Canadian excellence, global recognition:

Canada's 2021 winners of major international research awards

Universities Canada.

Foreword

Dr. Theresa Tam, Chief Public Health Officer of Canada

It is my honour to recognize outstanding Canadian researchers who exemplify leadership in action. These talented members of Canada's research community inspire us all to think critically, creatively and with resolve.

Researchers in all fields contribute tremendously to improving the lives of people in Canada and everywhere, including by supporting resilient, healthy and safe communities. The excellence and diversity of research being recognized in this year's publication is extraordinary.

The importance of research and discovery to address our world's most complex and pressing challenges cannot be overstated. At the forefront of knowledge generation, Canada's academic and research communities help inform decisions, approaches and actions that have real-world impacts.

Despite the challenges that Canada and the global community continue to experience with COVID-19, we are seeing unprecedented research development, collaboration, innovation and advancements within and across academic and research disciplines – from the sciences and mathematics, to the arts and cultural studies, and beyond.

Throughout the pandemic, I have seen first-hand how researchers are mobilizing to advance knowledge, making sense of rapidly evolving evidence and communicating complex science in a way that resonates with the general public.

Looking forward, it is critical to build on this momentum and leverage our country's best and brightest. We can start by celebrating Canada's research excellence, supporting and funding Canadian researchers, and encouraging more opportunities to bridge the gap between knowledge generation, policy and practice. In this way, we can build up our future research capacity, and ultimately, contribute to a stronger and healthier society.

A heart-felt congratulations to the 2021 award winners on your success! Your dedication and drive has pushed the frontiers of research in Canada – highlighting our country's great research capacity and inspiring the next generation of Canadian researchers.

Meet international award winners from previous years at:
www.univcan.ca/globalexcellence

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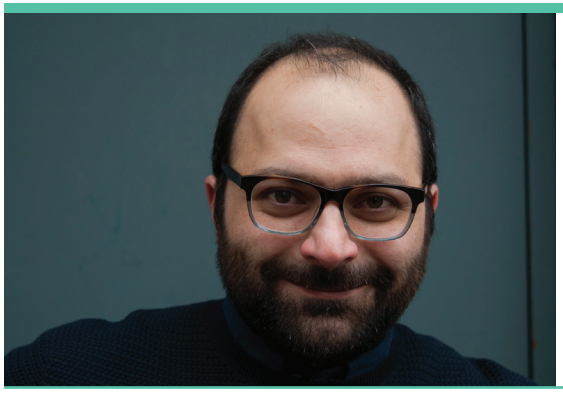


Ashkan Behzadi

Composer will take music to next level with Guggenheim support

Undergraduate studies at McGill University were “intense,” and helped shape his thinking around composition, says composer Ashkan Behzadi. Along with his lived experience as a child in Iran, McGill helped him build a successful earlier career in composing concert music.

Currently a lecturer at Columbia University, Dr. Behzadi is a 2021 winner of the Guggenheim Fellowship in musical composition – a boost that will help him advance a composition he wants to build upon a collection of poems by Federico García Lorca that also includes theatrical elements. At completion, he envisions four hours of music, dance, animation and painting.

“I learned composition and the process of composition by studying with Chris Paul Harman at McGill – how to develop your piece out of nothing to the final process,” he says. “Another composer that was very important to me was Philippe Leroux at Université de Montréal, now at McGill.”

Dr. Behzadi composes both electronic and acoustic music. With help from the Guggenheim award, he plans to develop his song cycle, “Love, Crystal and Stone,” based on collection of poems by Lorca, into an experience of abstract theatre, “as if you are entering a carnival,” he says, “with dance, theatre, etc.” Specifically, the fellowship will support development of the second portion of this song cycle, about 75 minutes of music.

The Canadian-Iranian composer plans to collaborate with Iranian visual artist Mehrdad Jafari on the theatrical elements.

Dr. Behzadi says news of his Guggenheim award was particularly uplifting, as it came during the dark days of the pandemic. “It was in the middle of the pandemic when I was questioning where I was going from this interruption. I remember I was teaching online in quarantine in Toronto; you feel you are in a box. It was an encouragement, a trust,” he says.

“[This composition] can become the sort of project I’m envisioning with this support.”

Photo credit: Michel Caron UdeS

Alexandre Blais

Guggenheim Fellowship a boost to physicist's work in quantum computing

Physics professor Alexandre Blais at the Université de Sherbrooke will have more time to advance his research in quantum computing as a winner of the 2021 Guggenheim Fellowship. Dr. Blais, scientific director of the Institut quantique, is a theoretical physicist focused on superconducting quantum circuits for quantum information processing and microwave quantum optics. He is helping develop the field of circuit quantum electrodynamics (circuit QED), a leading quantum computer architecture.

Dr. Blais says the potential of quantum research to address pressing global needs, such as climate change, is great.

"We will need a quantum computer to help us solve big problems," he says. "For example, nitrogen fixation is something that nature does – extracting nitrogen is something plants do for us at room temperature. But when humans want to do that to produce fertilizer, we apply extreme pressure and temperature, using two per cent of world's energy.

"If we can cut that down it would represent a major change. But we have no clue how to do that at the moment… A quantum computer would help with these quantum calculations."

Dr. Blais is a member of the Quantum Information Science program of the Canadian Institute for Advanced Research (CIFAR), a member of the College of the Royal Society of Canada, and a Fellow of the American Physical Society.

While he has won numerous physics awards in the past, he says the breadth of work recognized by the Guggenheim makes this fellowship unique. "From artists to philosophers, it's about different branches of what we do as humans."

Winning the Guggenheim will free up more of Dr. Blais' time for this research over the coming year, during "an exciting time full of possibilities."

"What will come of [this extra research time] is yet unknown," he says. "That's what makes it so special."

Ian Burton

Geographer takes a lead in putting climate change adaptation on international agenda

For the first time in its history, the BBVA Foundation Frontiers of Knowledge Award in Climate Change has gone to researchers in the social sciences, including Emeritus Professor Ian Burton at the University of Toronto, a geographer who has focused on climate change adaptation.

In the past, the Frontiers of Knowledge Awards have recognized contributions to climate change science from the realms of modelling, physics or economics. This year's prize recognizes the contribution of the social sciences by selecting three researchers who have pioneered the study of "how social conditions and culture shape our vulnerability to climate change and our ability to adapt," in the words of the award citation.

Addressing climate change means taking action on both mitigation and adaption. The former has been the focus of government efforts for decades, while the latter has been largely overlooked. Dr. Burton has focused on adaptation since his PhD days and was among the first to push this new area of research onto the agenda at international climate change meetings, as well as nationally in Canada.

Today, with mounting losses from floods, wildfires, windstorms and heat, the need to adapt to protect people and property – in parallel with mitigation efforts – is becoming a top priority.

"When it comes to how to adapt or adjust, there are enormous differences place to place and from one kind of risk to another," says Dr. Burton. "Overall, there are aggregate measurements for mitigation but no overall way to measure adaptation – other than maybe looking at the losses from atmospheric hazards which have been going up long before climate change came to the top of the agenda."

Losses from extreme events are mounting partly because of a failure to adapt or the failure of adaption policies, he says. That includes continuing increased exposure such as building in flood plains, on exposed coasts. In many areas of the world, he says, poorer people are being pushed into more hazardous locations. Vulnerability and exposure is being increased.

