CIFAR

IMPACT REPORT
2022/2023

LAND ACKNOWLEDGEMENT

CIFAR's office is located on the traditional territory of many nations, including the Mississaugas of the Credit, the Anishnabeg, the Chippewa, the Haudenosaunee and the Wendat peoples. This land is now home to many diverse First Nations, Inuit and Métis peoples. It is covered by Treaty 13 with the Mississaugas of the Credit.

As an organization, CIFAR is committed to respectful and collaborative relationships with Indigenous communities. We will continue to find ways to ensure that we are engaging in meaningful action to move reconciliation forward.

COVER PHOTOS:

Clockwise from top left: Humans & the Microbiome Co-Director Melissa Melby; Group photo of participants at the CIFAR Neuroscience of Consciousness Winter School; Fungal Kingdom Co-Director Leah Cowan speaking at CIFAR's 40th anniversary celebration event; CIFAR Azrieli Global Scholars Kwabena Bediako (left) and Brian Dias (right); Brain, Mind & Consciousness Fellow Nicholas Turk-Browne; Members of the CIFAR Azrieli Global Scholars program at the annual all-cohort meeting in Montebello, Québec.

CONTENTS

This report covers the period between April 1, 2022 and March 31, 2023.

MESSAGE FROM OUR PRESIDENT

At a time characterized by anxiety in the face of troubling global issues, CIFAR's vision to help create new knowledge for a better world continues to resonate loudly. It is more crucial than ever to convene extraordinary people to address the boldest, most important questions facing science and humanity, and point the way to changes that can benefit our world.

Joining CIFAR almost a year ago, during its milestone 40th anniversary, reaffirmed for me the legacy of leadership and influence that has buoyed CIFAR from its modest beginnings to its current status as a proudly Canadian-based, internationally respected global research hub.

With support from governments, donors and partners, CIFAR has built world-leading collaborative and interdisciplinary research networks. These networks have produced breakthroughs that have fundamentally changed the way we understand the world. They have identified new areas of study and produced insights that will affect future generations on our planet. From uncovering new uses for silicon that could pave the way for powerful quantum computers, to finding methods to convert CO_2 into less harmful, more useful chemicals to reduce the impact of climate change, this report demonstrates how CIFAR's community of researchers is paving the way towards global impact.

To support this work, CIFAR continues to seek out even better methods to buttress a sustainable and inclusive global research ecosystem, and contribute to the Canadian economy. This will be further supported through a renewed CIFAR Strategy in 2024, and I look forward to seeing how we can collectively shape a better Canada and a better world by bringing together the brightest research minds of our time.

Stephen J. Toope, OC, FRSC, LLD
President & CEO

MESSAGE FROM OUR CHAIR

Since our founding in 1982, CIFAR has grown from a small group of Canadian academics to a leader in the global research community.

This trajectory would not have been possible without a vast CIFAR community which comprises not only our Canadian and global research talent, but also a deep network of governments, partners and donors who understand the value of CIFAR's work and continue to generously support it.

The way that we arrive at impact is through collaboration. Whether developing a new vaccine against pathogens attacking bat populations or shaping policy responses to address wealth gaps amongst different communities, these advances require the systems, people and funding in place to transform our world.

In 2022-2023 alone, CIFAR collaborated with organizations from coast to coast to coast in Canada, as well as 15 other countries. These countries recognize CIFAR's leadership on a number of fronts, including through the Pan-Canadian AI Strategy, which has cemented CIFAR's and Canada's reputation as a leader in AI. This model is a beacon of progress and demonstrates CIFAR's ability to lead in other critical areas of research.

Moving forward, these and other partnerships will be key to growing our reach, deepening our networks, and driving strong economic impact in Canada and around the world.

William L. Young
Chair, CIFAR Board of Directors

2022/2023 HIGHLIGHTS
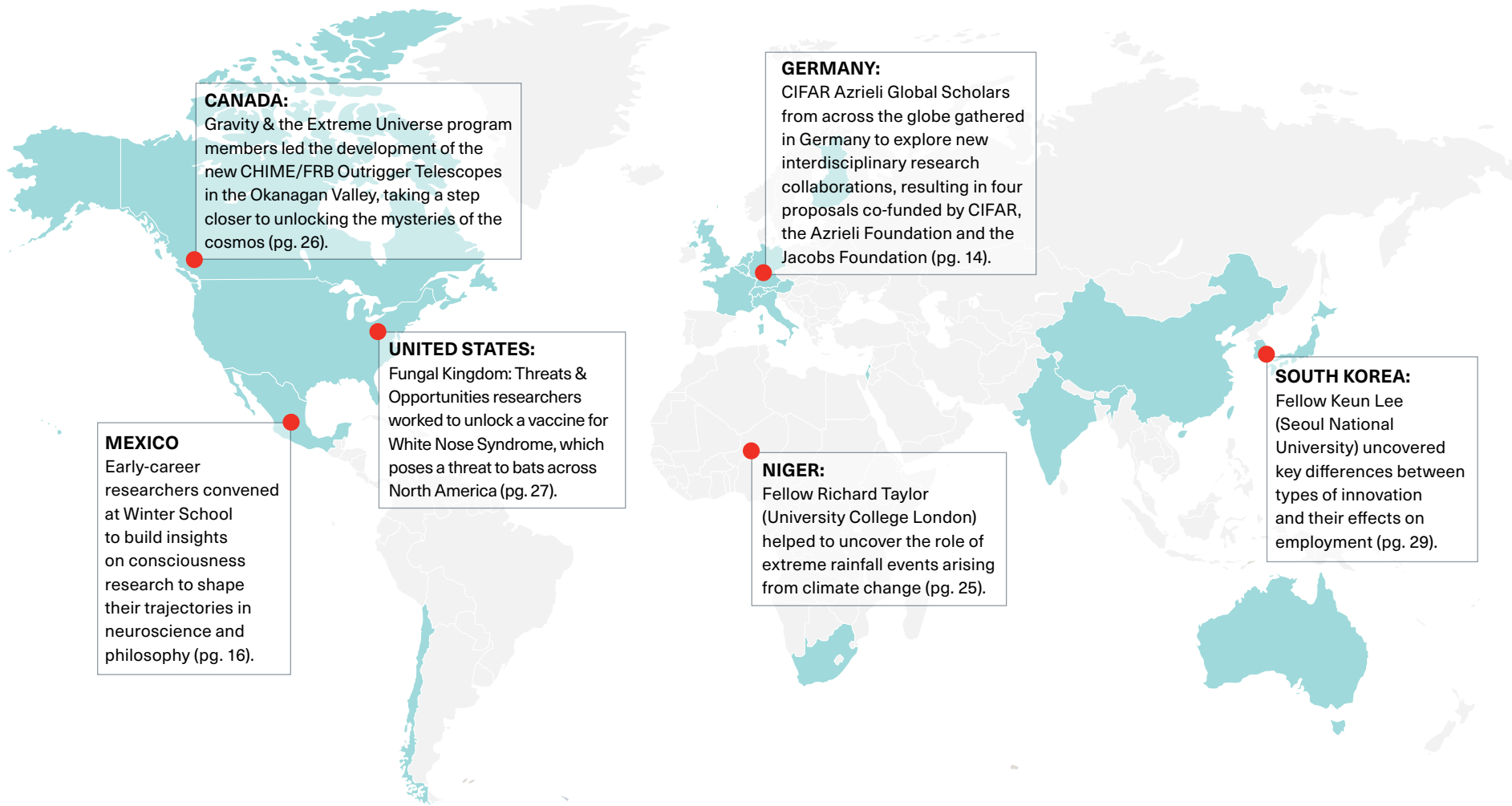
CANADA:
Gravity & the Extreme Universe program members led the development of the new CHIME/FRB Outrigger Telescopes in the Okanagan Valley, taking a step closer to unlocking the mysteries of the cosmos (pg. 26).

