneys begins. "Once we know what pathways are involved in activating the body's scarring response, we're well on our way to understanding how to block it," says U of T's **Richard Gilbert**, a Professor in the Department of Medicine.

Computing for Medicine

U of T is bridging the gap between medicine and technology with a new course for MD students called Computing for Medicine. Developed in partnership with the Department of Computer Science, this interdisciplinary course equips students with the coding and programming skills needed to succeed in the tech-centric future.

"You have physicians who understand what they need, but not how the technology works or how to harness it," explains Professor **Marcus Law** (BSc '96, MD '00, PGME '02, MEd '13), Director of Preclerkship Renewal & Academic Innovation in the Department of Undergraduate Medical Education. "On the other side, you have programmers and developers who understand the technology, but not how it can be applied in clinical settings. Combining these two streams of knowledge should unleash a river of opportunity."

Saint-Irénée, March 1931.

The Mysterious Miss Archer

By Susan Bélanger

A few years ago, the Banting Research Foundation received an unusual package from an unknown source: three small paintings, two of them addressed to a Miss Nancy Archer. They bore the signature of F. G. Banting.

The discovery was well timed. Canada's oldest biomedical research agency, founded in 1925 to commemorate the discovery of insulin and support promising new investigators, was refreshing its mission in preparation for its 90th anniversary. Yet there were many mysteries to resolve before the foundation could claim this prize.

Were the paintings authentic? The evidence was good: style, dates, subjects all fit with Banting's known works and his painting expeditions with friend and artistic mentor A.Y. Jackson of the Group of Seven. Official verdict: Yes!

Other mysteries remained. Who were the previous owners? Above all, who was Nancy Archer?

The foundation's new Executive Director Ramona Rea took up the case. Three years of dead ends ensued. Then finally, success! A single reference in the city directory identified Nancy Archer as Banting's maid in 1931. The famous scientist was well known for giving his artwork away freely as gifts of appreciation. This was where the trail ended in July 2015.

Three English Roses

After the mystery was publicized in a front-page Globe and Mail story, a woman in England identified Nancy as her grandfather's great-aunt. She had sailed to Canada in 1928 along with her mother and younger sister Betty to visit a third sister, Marjorie, then married to a Herbert Brown and living in Winnipeg. The family, including Marjorie's two sons, returned to the UK during the 1930s. The paintings passed from Nancy, who never married, to Betty. When she died, a distant relative sent the works to the Banting Foundation.

Miss Archer, WPC?

Most details of Nancy's life remain unknown. Yet according to one tantalizing piece of family history, she went on to spend many years with the London Metropolitan Police, known to crime drama fans worldwide as "The Met." Women began entering the force during World War I, and full-fledged "Women Police Constables" were introduced in 1923. Perhaps Miss Archer went on to join their ranks?

To view photos of all three Banting paintings, visit: **uoft.me/medmag**

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For more information about updating your information, please contact **416-946-0542**.

Events

June 10
Molecular Genetics Career Symposium
Toronto

June 15
Canadian Society of Plastic Surgeons: Plastic Surgery Alumni Reception
Ottawa

September 14
Connell Public Lecture in Biochemistry
Toronto

For more information about any of the above events, please contact **alumni.medicine@utoronto.ca**.

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