"I've been arguing that rather than talking about disaster risk reduction, we ought to look more carefully at what we're doing to create the losses," he says. "There's a pattern of development that tends to increase inequality. We need to stop putting people in harm's way and reduce their vulnerability and do that according to the nature of the particular risks. For example, in a heat wave we see the elderly in housing with no air conditioning, poor ventilation."

It is not correct to speak of 'natural disasters,' he says. Dr. Burton is quick to clarify that extreme events in nature and the huge losses they bring result from human behaviour and choice. They are increasing in magnitude and frequency due to human choices and decisions and practices including anthropogenic climate change.

Dr. Burton's current research explores what can be done to address adaptation collectively. "I'm looking at things that would require more systemic cooperation," he says. "In a case-by-case, incremental way there are things you have to do, but beyond that is there some more systemic problem involved in adaptation? It's a wicked problem. Look carefully at disaster risk creation."

Kamari Clarke

Socio-Legal scholar and anthropologist pushes boundaries and strives for social change

For more than two decades, legal scholar and political anthropologist Dr. Kamari Maxine Clarke has been focused on issues related to legal institutions, human rights and international law, religious nationalism, and the politics of race and globalization. The distinguished professor at the University of Toronto is a 2021 winner of the Guggenheim Fellowship – an accomplishment of which she is rightfully proud.

“It is something that I don't take lightly, particularly knowing that the Guggenheim Fellowship is highly competitive and coveted, but also that very few Guggenheim Fellowships in this category have been awarded to Black women,” she says. “Endowments such as this one will enable me to push the boundaries by engaging in research that involves grassroots social thought and intellectual mobilizations.”

Dr. Clarke explores theoretical questions around culture and power, and the relationship between new social formations and contemporary problems. One of her many academic contributions is in demonstrating ethnographically the ways that legal, scientific and religious knowledge regimes produce practices that travel globally.

Dr. Clarke is the author of three books and co-editor of an additional six. She is currently completing another book on how social movements in the Global South (Nigeria and Mexico) use new technologies – such as geospatial technologies, artificial intelligence, mobile phones and GPS – to challenge the way that justice has been traditionally accessed and delivered.

Her work shows how while these technologies have offered beacons of hope, they also bring with them a set of challenges having to do with the bias written into their operating logic. She demonstrates how highly visible data related to certain kinds of violence can be less easily captured by these technologies but others obscured from view. Dr. Clarke calls on scholars to examine the way that this bias inadvertently extends (neo)colonial dynamics that have historically given greater power to White people rather than racialized people, to Northern Western science rather than other knowledge systems and, in the context of violence in the Global South, to propertied and settled communities than to nomadic communities.

“I am working on a project involving early warning early responses in contexts of violence and am engaged in grassroots strategies around political solutions. The award has made it possible for me to position my research and writing as a vehicle for social change.”

In addition to her scholarly work, Professor Clarke has served as a technical advisor to the African Union (AU) legal counsel and produced policy reports to help the AU navigate various international law and United Nations challenges. She also continues to consult in different capacities with the Canada’s Global Affairs and the U.S. State Department’s Bureau of Conflict and Stabilization Operations.

Pieter Cullis

Researcher's perfect timing makes mRNA vaccines possible

Physicist and biochemist Pieter Cullis likes to joke that it's taken him 40 years to become an overnight success. Over those four decades, Dr. Cullis and colleagues in his lab at The University of British Columbia and at companies he co-founded, such as Inex Pharmaceuticals and Acuitas Therapeutics, developed the delivery technology that enabled the successful deployment of mRNA vaccines.

Dr. Cullis' research focuses on lipid nanoparticles (LNPs) and how they can help get medicine directly to where it's needed in the human body, such as a cancer tumour. The timing of his progress in this field was ideal when scientists needed a delivery system for mRNA in response to the COVID-19 pandemic.

Professor Cullis is joined by Katalin Karikó and Drew Weissman in receiving the 2021 US$100,000 Prince Mahidol Award for medicine for their work leading to the development of COVID-19 vaccines. Dr. Karikó is senior vice president at BioNTech RNA Pharmaceuticals in Germany. Dr. Weissman, an immunologist, is director of vaccine research at the University of Pennsylvania. The trio were also awarded the inaugural 2021 $3M VinFuture Grand Prize for this work.

"Katalin Kariko and Drew Weissman are widely acknowledged as being the two leaders in the mRNA vaccine space," says Dr. Cullis. "So to be honoured alongside them, it was really quite amazing."

From the early 1980s to the mid-1990s, Dr. Cullis and his team focused mainly on cancer drugs, trying to get them to where they were needed. "We're still doing that work, but starting in the mid-90s, we decided to also have a go at delivering nucleic acid-based drugs such as mRNA."

Initially this work focused on developing LNP systems to deliver a form of RNA to inhibit production of a pathogenic protein in the liver, leading to an FDA approved drug called Onpattro to treat a hereditary condition called transthyretin-induced amyloidosis. Then his colleagues at Acuitas started to develop on designing LNP containing mRNA to make proteins in the liver. That focus changed when Acuitas was approached by Dr. Weissman in 2014.

"He said, 'Well, I'd really like to try your system as a vaccine,'" recalls Dr. Cullis. "He had constructed messenger RNAs that would code for a protein that's associated with a virus. We started off with the influenza virus and Zika virus. Together we formulated messenger RNA that codes for a protein that's on the surface of these viruses into LNP, and then injected them into animals to see whether or not you can prevent them from getting that infection. And it worked very well."

Vaccine research came to dominate Acuitas' work leading to a collaboration with BioNTech on a flu vaccine.

"When the pandemic hit, of course all efforts switched to getting a vaccine for COVID-19."

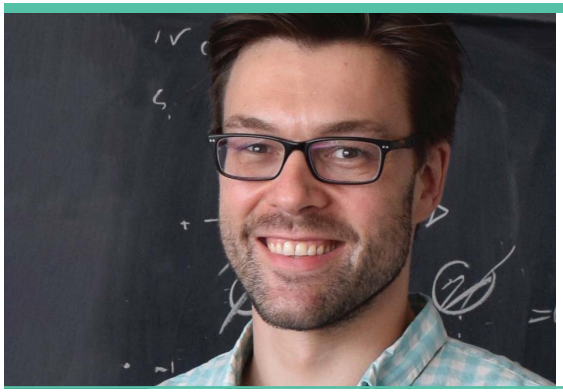
The lipid nanoparticle designed by Dr. Cullis and Acuitas ended up in the Pfizer/BioNTech COVID-19 vaccine, enabling its success.

"I mean, without the delivery system, the vaccine wouldn't work." The timing of these research advances perfectly aligned with the arrival of the pandemic. Before 2020, "there had been about five years of work done to establish that this was a good approach from a vaccine point of view."

So being ready to work on a vaccine for COVID-19 was "really being in the right place at the right time, that's for sure."

Dr. Cullis' work with LNPs also holds promise for cancer treatments. "You can see the potential for highly personalized, relatively non-toxic kind kinds of cancer treatments," he says. This could include several different approaches, such as "having the liver make an antibody that's very specific for your cancer."

"It's going to have a huge impact on cancer."