GERMANY:
CIFAR Azrieli Global Scholars from across the globe gathered in Germany to explore new interdisciplinary research collaborations, resulting in four proposals co-funded by CIFAR, the Azrieli Foundation and the Jacobs Foundation (pg. 14).

UNITED STATES:
Fungal Kingdom: Threats & Opportunities researchers worked to unlock a vaccine for White Nose Syndrome, which poses a threat to bats across North America (pg. 27).

MEXICO
Early-career researchers convened at Winter School to build insights on consciousness research to shape their trajectories in neuroscience and philosophy (pg. 16).

NIGER:
Fellow Richard Taylor (University College London) helped to uncover the role of extreme rainfall events arising from climate change (pg. 25).

SOUTH KOREA:
Fellow Keun Lee (Seoul National University) uncovered key differences between types of innovation and their effects on employment (pg. 29).

12 International Research Programs

3 AREAS OF ACCOUNTABILITY

Advancing knowledge

Developing future research leaders

Mobilizing knowledge

GLOBAL COMMUNITIES

439 Researchers

223 Fellows

64 Advisors

37 CIFAR Azrieli Global Scholars

121 Canada CIFAR AI Chairs

166 Institutions

EXTRAORDINARY MINDS

93 Major awards and honours received by Fellows, Advisors, CIFAR Azrieli Global Scholars and Canada CIFAR AI Chairs

DRIVING ENGAGEMENT

22,973 Media mentions, podcasts and features spotlighting CIFAR community members and their work

4,683,400 Impressions gained through CIFAR's social media amplification

546,436 Web visits to cifar.ca

20 Countries represented in our research community

Australia	Israel
Austria	Italy
Belgium	Japan
Canada	Netherlands
Chile	Singapore
China	South Africa
Finland	South Korea
France	Switzerland
Germany	United Kingdom
India	United States

6 Countries represented among 2022-2024 cohort of CIFAR Azrieli Global Scholars

Canada	South Africa
Chile	United Kingdom
India	United States

27 Program meetings and cross-programmatic events held in 6 countries

Canada	Mexico
France	Netherlands
Ireland	United States

6 Continents where subscribers (newsletter, REACH magazine, virtual events) are located

MAP LEGEND:

■ Locations of Case Studies

■ Countries where CIFAR researchers and CIFAR Azrieli Global Scholars 2022/24 are based and/or where program meetings were hosted

PAN-CANADIAN AI STRATEGY

STRENGTHENING CANADA'S LEADERSHIP IN RESPONSIBLE AI

The Pan-Canadian AI Strategy at CIFAR drives cutting-edge research, trains the next generation of diverse AI leaders and fosters cross-sectoral collaboration for innovation, commercialization and responsible AI adoption.

Top: Canada CIFAR AI Chairs Marc G. Bellemare (left) and Dhanya Sridhar (right) discuss causality and reinforcement learning at a CIFAR Talk at Mila in March 2023.

Bottom: Student participants at Actua's National Indigenous Youth in STEM (InSTEM) program. Learn more about CIFAR's Pan-Canadian AI Strategy and Actua partnership on page 17.

Our three National AI Institutes — Amii in Edmonton, Mila in Montréal and the Vector Institute in Toronto — are the vibrant central hubs of Canada's thriving AI ecosystem.

Funded by the Government of Canada, we're building a dynamic, representative and rich community of world-leading researchers who work to create transformative, responsible AI solutions for people and the planet.

CANADA'S AI TALENT: THE ENVY OF THE WORLD

Canada CIFAR AI Chairs advanced Canadian-led AI research in a range of fields, including drug discovery and machine learning for health, generative AI, autonomous vehicles, materials discovery, human-AI interaction, climate change mitigation and natural language processing.

1,164 Number of peer-reviewed publications across Canada's three National AI Institutes (2022-23)

In turn, these world-recognized AI scientists train thousands of graduate students and summer lab trainees each year, accelerating the expansion of Canadian leadership in this key global field.

3rd Canada's rank for largest pool of top-tier AI researchers

10% Proportion of the world's most elite (top 0.5%) researchers living in Canada, second only to the United States

Through the Pan-Canadian AI Strategy at CIFAR, our three National AI Institutes Amii, Mila and the Vector Institute provide expert advice and training for AI implementation and commercialization by established and emerging Canadian companies.

"Artificial Intelligence and machine learning play key roles in the evolution of our automated inspection offerings, and executing a partnership with the Vector Institute is a natural next step in advancing PAVE's best-in-class automated vehicle inspection solutions."

JAMEEL GHATA
Chief Strategy Officer, PAVE

2017
Year founded

121
Canada CIFAR
AI Chairs

1,650
Graduate trainees
in Chair-led labs

1,305
NextGen AI Training
Program trainees

ADVANCING KNOWLEDGE

At CIFAR, advancing knowledge means bringing together the world's leading researchers to address high-risk, high-reward questions. We do this by focusing on long-term, international interdisciplinary collaboration characterized by trust, openness and inclusivity to set forth a course towards impact.

Top: Members of Accelerated Decarbonization met in Mexico City for one of the program's annual meetings.
Bottom: Participants of the CIFAR Neuroscience of Consciousness Winter School (left); CIFAR Azrieli Global Scholar Ameet Morjaria speaking at the CIFAR 40th celebrations in June 2022 (right).

BUILDING A GLOBAL COMMUNITY

Convening diverse audiences allows CIFAR to take on new insights, make connections and gain deeper understanding on critical issues, which are important steps towards making impactful change. In the 2022-2023 period, CIFAR hosted events around the world and explored partnerships with government and national bodies around the world to open new lines of global research, shape foundations for collaboration and contribute to building a stronger research ecosystem both in Canada and abroad.

INTERDISCIPLINARY COLLABORATION

The work of CIFAR continues to be strongly underpinned by its 12 distinct and ambitious research programs, comprising an array of the world's top minds from across disciplines and borders. Additionally, CIFAR leads the Pan-Canadian AI Strategy, the world's first national plan to ensure this transformative technology benefits Canada and the world. Increasingly, advances in AI will help strengthen research across all CIFAR programs.

Convening within and across programs is done regularly and frequently results in Catalyst Fund projects and the development of avenues for further exploration on important topics — from how quantum can engage with computational chemistry and machine learning communities to studies that address gaps between the astrobiological and fungal research communities.

These convenings are also opportunities to connect with those outside of the CIFAR community — industry insiders, policy makers and even donors — to understand how research can be best carried into the world to effect change.

"CIFAR promotes ferocious curiosity, with humility that comes from interdisciplinary exploration and discussion. No idea is off limits, and transdisciplinary discussions lead to new insights and perspectives on grand challenges facing the world. Participating in CIFAR meetings always leads to new ideas, questions and often new avenues of research, many through catalyst grants and collaborations."

MELISSA MELBY
Co-Director, Humans & the Microbiome,
University of Delaware, United States

WHAT ARE CATALYST FUNDS?

Catalyst Funds support projects through time-limited grants for Fellows, Advisors and CIFAR Azrieli Global Scholars that facilitate and support high-risk, potentially high-reward, ideas and projects across CIFAR's portfolio of research programs.