David R. Curtin

Physicist expanding knowledge of Universe's most fundamental physical laws

The Universe holds so many unanswered questions, including about fundamental laws that operate at the smallest scales. In this area, theoretical particle physicist David Curtin is working to unlock the answers.

"For example, gravity is a fundamental law, as is electromagnetism," he says. "Others are not as easily apparent; things like nuclear forces and what kinds of different particles are inside a nucleus. What are forces by which they interact? Where does all this come from? And why are they the way they are?"

A Canada Research Chair in Theoretical Particle Physics at the University of Toronto, Dr. Curtin is a 2021 winner of the Sloan Fellowship. The award recognizes his important contributions in areas such as the behaviour of quantum fields during the Big Bang; the Higgs Boson; theoretical work related to the search for dark matter; and questions driving the construction of the next generation of detectors and high-energy particle accelerators.

Dr. Curtin's quest for answers to stubborn questions is seen in his proposal to build an innovative experiment named MATHUSLA to find previously undetectable particles generated by the Large Hadron Collider. Dr. Curtin is one of the leaders of the international collaboration behind the project.

A multidisciplinary approach is key, he says, in the search for new physics.

"Sometimes you need to knock on the door of your astronomy colleagues and hope one of them talks to you and explains something about stars to you," he says. "You have to sort of dip your toe into some of these other fields, because the consequences of new laws of particle physics can show up everywhere."

Dr. Curtin predicts the next 10 years will see "certain cosmological and astrophysical observations that will greatly increase our information about dark matter and the cosmic microwave background – which has to do with the Big Bang – and this could provide the first definitive measurements of some physics that is new, that is different."

His current work connects with precision cosmology, which Dr. Curtin describes as "an incredibly exciting field that is going to get a lot of previously unheard-of data and the interface with particle physics could reveal some very fundamental information. I see this interface with cosmology astrophysics as one of the most exciting areas and I'm working on trying to take advantage of that."

On winning the Sloan Fellowship, Dr. Curtin says, "It was incredibly delightful news. It's rarely given to theoretical particle physicist, so I'm very honoured."

Daniel J. Drucker

Giving back: Dr. Daniel Drucker donates Gairdner prize to establish innovation award

Dr. Daniel Drucker continues to be recognized globally for his groundbreaking work on glucagon-like peptides that led to major advances in the treatment of Type 2 diabetes, obesity and intestinal disorders. This year, Dr. Drucker – a senior investigator at Sinai Health's Lunenfeld-Tanenbaum Research Institute and professor in the University of Toronto's Temerty Faculty of Medicine – is a recipient of the Canada Gairdner International Award, one of the most prestigious international prizes in the biosciences.

Dr. Drucker shares the award with Dr. Joel Francis Habener, professor of Medicine at Harvard Medical School, and Dr. Jens Juul Holst, professor of biomedical science at the University of Copenhagen. In 2020, the three shared the Warren Alpert Foundation Prize.

He is donating the C$100,000 Gairdner Prize stipend to establish The Drucker Family Sinai Health Discovery Awards. Dr. Drucker says he hopes this new awards program will motivate colleagues across Sinai Health to pursue innovation throughout the hospital and research ecosystem.

The Drucker Family Awards will recognize innovative excellence in two categories: in-training awards and hospital-based awards.

The endocrinologist says his research story highlights the importance of basic research. It was "impossible to imagine, 30 years ago" where this work would lead, he says. In addition to new treatments for diabetes, obesity and intestinal disorders – shown to reduce heart attacks, strokes and rates of death – the research has enabled the phase III trials now underway on new treatments for liver disease and Alzheimer's.

The latest approval, for a new treatment for obesity, came in spring 2021. "And if you take a look at the results of that therapy, you see about 15 per cent body weight loss and about 40 per cent of patients losing 20 per cent of body weight.

"That's huge," he says. "We've never had anything like that before."

The Gairdner Award is special, Dr. Drucker says, because it's an international award based in Canada. "It's always good to be recognized at home."

With 2021 marking the 100th anniversary of insulin, Dr. Drucker says it's a reminder that Canadians can be proud of the contributions Canadian scientists have made and continue to make to advances in global health. Those discoveries and innovations stem from basic science, he says, which needs to be a priority for government investment.

"Investment in basic science is something that the government needs to do better," he says. "We punch below our weight in investments in science in the G7... We would do well as a nation to reflect on our priorities, whether it's climate change or next pandemic or treating obesity and diabetes – the investment in science is a very good investment for Canada."

Lenore Fahrig

Researcher challenges 'bigger is better' approach to land protection

How land is designated for protection, whether in small or large parcels, may not sound controversial or complex, but it is. And it's central to the work of Dr. Lenore Fahrig, a Carleton University biologist and 2021 winner of the Guggenheim Fellowship.

"For example, say you are going to conserve 100 hectares of forest. Is it better to conserve one big 100-hectare block or 10 small blocks that add up to 100 hectares? In the 1970s, the prevailing thinking was that one big block would be better.

"But people tested this and found more species in 10 small blocks than in the one big one," says Dr. Fahrig.

Tackling this question stems from her research on the impact of landscape structure on abundance, distribution and persistence of organisms. Since landscape structure is strongly affected by human activities such as forestry, agriculture and development, the results of her research are relevant to land-use decisions.

The Guggenheim Fellowship will support a research project looking at the effects of habitat fragmentation on several species. This study is connected to Dr. Fahrig's long-term research on the effects of habitat fragmentation.

Her studies include examining government policies on protecting natural habitats. "They tend to reflect the idea that bigger is better," she says. "This is a problem because if we assume that small parcels of habitat have low value for biodiversity, we can end up with thousands of small patches that have no protection, even though they host a great deal of biodiversity," she says. "If they are destroyed the loss to biodiversity is huge.

"There is a lot of intuitive thought about larger species or those endangered doing better in a larger block, such as species that do better in the interior of a forest. This seems to make sense because if you have 10 small blocks you have more of the edge and less of the interior area of the forest that those species need. Some people think that means there would be more species in a bigger block than many small ones.

"But is that true? People are extrapolating from a small-scale observation. They take that pattern comparing species at forest edges vs. the forest interior and scale it up to make an inference about what we should see across a whole region. The problem with that is that there are all kinds of other factors that come into play that could counteract that prediction. And this has not been tested."

Some government policies only protect large parcels.

"The problem is that in human-dominated parts of the world, you've already lost 80 per cent or more of the natural habitats and the remaining spots are very small. So if you aren't protecting small parcels you are saying they have no value, when we really need them and in fact they can contribute a lot to biodiversity."

This research is important because of the global biodiversity crisis, she says. "It's hard to know how many species have already gone extinct because of human activity."

She hopes her research can help inform responses to the crisis.

Roger Grosse

Computer scientist advancing our understanding of neural networks

In recognition of his promising work in artificial intelligence, Roger Grosse, assistant professor in computer science at the University of Toronto, is a winner of the 2021 Sloan Research Fellowship. A machine learning researcher, Dr. Grosse's work focuses on deep neural networks (DNN).

"Machine learning is a study of getting computers to learn from data and experience. And it's the technology used in AI that underlies systems ranging from computer vision and language understanding to computational medicine and other areas. The big change over the past decade, which came out of the University of Toronto actually, was the switch to neural networks."