The grants provide flexibility for early-stage projects, encourage interdisciplinary collaboration, and address emerging and exploratory themes within or between research programs. In the 2022-2023 period:

44
Catalyst Funds were awarded

$1,665,839
In Catalyst Funds, often supported by donors, were committed to projects that will accelerate discovery

CONVENING STAKEHOLDERS ON INCLUSIVE INNOVATION

In 2022, members of CIFAR's Innovation, Equity & the Future of Prosperity program embarked on a series of engagements with different economic sectors and industries to share perspectives on how to ensure that innovation creates broad-based prosperity. A meeting with Boston-area bio-economy stakeholders discussed the policies, business environments and supply of different skills (not just Research & Development) needed to support the growth and maintenance of a bio-industry. Additional conversations will be held in Ottawa and Washington in 2023.

CIFAR DAY AT THE SCIENCE SUMMIT HOSTED BY INTELLIGENCE IN SCIENCE (ISC)

Hosted during the 2022 United Nations General Assembly in New York City, this summit convened stakeholders from CIFAR's international research community to discuss the role of science in attaining the United Nations Sustainable Development Goals across a broad spectrum of fields, including international science diplomacy, technology, data sharing, global health, food security, climate change and biodiversity.

ADVANCING IMPACT

CIFAR's work relies on the support and expertise of strong partners and donors.

The Alfred P. Sloan Foundation's generous support in advancing knowledge is one such example. The Foundation's ongoing commitment to research and education in the fields of science, technology and economics is demonstrated through their support of CIFAR's Learning in Machines & Brains and Innovation, Equity & the Future of Prosperity programs.

CIFAR's AI & Society program demonstrates strong partnership in action. Since 2017, this program has built a community of experts across disciplines to examine and address the societal implications of AI.

In the area of AI for Health, CIFAR partnered with the Canadian Institutes of Health Research to bring together interdisciplinary groups of experts in AI, law, ethics, policy and medicine to assess and provide recommendations on regulatory models that could maximize the potential benefits of using AI in health care, while minimizing potential dangers.

Examining real-world case studies of AI already in use in health systems — from cardiac arrest prediction to digital twins and the Operating Room "black box" — they assessed current legal, ethical and regulatory readiness. The resulting reports are among the first real-world analyses of AI health tech to assess whether existing Canadian health laws are sufficient to meet legal concerns that may arise from the use of these technologies.

WHERE MIGHT RESEARCH LEAD US?

CIFAR's third Global Call for Ideas sought proposals for new research programs exploring the theme "The Future of Being Human" — to discover how humans interact with science and technology, with social and cultural systems, and with our environment.

Launched in June 2021, CIFAR's Research Council and senior staff consulted with stakeholders from academia, government, the private sector and the arts, to envision research directions central to the future of science and humanity. The result: CIFAR launched three new research programs in April 2023 that will shape a new trajectory of discovery with possibilities to develop solutions to the world's emerging challenges, from rapid changes in the environment to applications of emergent technology and threats to human health.

"As the United States' leading private funder of economics research, the Alfred P. Sloan Foundation spends a lot of time thinking about who we want to collaborate with. We seek partners with the highest standards of rigor and objectivity, novel and creative approaches to important societal problems, and a demonstrated track record of impact. CIFAR has consistently proven itself on all three criteria."

SANDRA BARBOSU
Program Officer, Economics Program,
Alfred P. Sloan Foundation

GLOBAL CALL FOR IDEAS

THREE NEW PROGRAMS*:

FUTURE FLOURISHING

Future Flourishing will examine what it means to be human and what it takes to live well in concert with other humans, animals, plants and machines that inhabit our planet.

HUMANITY'S URBAN FUTURE

Humanity's Urban Future will study what a liveable, adaptable urban environment should look like to drive dialogue and solutions to establish a better city of tomorrow.

THE MULTISCALE HUMAN

The Multiscale Human will explore whether it's possible to create a map of the human body, to understand how our body works, from organs right down to the molecular level.

BY THE NUMBERS

45
Researchers in CIFAR's new programs

11
Countries represented by CIFAR's new program members

99
Program applications received, involving over 320 researchers in 27 countries

* New Programs and appointments became official on April 1, 2023, and do not have activity to report in 2022-23.

DEVELOPING FUTURE RESEARCH LEADERS

Supporting high-potential early-career researchers across the globe through mentorship, networking and skills training is central to CIFAR's work.

Clockwise from top: CIFAR Azrieli Global Scholars Alona Fyshe (left) and Chibueze Amanchukwu (right); CIFAR Azrieli Global Scholar Megan Peters; CIFAR Azrieli Global Scholars and Jacobs Foundation Research Fellows at the Annual Meeting, Marbach, Germany, June 2022.

Opposite: All attendees at the 2022 CIFAR Azrieli Global Scholars all-cohort meeting in Montebello, Québec.

> **"Quite simply, my participation in the CIFAR Azrieli Global Scholars program has changed my academic trajectory. I have been empowered to think broadly about and initiate research projects that I think will be the most meaningful. It is academia at its most inspirational and idyllic."**

ALEEZA GERSTEIN
CIFAR Azrieli Global Scholar 2021-2023, Fungal Kingdom: Threats & Opportunities, University of Manitoba, Manitoba, Canada

CIFAR AZRIELI GLOBAL SCHOLARS

Future research leaders bring fresh perspectives that accelerate discoveries within global, interdisciplinary research networks. That's why, since 2015, the prestigious CIFAR Azrieli Global Scholars program has cultivated the research talent of tomorrow among CIFAR's research programs. This ambitious initiative provides two years of mentorship, global networking, professional skills development and unrestricted research funding to outstanding emerging talent tackling important questions facing science and humanity. This is made possible through the generous and long-standing support of the Azrieli Foundation.

Scholars participate in various enrichment activities to encourage collaboration, hone their leadership skills and further novel areas of study, including at a joint Annual Meeting held with the Swiss-based Jacobs Foundation Research Fellows. In 2022, we also held the first-ever All-Cohorts Meeting of all current and former Azrieli Global Scholars, an event filled with excitement and energy. These gatherings, along with leadership development workshops throughout the year, gave Scholars space and time to explore new interdisciplinary research collaborations, receive peer feedback on emerging ideas and learn from expert consultants.

125
CIFAR Azrieli Global Scholars to date

37
Active CIFAR Azrieli Global Scholars

18
New Global Scholars welcomed into the 2022-2024 cohort

"The Azrieli Foundation has been a longtime supporter of CIFAR because we believe in its model, and we believe in their mission in overcoming the impossible. I know that CIFAR's future is bright, and I am looking forward to the next 40 years and what that will bring."

NAOMI AZRIELI
Chair and CEO of the Azrieli Foundation

Left: Naomi Azrieli, Chair and CEO of the Azrieli Foundation, moderating a panel on CIFAR's impact on the global research ecosystem at CIFAR's 40th anniversary event.

NEXT GENERATION EVENT SNAPSHOT:

NEUROSCIENCE OF CONSCIOUSNESS WINTER SCHOOL

CIFAR hosted its fourth annual Neuroscience of Consciousness Winter School, generously supported by the Templeton World Charity Foundation, Inc.

Thirty-seven graduate students from 16 countries were competitively selected to learn from preeminent global leaders in consciousness research. Led by CIFAR Azrieli Global Scholars in the Brain, Mind & Consciousness program, Sahba Besharati (University of the Witwatersrand), Michael Cohen (Amherst College) and Adeel Razi (Monash University), the 2022 Winter School represents part of Templeton World Charity Foundation's five-year commitment to help build the next generation of consciousness researchers at the intersection of science, theology, philosophy and society.

"A lot of academic spaces can be too formal, and even too scientific in nature. It's hard to create an environment where people are comfortable to share their research, but also their experiences, and to engage in mentorship spaces. The Winter School provides those unique opportunities, which galvanize the next generation of brain scientists."

SAHBA BESHARATI
CIFAR Azrieli Global Scholar 2021-2023, Brain, Mind & Consciousness, University of the Witwatersrand, South Africa

HONOURING A LEGACY

Carolina Tropini (University of British Columbia), a member of CIFAR's Humans & the Microbiome program, was named the inaugural Alan Bernstein Fellow in honour of CIFAR's newest President Emeritus. In celebration of CIFAR's 40th year, close to 100 members of the CIFAR community raised over $1 million to establish a new honourific fellowship which will serve as a testament to Alan's decade of leadership and his long-standing commitment to fostering the next generation of early-career researchers.

Tropini, a leading researcher of the human microbiome, is a former CIFAR Azrieli Global Scholar and current CIFAR Fellow who is building an understanding of the vibrant microscopic world located within the human gut, and the potential it holds for precision health and medicine.

A DIVERSE AND INCLUSIVE RESEARCH ECOSYSTEM FOR THE FUTURE

Impactful change for tomorrow is not possible without a research ecosystem that is equitable, diverse and inclusive. CIFAR remains committed to advancing reconciliation with Indigenous peoples and taking steps to identify and address inequities which impede EDI in research today. By doing so, CIFAR can contribute to building a more inclusive research ecosystem.

Knowing that concrete action is the path towards meaningful change, CIFAR launched the Research EDI Ambassadors Community (REDIAC) to further support the advancement of EDI in CIFAR's research community. The REDIAC, which includes representatives from each of CIFAR's research programs, provides input on CIFAR's policies, practices and programs, acting as champions of a bias-free research environment and promoting inclusion for all CIFAR Fellows, Scholars and Advisors. Currently, each research program is developing an EDI plan to be in place by December 2023, which will include recommendations on how each program can make a meaningful impact in establishing an inclusive environment.

AI4GoodLab, a national training program through the Pan-Canadian AI Strategy, is another key example. Currently the only national initiative of its kind in applied AI at the undergraduate level, AI4GoodLab increases participation of women and people of diverse genders

"There's this pressure of having to exist as a woman in what can be a very male space... [This is] the first time I've been a part of a women-only tech group, and it feels innately safe and welcoming."

PAIGE LEWIS
AI4GoodLab 2022 participant

"CIFAR is the Canadian-based global risk-taker on [turning] fundamental research into 'big ideas' that can transform the world and our place and condition within it. Some succeed, some fail. That is the nature of advanced research. But when they succeed — Wow! CIFAR has had a number of these Wows. They're why I support this great organization. Huge congratulations to CIFAR for 40 years of discovery."

BRUCE MITCHELL
Chairman & CEO, Permian Industries Ltd., long-time CIFAR supporter and donor to the Alan Bernstein Fellowship

and backgrounds in STEM (science, technology, engineering and math), and addresses biases that perpetuate societal inequities and weaken the quality of technology. The seven-week annual summer training program brings together undergraduate trainees from across Canada who identify as women and other gender minorities in STEM for mentorship, professional development and self-directed team projects to advance participants' interests within their unique fields. In 2022, the program expanded to three Canadian cities (Edmonton, Toronto and Montréal), and is now training 90 people each year.

Other achievements:

- Ongoing investments through the Pan-Canadian AI Strategy also continue to support programs including CIFAR's partnership with Actua's National Indigenous Youth in STEM program, which saw AI content integrated into Actua's science, technology, engineering, and mathematics (STEM) programs to help remove barriers to Inuit, Métis and First Nations youth engagement in STEM through land-based education.

- To lower barriers to participation, CIFAR established the CIFAR Inclusive AI Scholarship, which covers the full costs of participation for self-identified Black and Indigenous students in all CIFAR NextGen AI Training Programs.

MOBILIZING KNOWLEDGE

CIFAR creates impact by engaging experts in cross-sectoral conversations with global research leaders to drive innovation. By producing programming to stimulate scientific curiosity, CIFAR continues to mobilize the global research community to dig deeper, and to explore and apply new perspectives to their work.

ESTABLISHMENT OF CANADA CIFAR AI CHAIR WORKING GROUPS

This past year, CIFAR's leadership of the Pan-Canadian AI Strategy continued to set the global standard for responsible AI research through the development of several Canada CIFAR AI Chair Working Groups in key research priority areas: AI for Health, AI for Energy and the Environment, and Responsible AI.

The AI for Energy and the Environment Working Group led a symposium to bring together AI researchers with stakeholders and researchers from the public and private sectors to develop a framework for applying AI to challenges related to sustainable energy and the environment. The resulting report will be used to guide priority initiatives of the Pan-Canadian AI Strategy for climate-related AI science going forward.

A NATIONAL NEUTRON STRATEGY FOR CANADA

Beginning with discussions in 2016 that included both Canadian and international experts, Neutrons Canada embarked on a consultative process, co-chaired by CIFAR Quantum Materials Fellow Bruce Gaulin (McMaster University), to develop a long-term plan (2025-35) to guide the implementation of a national neutron strategy. The aim was to rebuild Canadian capacity for research with neutron beams — an indispensable tool for the study, design and characterization of materials key to advances in a range of industries and applications, from clean energy storage and nuclear safety to new materials for quantum technology.

Left (top): Brain, Mind & Consciousness program members Nancy Kanwisher (left) and Atsushi Iriki (right) work with participants of the 2022 CIFAR Neuroscience of Consciousness Winter School.

Left (bottom): Accelerated Decarbonization Program Co-Director Alán Aspuru-Guzik speaking at the 2022 CIFAR Massey Talk.

"CIFAR has created a 'thought accelerator' that fuels many, if not all, of Canada's most prominent breakthroughs in AI and computational neuroscience."

MARC BELLEMARE
Canada CIFAR AI Chair,
Learning in Machines & Brains,
McGill University, Google Brain,
Québec, Canada

To support this process, CIFAR hosted a panel at the Science Meeting of the Canadian Institute for Neutron Scattering, bringing leaders from Neutrons Canada, TRIUMF (Canada's national particle accelerator centre) and the Nuclear Waste Management Organization into conversation with the neutrons user community. The panel explored issues related to the recruitment and retention of scientific professionals, outreach to industry and government users, inclusion of equity-deserving and Indigenous communities, and support for trainees. These discussions will help shape the trajectory of Canada's national strategy, ensuring its development will be undertaken responsibly and collaboratively.

PARTNERS WHO ENVISION THE FUTURE

Long-time donors like BMO Financial Group demonstrate a visionary capacity to enable a better future. Since 1989, BMO has provided funding to CIFAR across many different programs that benefit the communities BMO serves. Their current support of CIFAR's Boundaries, Membership & Belonging program has allowed researchers to make great strides in exploring the nature and sources of solidarity in contemporary societies, including issues around nationalism and multiculturalism, work that is critically important to supporting BMO's multi-year Zero Barriers to Inclusion Strategy.