A Canada Research Chair in Probabilistic Inference and Deep Learning, Dr. Grosse explains that in the past, developers would manually engineer features to solve a given problem, like trying to figure out what features of data are important to pay attention to. "And now neural nets essentially do that automatically," he says.

"It used to be that we used algorithms that were really well understood, and you could analyze them ahead of time and prove what they're going to do. Now, neural nets often work for reasons that we don't understand. And so, a lot of what I do is trying to better understand how neural nets work and use that understanding to develop better algorithms."

His work is largely about keeping up with what machine learning algorithms are doing.

"In the past we designed machine learning algorithms by writing down the thing that we're trying to optimize and then separately writing an algorithm to find the optimal solution. But now we actually have to think about the trajectory that the algorithm takes to find an optimal solution. Once we understand this, we can use this understanding to get neural nets to train faster and generalize better."

Understanding neural nets also has an important ethical aspect.

"As AI systems get more and more powerful, we have to understand what they're doing, because it might be that they appear to work for what turns out to be the wrong reasons. It could be that we write down an objective function for the algorithm to optimize, but as a side effect of optimizing that, the algorithm winds up doing something harmful, like discriminating against a demographic group, or causing political polarization. We need a better understanding of neural nets in order to diagnose and correct these failures."

On winning the Sloan Fellowship, Dr. Grosse says the award has given him a confidence boost. "And I think the funding will help me to grow the team and get the sort of computational resources that we need to carry out deep learning research.

"I really appreciate having a flexible source of funding that supports curiosity-driven research…A lot of the funding in AI is very tied to particular applications. It's important to be able to work on the fundamental questions. I think the Sloan award is great for that."

Tovi Grossman

With advance of AI, researcher helps people learn to work in new ways

Tovi Grossman and his research team at the University of Toronto study Human Computer Interactions (HCI) – basically anything and everything about how humans use technology.

"It's a field that used to be focused on desktop computer stuff, that was HCI originally," says the computer scientist. But it's evolved, now including "understanding how people will interact with all forms of existing and emerging technologies, and the impact they have on society."

Dr. Grossman acknowledges what many of us have experienced: sometimes those interfaces aren't designed very well and we find the technology complex to use. Today's HCI looks at how to design human interfaces so they are more efficient, flexible, easier to use and easier to learn.

A 2021 winner of the Sloan Fellowship, Dr. Grossman's research looks at the interfaces of new technologies. "In the early 2000s, when I was doing my PhD, I was looking at multi-touch interaction and freehand interaction, the touch points on a display. It was an unknown, emerging technology, but now that's widespread.

"The work we do in our labs now is looking at new technologies perhaps on cusp on being released, from the standpoint of how will this impact the way we use technology."

In particular, Dr. Grossman's team is exploring how to help people learn new ways to work with technological tools.

"As that work developed, we came to the realization that automated technologies are becoming more common. Say I work in the architectural industry, for example. Some design work, because of AI, will become automated. Computers will do more of tasks that people would have normally done," he says.

"AI is really going to disrupt the employment landscape. My feeling is it's not going to take jobs away but change the nature of work people do…We are going to have to learn to do things in new ways."

That also means finding the right balance between human work and machine work, he says. "We can't have AI do everything for us and it probably can't. But also, if we need to work in new ways, how do we help people learn to do that? It's a lot about real-time learning. Can you make a user interface so friendly it almost walks you through that in real time?"

Dr. Grossman says funding from the Sloan fellowship will help him add research assistants to his lab, where he currently has seven PhD students, three masters and two post-docs.

Maria Ioannou

Neuroscientist unlocking secrets of lipids to help tackle neurodegenerative disorders

Neuroscientist Maria Ioannou, assistant professor in the Dept. of Physiology at the University of Alberta, has been awarded a 2021 Sloan Fellowship for her innovative work in lipid biology. Dr. Ioannou's research focuses on the cellular function of lipids – a group of biological molecules such as fats, oils and waxes – and their role in the central nervous system.

"We're looking at how this influences cell health in pathology," she says. "So we started looking at stroke and now we're starting to look at Alzheimer's disease and I think that this is going to apply to a wide variety of neurodegenerative disorders."

The Ioannou Lab at the university uses a combination of biochemistry and quantitative microscopy to study the mechanisms of lipid transport and metabolism in the brain.

"When neurons get really stressed out they seem to generate a lot of excess lipids and that can be very toxic to them. So because they don't have the capacity to deal with that themselves they then unload it onto another cell type," Ioannou says. "I think we're really going to try to home in on the mechanisms of how this transfer process happens and try to see if there's any drugs that could be used or pathways that can be targeted to modulate it. For instance, if we could help prevent some cell death maybe we could try to apply that to animal models of disease."

Dr. Ioannou's projects are driven entirely by the cell biology and what's unknown about the cell biology. "I think we need to keep pushing on how important that is. I think it's that strategy that makes my research so applicable to such a wide range of diseases."

Joan Judge

Guggenheim validates study of vernacular knowledge in 20th century China

For Joan Judge, winning the Guggenheim Fellowship – the only one awarded this year in East Asian Studies – is particularly validating. The York University professor, a cultural historian of modern print and knowledge, says she received "a lot of pushback" on her current book-length research project, "China's Mundane Revolution: Cheap Print, Vernacular Knowledge, and Common Reading in the Long Republic, 1894-1955."

Some scholars had advised her against pursuing work on "crappy old books," she recalls. The Royal Society of Canada member studies daily-use texts that informed and shaped everyday life in 20th century China – texts that helped people manage their quotidian lives.

"So [the Guggenheim] was a real thumbs up for trying to get to this level of knowledge that has been largely neglected," she says. "It does a lot for the field. To young scholars, it signals that this kind of work is valid."

"It's incredibly challenging to do this work," she says, describing it as "digging under the structures that are better known," such as the revolutions of 20th century China. Her sources are cheaply produced commercial texts that have generally not been included in major library collections. A challenge has been locating these materials – she now has a personal database of about 500 of them.

"Sometimes you have to stick to your guns," she says of pursing research interests despite criticism. "I felt the more I uncovered these materials, and dug into their layered richness...I saw connections between the mundane and the momentous, between practical modes of reasoning and what we think of as science." Her research stretches from the late 1890s to just before the Communist government took power in 1949.

"There was an intensive influx of foreign diseases, things and ideas," at the time, she says, as common readers – people with rudimentary literacy – dealt with the challenges of the era, including repeated cholera outbreaks, the growth of opium production and the introduction of new technologies such as electricity.

"I've taken a series of problems I've seen come up repeatedly and tried to get a sense of what these people knew. The premise is that what they knew was valuable because it was based on experience that they trusted. We can learn from what they learned, especially about Chinese medicine, Chinese approaches to nature and, by extension, bigger questions around knowledge and politics."

These types of knowledge are ignored at a country's peril, says Dr. Judge, drawing comparisons to Indigenous knowledge in Canada and elsewhere.

"The parallels with so many other types of Indigenous knowledge are very, very clear. We see that throughout the Western world with the degradation of the environment, which possibly wouldn't have been what it is today if we had paid more attention to the way Indigenous people understood nature and interacted with nature and respected nature.

"I want to emphasize that knowledge is dynamic, that knowledge evolves through assemblages…The danger is when we think in terms of purification, that knowledge has to be all new or all Western or aligned with a particular ideology. Too much is lost in the process."