CIFAR also thanks the insightful, curious and forward-thinking donors who chose to leave a legacy through a donation in their Will to the Fraser Mustard Legacy Society, enabling CIFAR to continue its work for the benefit of future generations.

ADDRESSING THE MOST IMPORTANT QUESTIONS FACING SCIENCE AND HUMANITY

2,312
Publications from **324** researchers (7.1 per researcher on average)*

95%
Of researchers report that participation in CIFAR activities has positively informed or affected their research (e.g. has influenced their research directions, prompted new ideas, facilitated new collaborations, etc.)

HIGH-IMPACT SCHOLARSHIP

229
Fellows, Advisors and CIFAR Azrieli Global Scholars (71%) contributed to the top 1% of most-cited papers worldwide from 2017-2021.**

*Scholarly output from active CIFAR Core researchers (n=324) for the most recent complete calendar year of data (2022) in SciVal/Scopus.

**Percentage of CIFAR researchers contributing to the top 1% of most-cited papers at the world level from 2017-2021 using SciVal and Scopus. Excludes Solutions Network members because they are not expected to publish traditionally and CCAI Chairs.

RESEARCH PROGRAMS

CIFAR's research programs bring together international, interdisciplinary researchers who work together for five-year terms. Programs are led by a Director or two Co-Directors, engage approximately 20-40 Fellows and Advisors from around the world, and include two or three CIFAR Azrieli Global Scholars for two-year terms.

Top: CIFAR Azrieli Global Scholars Craig Chapman (left) and Katherine McAuliffe (right) work together during a session at the program's first all-cohort meeting.

Right: Brain, Mind & Consciousness Program Co-Directors Adrian Owen (left) and Anil Seth (right) address students at the CIFAR Neuroscience of Consciousness Winter School.

ACCELERATED DECARBONIZATION

> Over the last year, the Accelerated Decarbonization program redefined its mission to draw in innovative thought leaders in science and engineering and determine new ways to address the carbon cycle. Motivating program members is the advancement of fundamental science, offering new ways of solving climate-related problems.

COMBINING CARBON CAPTURE AND CONVERSION

Through a Catalyst Fund project, program Co-Director Curtis Berlinguette (University of British Columbia) and Fellow Christopher Chang's (University of California, Berkeley) research groups have mimicked the combined CO_2 capture and conversion capabilities of bacterial organelles in the natural world by combining expertise in molecular chemistry, materials science and engineering. Synthetic bacterial proteins are used to convert CO_2 into bicarbonate-rich solutions. Next, more useful chemicals are produced by applying electrolyzer devices to these solutions to reduce CO_2.

CONVERTING CO_2 INTO LESS HARMFUL, MORE USEFUL CHEMICALS

Work in CIFAR Azrieli Global Scholar Chibueze Amanchukwu's (University of Chicago) lab focuses on understanding the influence of electrolytes on CO_2 conversion and uses organic solvents (not water) as the electrolyte. The group was the first to create valuable carbon products from CO_2 while using alkali cations in organic solvents, a breakthrough that has major implications for the future of carbon conversion.

"CIFAR has enabled me to collaborate more closely with scientists in my field, while introducing me to researchers in adjacent fields whose work provides new perspectives on the problems we solve. This combination has enabled us to tackle global challenges in new and unprecedented ways."

ARIEL FURST, CIFAR Azrieli Global Scholar 2022-2024, Accelerated Decarbonization, Massachusetts Institute of Technology, United States

FOUNDED: 2014

PROGRAM CO-DIRECTORS:

Alán Aspuru-Guzik
University of Toronto
and Vector Institute

Curtis Berlinguette
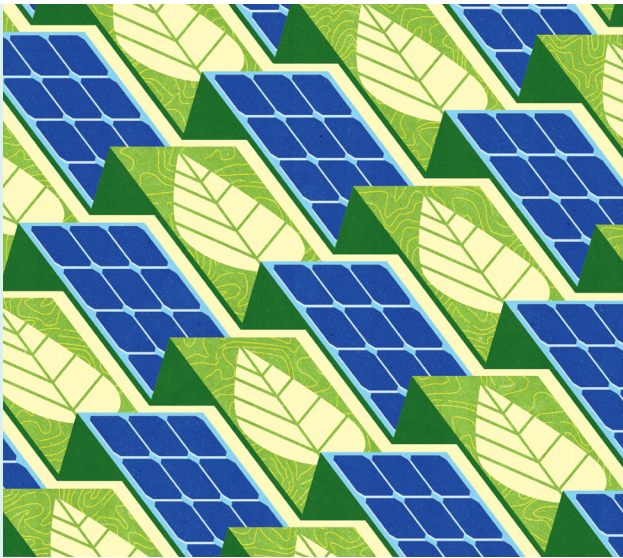University of
British Columbia

**FELLOWS
(excl. directors):** 8

**CIFAR AZRIELI
GLOBAL SCHOLARS:** 3

ADVISORS: 5

**ASSOCIATE
FELLOWS:** 1

LEAD SUPPORTERS:
Chisholm Thomson Family Foundation, The George Cedric Metcalf Charitable Foundation, Gerald Heffernan, McLean Group, RBC Foundation, Trottier Family Foundation

BOUNDARIES, MEMBERSHIP & BELONGING

POLICY IMPLICATIONS STEM FROM NEW INSIGHTS ON RACIAL INEQUALITY

CIFAR Azrieli Global Scholar Ellora Derenoncourt (Princeton University) and collaborators published a major paper on racial inequality through the National Bureau of Economic Research. Focusing on the wealth gap between white people and Black people, the study examines the trajectory of this racial wealth gap from 1860 to 2020 and models different policy responses to reduce that gap.

CONTRIBUTING EXPERTISE TO THE WORLD DEVELOPMENT REPORT

Co-Director Irene Bloemraad (University of California, Berkeley), Fellow Victoria Esses (Western University), Co-Director Will Kymlicka (Queen's University) and CIFAR Azrieli Global Scholar Yang-Yang Zhou (University of British Columbia) provided advice on a chapter of the *2023 World Development Report*, the major annual policy-setting publication by The World Bank, which focuses on migrants, refugees and societies this year. Intrigued by the group's alternative framing of the issues, The World Bank invited them to draft a complementary background paper to elaborate on their interdisciplinary insights in which they presented an alternative framework for successful global migrant integration.

"[CIFAR] has supercharged my research program in ways that I hadn't anticipated."

MICHAEL MUTHUKRISHNA, CIFAR Azrieli Global Scholar 2021-2023, Boundaries, Membership & Belonging, London School of Economics and Political Science, United Kingdom

FOUNDED: 2019

PROGRAM CO-DIRECTORS:

Irene Bloemraad
University of California, Berkeley

Will Kymlicka
Queen's University

FELLOWS (excl. directors): 9

CIFAR AZRIELI GLOBAL SCHOLARS: 3

ADVISORS: 5

ASSOCIATE FELLOWS: 1

LEAD SUPPORTER:
BMO Financial Group

BRAIN, MIND & CONSCIOUSNESS

FINDINGS ON THE LONG-TERM EFFECTS OF COVID-19 ON COGNITION

CIFAR Advisor David Menon (University of Cambridge) and program Co-Director and Koerner Fellow Adrian Owen (Western University) co-authored a large-scale study that discovered a relationship between "long COVID," "brain fog" and cognitive deficit. The study showed that these are present for patients who experienced varying severity of COVID-19 symptoms, as well as the relationship of long COVID to physical symptoms and mental health.

CONSCIOUSNESS THEORIES STUDIES (ConTraSt) DATABASE

CIFAR Fellow Lucia Melloni (Max Planck Institute), Tanenbaum Fellow Liad Mudrik (Tel Aviv University) and collaborators launched a database that enables a birds' eye view of the field of consciousness — across definitions, methodologies, populations and findings — as well as looking for possible biases with respect to testing particular theories. This database synthesizes reams of data to allow future researchers to expedite studies and analyze trends in the field of consciousness.
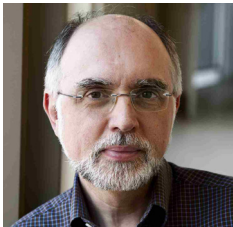
"CIFAR is the only platform I know of that allows scientists to work and especially to think together freely and without specific pre-determined goals or agendas. It is truly a unique and valuable organization because of its 'think-tank' approach which produces the best and most novel scientific outcomes."

ROBERT ZATORRE, CIFAR Fellow, Brain, Mind & Consciousness, McGill University, Québec, Canada

FOUNDED: 2014

PROGRAM CO-DIRECTORS:

Adrian Owen
Western University

Anil Seth
University of Sussex

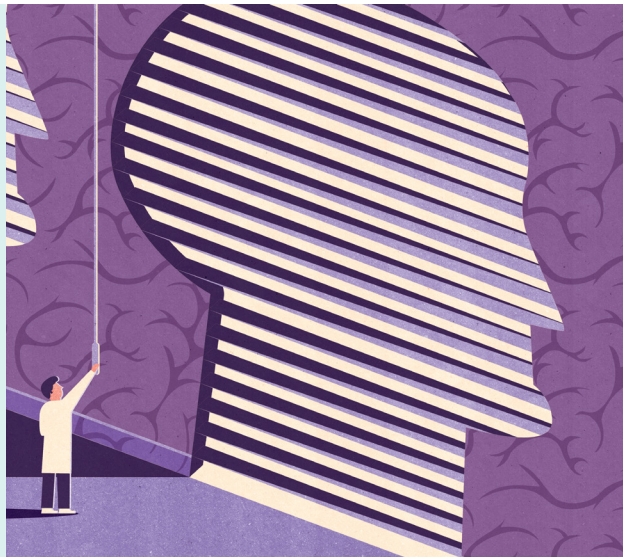**FELLOWS (excl. directors):** 16

CIFAR AZRIELI GLOBAL SCHOLARS: 3

ADVISORS: 5

ASSOCIATE FELLOWS: 2

PARTNER:
Anonymous partner

LEAD SUPPORTERS:
Michael and Sonja Koerner Charitable Foundation,
The Lawrence & Judith Tanenbaum Family Foundation,
Templeton World Charity Foundation, Inc.

CHILD & BRAIN DEVELOPMENT

ANALYSIS OF LEARNING LOSS DURING COVID

CIFAR Fellow Daniel Ansari (Western University) and Co-Director Candice Odgers (University of California, Irvine) have made major contributions at the intersection of child learning, big data and inequality through an analysis of learning loss during COVID. These researchers have developed a partnership with AMIRA Learning to leverage assessments of children's early reading, providing access to large volumes of high-resolution data on children's early learning, and opening up avenues for improved in-home data collection.

THE IMPACT OF EARLY CHILDHOOD EXPERIENCES AND EXPOSURES ON LONG-TERM HEALTH

Researchers from the Child & Brain Development and Humans & the Microbiome programs collaborated to develop new methodologies to assess the impact of early childhood experiences and exposures on long-term health. Through new collection and integration methods of biological, behavioral and sociological data, they have recruited participants remotely for projects such as the Baby Teeth Study, which measured substance levels in children's teeth to assess which substances children have come into contact with throughout their development. This remote collection approach is an inclusive one as it allows researchers to reach children from diverse backgrounds and locations, including rural, remote and Indigenous communities, compared to onsite collection approaches.

"The diversity and richness of the knowledge experts that are a part of [this] group provide the insights into many of the problems and improve the impact of my work. Interacting with [CIFAR] members helped me to more holistically view the problems I am working on."

ANNA GOLDENBERG, Canada CIFAR AI Chair, Vector Institute, Lebovic Fellow, Child & Brain Development, The Hospital for Sick Children, University of Toronto, Ontario, Canada

FOUNDED: 2003

PROGRAM CO-DIRECTORS:

Thomas McDade
Northwestern University

Candice Odgers
University of California, Irvine

FELLOWS (excl. directors): 15

CIFAR AZRIELI GLOBAL SCHOLARS: 3

ADVISORS: 5

ASSOCIATE FELLOWS: 3

LEAD SUPPORTER:
Genome British Columbia

EARTH 4D: SUBSURFACE SCIENCE & EXPLORATION

PROOF OF CONCEPT ON MECHANISMS FOR HELIUM-RICH GAS FIELD FORMATION

CIFAR Fellow Chris Ballentine (University of Oxford) and Co-Director Barbara Sherwood Lollar (University of Toronto) developed a proof of concept for the assessment of novel mechanisms by which primary helium-rich gas fields form. The model offers applications in finding closely related natural hydrogen gas reservoirs, providing a new perspective to help identify the environments where helium (and potentially hydrogen) may accumulate, a historically difficult task. At a time when the world faces acute helium shortages, the prospect of improved helium discovery is particularly valuable, not only because it is critical to the operation of MRI machines, among other uses, but also because it can contribute to hydrogen discovery, which is a key resource in green energy.

ASSESSING THE ROLE OF HYDROGEOLOGY IN CLIMATE CHANGE

CIFAR Fellow Richard Taylor (University College London), through field research in Niger with scientists from University Abdou Moumouni and the Institut de Recherche pour le Développement (IRD), demonstrated the significant role of extreme rainfall events due to climate change in the replenishment of groundwater in a tropical dryland. This work underscores the role of hydrogeology in a world that transitions its energy resources and needs in response to global climate change, and its effects on accessible water resources, agriculture and food security.

"CIFAR is an astounding organization that draws together people from many diverse backgrounds and expertise, addressing key questions in contemporary science. Although many proclaim to do this, CIFAR delivers."

NIGEL SMITH, CIFAR Fellow, Earth 4D: Subsurface Science & Exploration, TRIUMF, British Columbia, Canada