Dr. Judge says she is grateful to have all her research material gathered, given today's political climate with China and travel restrictions, and hopes to bring her work to completion in a book over the coming year.

Victoria Kaspi

Astrophysicist uses new CHIME telescope to study Fast Radio Bursts in space

Victoria Kaspi, astrophysicist and professor of physics at McGill University, is working to unlock secrets of the Universe. Specifically, she studies Fast Radio Bursts (FRBs) – mysterious bursts of radio waves happening all over the sky. These bursts are very short – most last just a few thousandths of a second – and powerful, coming from far outside our Milky Way.

“But we don't know what they are,” says Dr. Kaspi. “Currently a leading model is that they are magnetars, ultra-highly magnetized neutron stars. But we don't know that for sure, or even that FRBs are not comprised of many different types of objects.”

Dr. Kaspi and her team are studying FRBs using the CHIME telescope, a newly constructed radio telescope in Penticton, B.C.

The astrophysicist shares this year’s prestigious Shaw Prize in Astronomy with Chryssa Kouveliotou of George Washington University for their contributions to our understanding of magnetars. “Through the development of new and precise observational techniques, they confirmed the existence of neutron stars with ultra-strong magnetic fields and characterized their physical properties,” says the Shaw Prize website. “Their work has established magnetars as a new and important class of astrophysical objects.”

This research was connected to a project Dr. Kaspi initiated and led to monitor magnetars in the Milky Way using X-ray telescopes, most notably NASA's Rossi X-ray Timing Explorer and later NASA's Swift Observatory. “My students and I studied a class of objects then called ‘anomalous X-ray pulsars’ and showed that they were actually magnetars, effectively approximately doubling the population of known magnetars.”

She says winning the Shaw Prize is “very gratifying, and especially to be co-awarded with Chryssa Kouvelietou, whose work I have admired for years.”

Speaking to the significance of her current work on FRBs, Dr. Kaspi says “nature seems to have found a way to make extremely powerful explosions; I think it is important to understand the underlying physics and know how this is possible.

“Moreover, FRBs, even if we never understand what causes them, are very useful as probes of the structure of the Universe. They have imprinted on them interesting information about the medium through which they propagated, allowing us a unique new way to understand the structure and composition of the intergalactic medium.”

Dr. Kaspi says international awards like the Shaw Prize are important “in the Canadian context because they show the world that excellent science, as judged by an international panel, is being done within Canada. This then helps recruit the top students and postdocs worldwide to Canada, which improves the overall scientific environment.

“I think it also demonstrates to the Canadian government and to Canadian taxpayers that their tax dollars going to science here are well spent.”

Gordon Keller

Revolutionary work to build new heart tissue garners prestigious Institut de France award

In Gordon Keller's lab, researchers can make heart cells that beat in a Petri dish. That amazing achievement first happened years ago, but it was a key milestone on a path to building new heart tissue – work recognized this year when Dr. Keller was named co-recipient of the 2021 Scientific Grand Prize from the Lefoulon-Delalande Foundation of the Institut de France.

The 600,000 euros prize is awarded annually to a world-leading researcher who has made significant contributions to cardiovascular research and medicine.

The Scientific Grand Prize highlights the work of Dr. Keller, Director of the McEwen Stem Cell Institute and senior scientist at the Princess Margaret Cancer Centre at the University Health Network in Toronto, to understand the pathways that regulate the differentiation of a specialized type of stem cell, known as a human pluripotent stem cell (hPSC). His lab looks at how these cells make blood cells and heart cells – with groundbreaking results.

"And these are stem cells that we can propagate in a Petri dish," he says. "But most importantly, we can direct them to make different cell types in the dish…So when you when you coax them along the path to make heart cells, you know you are successful because the cells start beating in a dish. It's absolutely spectacular."

Dr. Keller and his team are now able to make most of the cell types of the human heart and blood cell system from hPSCs. "Now we're in a position where we can probably make at least six different cell types found in the human heart," he says. "And this is really important because we can now use these cells to study diseases that affect different regions of the heart and to develop new therapies to treat them."

The team is also working to produce different types of immune cells from hPSCs that can be used to fight cancer, eradicate infections or modulate autoimmune responses in patients.

Eugenia Kumacheva

Chemist grows massive arrays of micro-tumours to develop precision treatment for cancer patients

University of Toronto chemist Eugenia Kumacheva is leveraging the power of automation and artificial intelligence to help identify the right drug program for individuals undergoing treatments for cancer and other diseases.

Dr. Kumacheva explores the field of "soft matter" or polymers, colloids, liquid crystals, hydrogels and living matter. She has designed and developed soft materials for use in a broad range of applications, stretching from drug delivery and tissue engineering and telecommunications and security.

In cancer treatments, her research involves growing micro-tumours.

"They can be from model (immortalized) cells, or they can be taken from patients through biopsies," she says. "We use massive arrays of modelmaker tumours to screen individual drugs and multi-drug therapies.

"And it's about how multiple drugs can be supplied either mixed together or in a specific sequence, dosage and time. For example, the first one then the second one then the third one or the first and the second together. So, there are many, many possible combinations."

The challenge, she says, is to study all of the options at the same time. "So my lab works on tiny labs-on-a-chip that are the size of a credit card, allowing us to screen drug combinations in a much more efficient way."

Her work involves automation and contributing to big data.

"A lot of outputs about the next drug formulation and how it can be supplied can be assisted with machine learning," she says. "We can use specific algorithms, in collaboration with my colleague Prof. Aspuru-Guzick, to decide what is the next experiment based on the results of the previous one.

"So I would say that this is on the forefront, because we are using automation, instead of human labour, and artificial intelligence for decision-making, which are both costly and time consuming."

Her research holds huge potential for precision medicine in cancer. "After a surgery, cancer patients have certain time before chemotherapy. During this time, we hope to be able to decide which drug and which drug dose and which drug combination will be the most efficient for this specific cancer patient.

"It depends on the patient's age, gender and so on. And at the moment, this is done based on the available statistics. But in our case, if we take cells from the tumour of specific patient and grow a tumour from the cells of this particular patient, we can find what therapy would potentially be most efficient for this particular person."

On winning the Guggenheim Fellowship, Dr. Kumacheva says it is a "very special" honour. "It's not just another award. When you look at list of people receiving this fellowship, it puts you in a wonderful cohort."

The Guggenheim Fellowship will help Dr. Kumacheva hire post-docs and purchase equipment for her lab and travel to share findings with international research teams.

Yevgeny Liokumovich

Sloan Fellowship will enable in-person collaboration for mathematician specializing in topology

For Yevgeny Liokumovich, a mathematician at the University of Toronto Mississauga, a major problem presented by the COVID-19 pandemic has been the inability to collaborate with colleagues in person. But now, with travel restrictions easing and financial support from winning a 2021 Sloan Fellowship, Dr. Liokumovich will be able to travel to meet with his international collaborators to advance his work in geometric analysis.

"I think that's really important because math, especially right now, is a very collaborative enterprise," he says. "You really need to talk to people. And that's been harder because of the pandemic. Sometimes you need to get people in the same room to make progress."

Dr. Liokumovich's research focuses on spaces and their properties. "For example, a long time ago we thought the Earth was flat. And then gradually we realized it has a more complicated shape. It looked flat to us but globally, it curves. The same can be said about high-dimensional spaces," he explains.

"When you actually approach them in a more mathematical, rigorous way, you can discover things that are difficult to imagine. You encounter things that you wouldn't think of immediately. You can describe spaces that are quite interesting and complicated. You can try to understand what they are, what kinds of properties they can have."

That's what a lot of my work is about: considering these simpler spaces inside these complicated large spaces, and how they relate to each other."

The importance of this area of research lies in applications ranging from robotics to data analysis in cancer research, he says.

"Geometry in itself is important because we can geometrize many problems that don't initially appear to have any relationship to geometry…There have been many instances where geometrics techniques have been applied very practically for problems in medical imaging and physics and engineering."

Dr. Liokumovich said he had had some hesitations about applying for the Sloan Fellowship but was encouraged by the chair of his department.

"I'm really grateful for that," he says. "It was the right decision."

Benjamin J. Matthews

Zoologist studies mosquitos' adaptive abilities in smell and taste

Ben Matthews is interested in how female mosquitos choose where to lay her eggs.

An assistant professor in the Dept. of Zoology at The University of British Columbia, Dr. Matthews knows that such findings could have a significant impact on human health.

"We study how mosquitoes smell and taste," he says. "We want to know how they interact with odors and tastings in their environment, so that they can determine what is going to be a good meal. And that could be blood from a human, or it could be nectar from a flower depending on the where the mosquito is in their lifecycle. And the behaviour that we're most focused on these days is actually egg laying. So how an adult female mosquito chooses where to lay an egg."

In recognition of his work on the ability of mosquitos and other insects to perform adaptive behaviours, including selecting suitable egg-laying sites, Dr. Matthews has been awarded the 2021 Sloan Fellowship.

Knowing how female mosquitos decide where to lay eggs might not sound overly important, he says, "but because the larvae and pupa, the developmental stages of the mosquito, are aquatic, it means that wherever the eggs are laid, that's where the offspring are going to live. They can't move in the same way that a terrestrial animal would. And so mom's decision about where to lay that egg is extremely important because she has to choose a body of water that is not too salty, that has food and doesn't have predators in it. And to do that she's using her sense of smell and taste."

Matthews' lab is studying how mosquitos do this at the genetic level; what types of genes and proteins female mosquitos use to perceive chemical cues in the environment – and how the brain processes those cues.

"So if they get conflicting sensory cues, how does the animal make sense of that in order to make the most beneficial decision for them and their offspring?"

The answers impact human health because mosquitoes are deadly vectors of the arboviral pathogens that cause dengue fever, yellow fever, Zika and chikungunya.

"We have to understand an animal before we can devise ways to control that animal," he says. The research could lead to better traps or repellents, for example. "We absolutely look towards applications but it's still primarily basic science."

Dr. Matthews says the Sloan Fellowship is special because it provides unrestricted funding, allowing researchers to pursue "experiments that may be a little riskier.

"We can try a crazy idea or two and see where it goes. It's extremely freeing."

Alison McAlpine

Award helps filmmaker develop 'hybrid' film inspired by grandfather's life

Filmmaker and writer Alison McAlpine, winner of a 2021 Guggenheim Fellowship in film/video, blurs the lines between documentary and fiction.

"All of my work, in differing ways, is personal," she says. "Of course, that's linked with my imagination, my background as a poet and my ensemble of collaborators are always key contributors."

The Guggenheim is in support o her current film project, *Dr. Procter*. It's inspired by the life of her grandfather, an opioid-addicted doctor in the 1920s-40s.

"So the Guggenheim allows me to develop this hybrid of documentary and fiction," she says. "It will fund a key part of the development, allowing me to explore without any strings attached, which is usually hard to do in the financial structures of filmmaking."

For example, those structures usually require quick decisions around collaborations. "This [award] allows me to work, in the initial exploration stage, with whoever I want to work with, anywhere in the world."

Her research for the film has introduced her to doctors in Canada, the United States and Scotland who are recovering addicts. "My network of doctors in recovery will provide guidance and wisdom regarding the complexities of drug addiction and recovery. Several will be in the film."

The filmmaker, who was the Mordecai Richler Writer-in-Residence at McGill University the year when COVID-19 struck, describes the Guggenheim as an "enormous gift and honour," noting that even the process of applying itself was a helpful experience.

"It helped my process. Answering the questions, you had to be so succinct. The whole process was very demanding but very helpful for me artistically."

Amira Mittermaier

Writing an ethnography of God with help from Guggenheim Fellowship

Dr. Amira Mittermaier, winner of a Guggenheim Fellowship in religion, is tackling a very challenging topic: the ethnography of God.

"An ethnography, traditionally being a book that we write about a place or a people or a community or a person maybe – well I'm trying to make God the centre of that ethnographic text, which is paradoxical and complicated," says the University of Toronto professor. "For me it's very interesting as a writing challenge also."

Dr. Mittermaier is particularly interested in God as a figure that Muslim lives gravitate around. "I'm interested in Islam and how it is lived on the ground, looking at how people interact with their religious tradition in their day-to-day lives."

Her current project, supported by the Guggenheim award, "builds on the anthropology of Islam, but also Muslim life…and what Islam means in a place like Egypt."

"I'm also committed to this work because I find my field, the anthropology of Islam, hasn't been making enough space for God, as if God is not a very central figure. To get a better understanding of Islam we need to make space for God.

"It's also a way for me to push back against a stereotypical understanding of Islam as the counterpart to Christianity…Islam has sometimes been portrayed, even by Pope Benedict XVI, as the quintessential religion of transcendence – with a god far removed, unapproachable, unknowable – and I don't find that to be true. God can be intimately present in Muslim lives."

The Guggenheim means Dr. Mittermaier can have time off from teaching and administrative responsibilities to write her ethnographic study of God.

"That's the big gift of the Guggenheim," she says. "It's the time."

Kevin Lewis O'Neill

Cultural anthropologist studies exportation of abusive priests to Central America

Kevin Lewis O'Neill's research on clerical sexual abuse within the Roman Catholic Church, and in particular the transfer of abusive priests from North America to Central America to avoid prosecution, will soon be shared in book form thanks to support from the 2021 Guggenheim Fellowship.

"It's a 40-year narrative about the church's efforts to evade responsibility," says Dr. O'Neill, professor in religious studies at the University of Toronto.

The research is challenging on a number of fronts, he says. "The kinds of representations we get in North America are largely governed by the limitations of litigation…There is not really a functioning international court system…It's easier to document and litigate abuse within the U.S. and Canada."

As a researcher, he says the topic can be demoralizing. "It's incredibly difficult. I spend a large portion of my time speaking with the survivors of clerical sexual abuse…And that is really tough. And it's also difficult to get a sense of how the church is acting to shield itself from judgments both in terms of litigation, but also in terms of the court of public opinion.

"I am really enthused, however, by the idea that this research could set a precedent where those abused by U.S. priests in Central America could claim some portion of settlements made in the United States…I am really propelled by this idea of transnational justice when it comes to clerical sexual abuse."

Much of Dr. O'Neill's research in this area has already been completed. His work is anchored in the movement of priests from a few dioceses in Minnesota to Guatemala. The research also involves New Mexico, home to a church-run sex therapy centre where many priests were sent.