FOUNDED: 2019

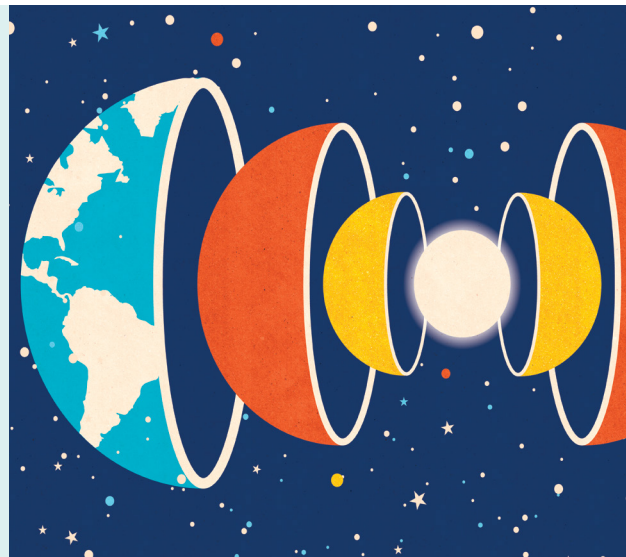**PROGRAM CO-DIRECTORS:**

John Mustard
Brown University

Barbara Sherwood Lollar
University of Toronto

FELLOWS (excl. directors): 12

CIFAR AZRIELI GLOBAL SCHOLARS: 3

ADVISORS: 5

ASSOCIATE FELLOWS: 1

GRAVITY & THE EXTREME UNIVERSE

LEADING THE DEVELOPMENT OF OUTRIGGER TELESCOPES

CIFAR Fellows Matt Dobbs (McGill University), Mark Halpern (University of British Columbia), Gary Hinshaw (University of British Columbia), Co-Director Vicky Kaspi (McGill University), as well as CIFAR Fellows Ue-Li Pen (University of Toronto) and Ingrid Stairs (University of British Columbia) led the development of the new CHIME/FRB Outrigger Telescopes in the Okanagan Valley. The telescopes can obtain unprecedented precision sky localizations for hundreds of Fast Radio Bursts — mysterious, intense but short flashes of radio waves from outer space. A Catalyst Fund project further helped researchers work toward construction and develop algorithms for telescope calibration using Galactic radio pulsars, which will ultimately help to uncover even more mysteries of the cosmos.

UNDERSTANDING HOW ASTRONOMY AND MACHINE LEARNING CAN HELP DETECT NEURODEGENERATION

By combining detection algorithms and citizen science techniques used to detect and classify faint stars and galaxies in astronomy with multi-scale optical brain imaging, CIFAR Canada AI Chairs Audrey Durand (Université Laval, Mila) and Christian Gagné (Université Laval, Mila), and CIFAR Azrieli Global Scholar Renée Hložek (University of Toronto) are pioneering early detection techniques in neurodegeneration. This group successfully leveraged insights from their CIFAR collaboration and Catalyst Fund application to propel a successful New Frontiers in Research Fund grant, and is developing the work into additional proposals to the Discovery Horizons grant program and the Schmidt Foundation.

"The Gravity & the Extreme Universe program at CIFAR is one of the gems of astronomy. [It] is a diverse, dynamic, influential and exciting program at the forefront of the field that punches far above its weight."

LYMAN PAGE, CIFAR Advisor, Gravity & the Extreme Universe, Princeton University, United States

FOUNDED: 1986

PROGRAM CO-DIRECTORS:

Victoria Kaspi
McGill University

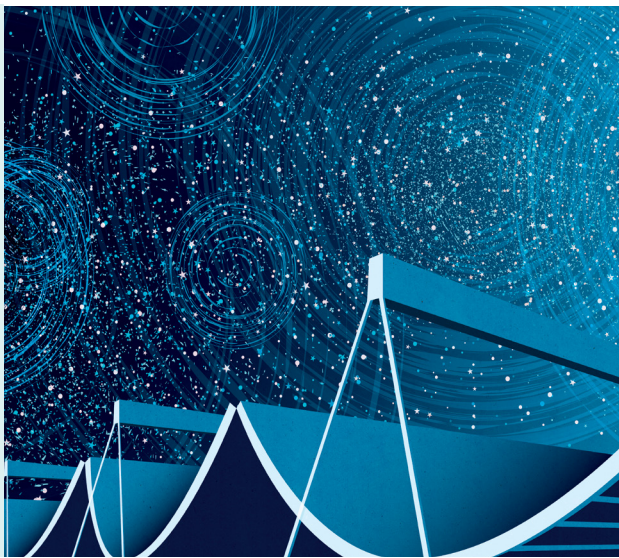**Luis Lehner**
Perimeter Institute
(Starting April 1, 2023)

**FELLOWS
(excl. directors):** 17

**CIFAR AZRIELI
GLOBAL SCHOLARS:** 3

ADVISORS: 6

**ASSOCIATE
FELLOWS:** 11

LEAD SUPPORTER:
R. Howard Webster Foundation

FUNGAL KINGDOM: THREATS & OPPORTUNITIES

THE NEED FOR ANTIFUNGALS

CIFAR Fellow Charles Boone (University of Toronto), Co-Director Leah Cowen (University of Toronto), Fellow Christina Cuomo (Broad Institute), Co-Director Joseph Heitman (Duke University), and Fellow Gerard Wright (McMaster University) identified new molecules that kill fungal pathogens or reduce resistance to existing antifungal treatments by screening diverse chemical libraries, including natural products and derivatives. The next steps in this work are to catalyze the discovery of novel antifungals, targets and resistance mechanisms.

UNLOCKING A VACCINE FOR WHITE NOSE SYNDROME

CIFAR Fellows David Blehert (United States Geological Survey), Bruce S. Klein (University of Wisconsin, Madison) and Don Sheppard (McGill University) made a major discovery related to a pathogenic fungus called Pseudogymnoascus destructans, better known as the White Nose Syndrome. This Syndrome has killed millions of ecologically vital bats across North America, with 90-100% mortality rates at some sites. The research team discovered how the fungus initiates the infection via skin, leading to new prevention strategies, including a new vaccine which is already showing promise. If successful, these studies would have a beneficial impact on ecosystems, biodiversity as well as animal and human health.

"It is easy in academic research to get intensely focused on very specific experimental questions. The extensive engagement provided by CIFAR is a terrific opportunity to step back and consider larger questions and the broader implications of our research."

JAMES KRONSTAD, Power Corporation Fellow, Fungal Kingdom: Threats & Opportunities, University of British Columbia, British Columbia, Canada

FOUNDED: 2019
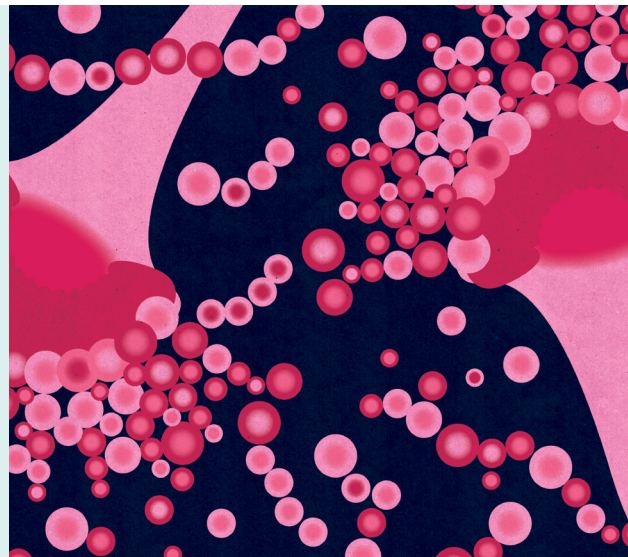
PROGRAM CO-DIRECTORS:

Leah Cowen
University of Toronto

Joseph Heithman
Duke University

**FELLOWS
(excl. directors):** 18

**CIFAR AZRIELI
GLOBAL SCHOLARS:** 3

ADVISORS: 6

**ASSOCIATE
FELLOWS:** 1

HUMANS & THE MICROBIOME

TRACKING PERCEPTION OF THE HUMAN MICROBIOME

Through ethnographic and semi-structured interviews with adults in the United States, CIFAR program Co-Director Melissa Melby (University of Delaware) and Advisor Mark Nichter (University of Arizona) found public perception of the human microbiome centres on gut microbiome only, whereas the microbial populations of the skin, lungs and many other areas are also critically important. These findings will help inform how best to shape information about the microbiome for the public, and identify areas of further research needed.