"A fourth site is the Vatican," he says. "I've completed a number of research trips there."

When the Vatican wanted to transfer some priests from the U.S. to Latin America, to support what was then a lack of priests in Latin America, there were questions around who should go. "Sometimes those decisions were made easier if a cleric was under suspicion or a problem in the community," says Dr. O'Neill. So Guatemala became something of a dumping ground for predatory priests in 20th century and even the 21st century."

Winning the Guggenheim Fellowship means Dr. O'Neill will have more time to dedicate to producing a book about this research. He says the award is also a "really great moment of encouragement."

"It signals that you're heading in right direction and is a reason to be even more ambitious with your work."

Sophie Rousseaux

Chemist seeks more sustainable ways to produce synthetic materials

Sophie Rousseaux, a Canada Research Chair in Organic Chemistry at the University of Toronto, is looking for more sustainable ways to make the molecules we need for medicines, plastics and other everyday uses.

"We know how to make many of these molecules, but as we evolve and become aware of a lot of societal needs there is a need to make them with less waste and more efficiency," she says. For her promising work in this field, Dr. Rousseaux has been awarded a 2021 Sloan Fellowship.

Dr. Rousseaux's research focuses on finding new ways to access biologically active and medicinally relevant small molecules – particularly through transition metal catalysis. Her work is significant to the biotech, agrochemicals and materials sectors. Among other applications, it has the potential to develop new ways to protect crops from the impacts of extreme weather.

New discoveries in synthetic chemistry can also impact costs. "The longer it takes to make these molecules," she says, "the higher the costs for a company."

Dr. Rousseau says winning the Sloan Fellowship is "a tremendous honour and recognition of all the hard work the students in my group have done over the past six years…I want to thank all the students who have done all this work." Her research group currently includes nine PhD students and one undergraduate.

"The Sloan Fellowship will allow us to take bigger risks and explore areas of interest that are not as easily funded without preliminary data…An award like this allows you to go after some riskier ideas without that proof of concept already in your pocket."

Egor Shelukhin

Mathematics professor wins Sloan Fellowship for work in growing field of sympletic topology

Egor Shelukhin, a member of the geometry and topology group in the Department of Mathematics and Statistics at the Université de Montréal, is a 2021 winner of the Sloan Fellowship for his work in the rapidly developing field of mathematics called symplectic topology.

“This approach is in its source related to various aspects of geometry and topology, as well as modern physics,” he says. “One may say that methods of string theory are applied to prove new results in classical mechanics.”

Symplectic topology has its origins in classical mechanics, and in particular in the work of Henri Poincaré on the three-body problem. It was revitalized in the late ‘70s and early ‘80s by the appearance of variational methods of non-linear partial differential equations, notably following the work of Mikhail Gromov on the notion of the pseudoholomorphic curve.

“Symplectic topology interacts with many different disciplines of mathematics,” says Dr. Shelukhin. “It provides important insights into different mathematical questions.”

Dr. Shelukhin’s research interests are broad, extending beyond symplectic topology. “In particular, I apply methods that have appeared in a branch of data sciences, called topological data analysis, to quantitative questions of symplectic topology. In general, symplectic topology borrows upon a wide range methods and techniques in different fields in mathematics.”

Of the Sloan Fellowship, he says he was very happy to have his research “recognized with such an award…The list of past recipients contains many of my mathematical heroes.”

Dr. Shelukhin plans to use funds from the award to hire additional postdocs for his research lab.

William Slofstra

Mathematician proves what is unsolvable

Mathematicians are normally focused on finding solutions, but William Slofstra, assistant professor in pure math at the University of Waterloo, has had breakthroughs in proving that some things can't be solved.

"We have certain math problems we'd like to solve, like maybe make a calculation and get some number out of it. And the type of thing I've been doing has been showing that some of the problems we care about in quantum information and quantum computing, you can't solve."

Dr. Slofstra, a winner of the 2021 Sloan Fellowship, says his work in the mathematics of quantum computing can be very satisfying, "especially if you spent time trying to solve these questions, because you've just been maybe racking your brains over some problems, and being like, 'Well, why can't I solve these problems? Am I going to go on for my entire life not knowing, you know, just feeling that I can't solve this?' Well, when you can show that you can't solve it, then you know, you have some explanation. And you can save a lot of time for yourself and for other people in the future."

Other researchers have built on Dr. Slofstra's discoveries, yielding more groundbreaking results.

A member of Waterloo's Institute for Quantum Computing, Dr. Slofstra was nominated for the Sloan Fellowship by David McKinnon, chair of the Department of Pure Mathematics. In a university story about the award, he referred to Dr. Slofstra as "rising superstar" in this area of research, a pure mathematician with "enormous talent and potential."

Photo: Élisabeth Roger : ALCA Nouvelle-Aquitaine

Jorge Thielen Armand

Guggenheim supports full-time filmmaking for accomplished Canadian-Venezuelan creator

Like many postsecondary students in Canada, Jorge Thielen Armand changed paths while in university. For the Canadian-Venezuelan filmmaker, that move made all the difference.

Exposed to a variety of subjects in pursuit of a Bachelor of Arts degree at St. Thomas University in Fredericton, Thielen Armand initially thought he wanted to be a journalist.

"I got exposed to various authors," he says, "and I found that film combined a lot of my interests." Born in Caracas, Venezuela, Thielen Armand says he "wanted to explore what I left behind and where I was."

"I transferred to communications studies at Concordia University and there, in Montreal I really had some amazing professors who made a big difference in me learning what I wanted to do and what independent filmmaking could be."

Thielen Armand now has two feature films to his credit and is a 2021 Guggenheim Fellow.

A founding partner of the Venezuelan-Canadian film production company La Faena, Thielen Armand develops films that question reality through introspection and strong perspectives, with a focus on contemporary Venezuelan identity. His work has been screened and recognized at several world-class festivals.

His first feature film *La Soledad* (2016) premiered at the 73rd Venice International Film Festival and screened at more than 60 festivals, receiving over a dozen awards. His second feature film *La Fortaleza* (2020) was presented in the Tiger Competition of the 49th International Film Festival Rotterdam, followed by screenings in Busan, Guadalajara, Gijón, Cairo and other major festivals.

"I was completely floored," when learning he won the Guggenheim Fellowship, Thielen Armand says. "I felt very fortunate."

At 31, Thielen Armand says he is the youngest Guggenheim Fellow this year. "So that was certainly very encouraging." The financial support of the award will allow Thielen Armand to continue working full time on filmmaking over the coming year.

And that's what he'd like to continue to do in the years ahead – that, "and other things that really speak to my heart."

Jacob Tsimerman

Mathematician wins prize for rising stars

University of Toronto researcher Jacob Tsimerman has been awarded the New Horizons Prize in Mathematics from the Breakthrough Prize Foundation. The award for early-career achievements in physics and math recognizes Prof. Tsimerman for "outstanding work in analytic number theory and arithmetic geometry, including breakthroughs on the André-Oort and Griffiths conjectures."

As Dr. Tsimerman explains, his work focuses on "the part of math that asks questions about addition and multiplication with whole numbers. Number theory asks questions like how to do the prime numbers behave; how many prime numbers are there; and if you write down an algebraic equation, does it have solutions in whole numbers," he says.

One of Dr. Tsimerman's important research accomplishments is his contribution to a proof for the mathematical hypothesis called André-Oort conjecture.

Dr. Tsimerman says when he first went to grad school, he had very little understand of what research in math was about. He found his path to research in number theory after his advisor gave him interesting problems to work on.

"Eventually I just carved out a little corner for myself in research," he says.

When it comes to major international research awards, Dr. Tsimerman says they are helpful in offering "something to aim for."

"It's also nice to single some stuff out as a community that we think we should be pursuing," he says.

Dr. Tsimerman was the youngest faculty member in the department of mathematics when he joined the University of Toronto as an assistant professor in 2014.

Awards Descriptions

BBVA Foundation Frontiers of Knowledge

The BBVA Foundation Frontiers of Knowledge Awards seek to recognize and encourage world-class research and artistic creation, prizing contributions of lasting impact for their originality, theoretical significance and ability to push back the frontiers of the known world. These international awards span eight categories: Basic Sciences (Physics, Chemistry, Mathematics), Biomedicine, Ecology and Conservation Biology, Information and Communication Technologies, Economics, Finance and Management, Contemporary Music, Climate Change and Development Cooperation.

Canada Gairdner International Award

The Gairdner Foundation was established in 1957 with the main goal of recognizing and rewarding international excellence in fundamental research that impacts human health. The Canada Gairdner International Awards recognize individuals from various fields for seminal discoveries or contributions to biomedical science.

Grand prix scientifique de la Fondation Lefoulon-Delalande of the Institut de France

The Grand Prix scientifique de la Fondation Lefoulon-Delalande (Scientific Grand Prize of the Lefoulon-Delalande Foundation) is granted annually by the Lefoulon-Delalande Foundation at the Institut de France. It is awarded in the areas of medical science, particularly cardiovascular science. Each year the prize has a different theme. The award has a €500,000 prize.

Guggenheim Fellowship

Since its establishment in 1925, the John Simon Guggenheim Memorial Foundation has granted nearly US$400 million in fellowships to more than 18,000 individuals among whom are more than 125 Nobel laureates, members of all the national academies, winners of the Pulitzer Prize, Fields Medal, Turing Award, Bancroft Prize, National Book Award and other internationally recognized honors.

New Horizons Prize

The New Horizons Prize is awarded to promising junior researchers who have already produced important work in the categories of Fundamental Physics and Mathematics. Each year, up to six New Horizons Prizes are awarded. The prize is funded by a grant from the Breakthrough Prize Foundation.

Prince Mahidol Award for Medicine

The Prince Mahidol Award is an annual award for outstanding achievements in medicine and public health worldwide. The award is given by the Prince Mahidol Award Foundation, which was founded by the Thai Royal Family in 1992. The award has a US$100,000 prize.

Shaw Prize

Established under the auspices of Mr. Run Run Shaw in November 2002, the Prize honours individuals, regardless of race, nationality and religious belief, who have achieved significant breakthrough in academic and scientific research or application and whose work has resulted in a positive and profound impact on mankind. The Shaw Prize consists of three annual prizes: Astronomy, Life Science and Medicine, and Mathematical Sciences, each bearing a monetary award of US$1.2 million.

Sloan Research Fellowship

The Sloan Research Fellowships are given annually to early-career scientists and scholars whose achievements and potential identify them as rising stars and influential leaders. They are one of the oldest awards conferred by the Alfred P. Sloan Foundation, a philanthropic, not-for-profit grant-making institution based in New York City. The foundation makes grants in support of original research and education in science, technology, engineering, mathematics and economic performance. In 2021, the amount of the award was US$75,000.

VinFuture Grand Prize

The US$3 million VinFuture Grand Prize is the first global sci-tech award from Vietnam. It was established in 2021 to recognize breakthrough research and technological innovations which positively improve the quality of human life and create a more equitable and sustainable world for future generations. The prize is awarded by the VinFuture Foundation, founded by Vietnamese businessman Mr. Pham Nhat Vuong.

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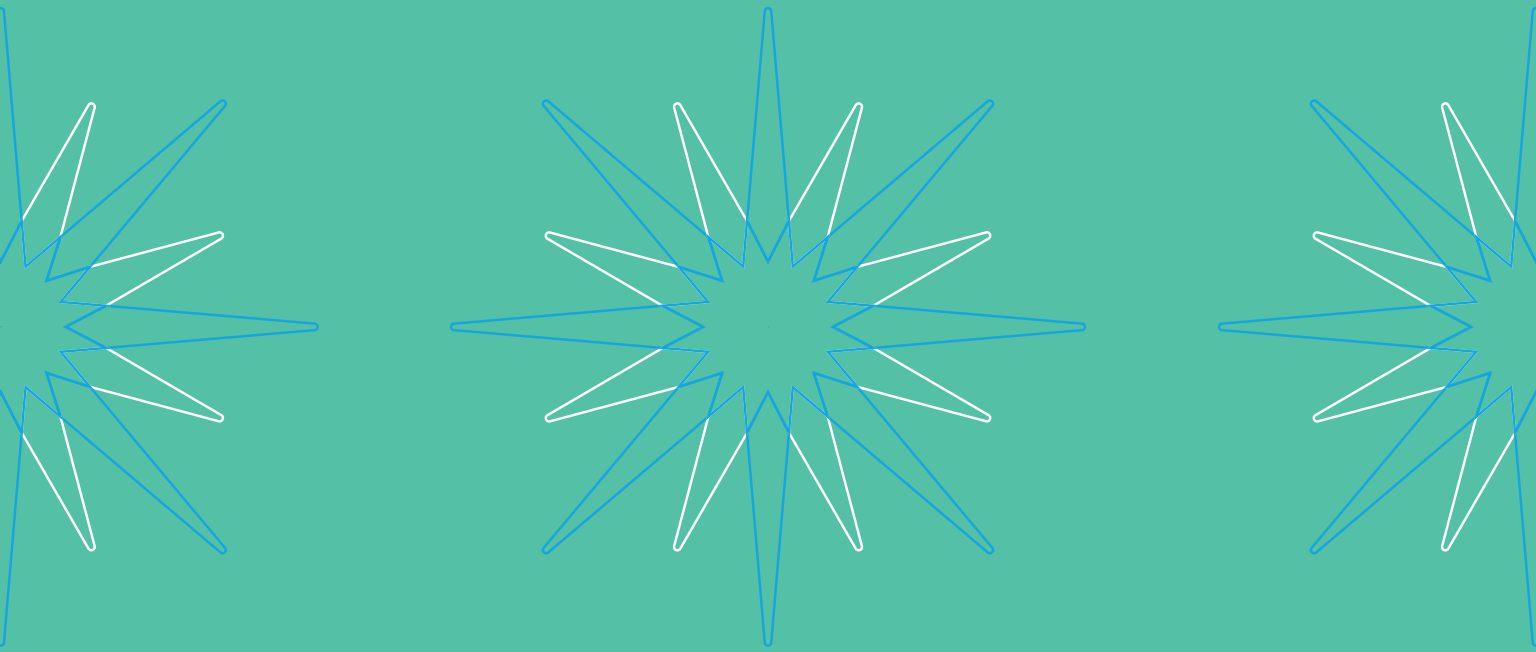

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