UNDERSTANDING MILK MICROBIOME VARIATION IN BREASTMILK

Through a CIFAR Catalyst Fund project, Fellows Meghan Azad (University of Manitoba, Children's Hospital Research Institute of Manitoba) and Naama Geva-Zatorsky (Technion - Israel University of Technology) are discovering how indoor and outdoor environmental factors affect the composition of the milk microbiome. The outcomes of this project could have far-reaching implications on the habits and recommended behaviour of families, especially before delivery, and during the first months of infants' lives as mothers' milk affects their infants' gut.

"What participation in [this program] has brought to my research has been invaluable. It makes me ask questions and look for answers in ways that I wouldn't have imagined."

TAMARA GILES-VERNICK, CIFAR Fellow, Humans & the Microbiome, Institut Pasteur, France

FOUNDED: 2014

PROGRAM CO-DIRECTORS:

Brett Finlay
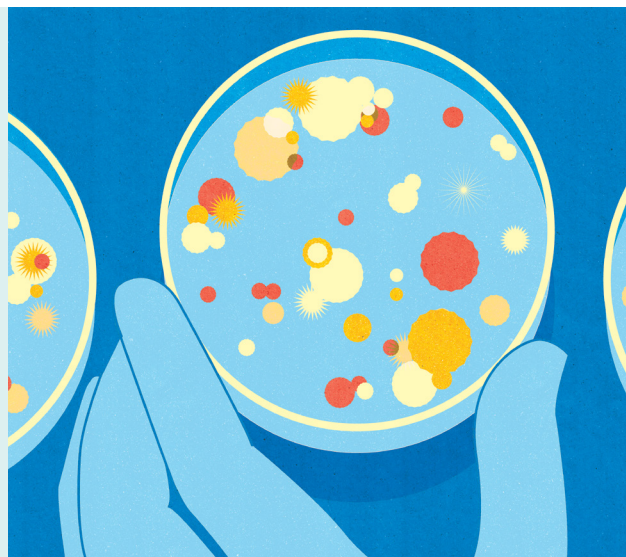University of
British Columbia

Melissa Melby
University of Delaware

**FELLOWS
(excl. directors):** 16

**CIFAR AZRIELI
GLOBAL SCHOLARS:** 3

ADVISORS: 5

**ASSOCIATE
FELLOWS:** 1

INNOVATION, EQUITY & THE FUTURE OF PROSPERITY

SHAPING THE FUTURE OF INNOVATION

Program Co-Director Dan Breznitz (University of Toronto) served as the Clifford Clarke Economist of the Government of Canada and advised on a number of files, among them the creation of the Canada Innovation Corporation, announced and funded in Budget 2022. This is the first effort to create an independent experimental learning public agency at the federal level.

NEW FINDINGS ON INNOVATION AND EMPLOYMENT

CIFAR Fellow Keun Lee (Seoul National University) uncovered how innovation affects employment by using South Korean data to untangle the effects of process versus product innovation on employment and wages. Through this work, Lee demonstrated that on the sectoral level, product innovation has positive employment effects while process innovation is virtually neutral — these findings will have major implications for the future of work.

"The long-term collaboration with a core set of researchers in other disciplines and institutions provides a unique environment in which to learn, gradually and iteratively, from the perspectives of others. It is an extremely unusual and precious forum."

YOCHAI BENKLER, CIFAR Fellow, Innovation, Equity & the Future of Prosperity, Harvard University, United States

FOUNDED: 2019

PROGRAM CO-DIRECTORS:

Dan Breznitz
University of Toronto

Jane Gingrich
University of Oxford

Amos Zehavi
Tel Aviv University
(Associate Director)

**FELLOWS
(excl. directors):** 11

**CIFAR AZRIELI
GLOBAL SCHOLARS:** 4

ADVISORS: 5

LEAD SUPPORTERS:
Alfred P. Sloan Foundation, Max Bell Foundation, Scotiabank

LEARNING IN MACHINES & BRAINS

USING AI TO LEARN ABOUT THE BRAIN

CIFAR Fellow and Canada CIFAR AI Chair Blake Richards (McGill University, Mila) and Associate Fellow Joel Zylberberg (York University) led a workshop with experts from academia, industry and non-profit institutions to discuss the scale, scope, use cases, organizational structures and funding required to build neuro-foundation models, applying recent advances in AI to better understand the brain. These big-scale machine learning models, pre-trained on large quantities of data, can be adapted to new tasks with relatively small amounts of new training data and computational power, and could potentially serve both the neuroscience and neurotechnology communities, while also benefiting machine-learning research.

BRIDGING THE GAP BETWEEN MACHINE LEARNING AND HUMAN INTELLIGENCE

Program Co-Director Yoshua Bengio's (IVADO, Canada CIFAR AI Chair at Mila, Université de Montréal) research group is developing new theories to bridge the gap between current machine-learning techniques and human intelligence. By studying the kind of inductive biases that humans and animals exploit, CIFAR researchers are clarifying the principles that are hypothesized to guide human and animal intelligence, and which could provide inspiration for both AI research and neuroscience. Work continues to develop AI systems that can exhibit flexible out-of-distribution learning and systematic generalization, areas where contemporary machine learning approaches still lag human cognitive abilities.

> "CIFAR is unique in that it brings together outstanding and inspiring colleagues from all over the world, providing an open forum for the exchange of ideas. I like that it is uniquely driven by scientific quality and openness."
>
> **BERNHARD SCHÖLKOPF**, CIFAR Fellow, Learning in Machines & Brains, ETH Zurich, Max Planck Institute for Intelligent Systems, Germany

FOUNDED: 2004

PROGRAM CO-DIRECTORS:

Yoshua Bengio
Université de Montréal

Konrad Körding
University of Pennsylvania
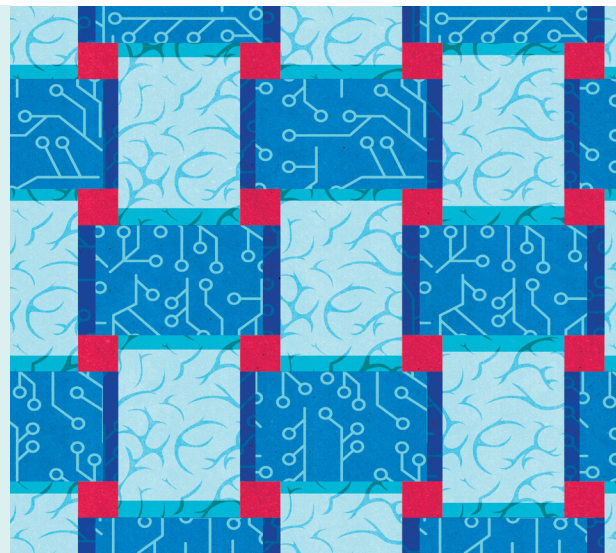
**FELLOWS
(excl. directors):** 14

**CIFAR AZRIELI
GLOBAL SCHOLARS:** 3

ADVISORS: 6

**ASSOCIATE
FELLOWS:** 10

PARTNER:
Inria

LEAD SUPPORTERS:
Alfred P. Sloan Foundation, RBC Foundation

QUANTUM INFORMATION SCIENCE

MITIGATING ERRORS IN THE MOST COMMON QUANTUM COMPUTING ARCHITECTURE

Circuit quantum electrodynamics (QED) architecture is the most widely studied approach to building quantum computers in both academic and industry settings, but it could often produce inaccurate results when its qubits (the units of information that quantum computers operate on) are measured. A team led by CIFAR Fellow Alexandre Blais (Université de Sherbrooke) and Associate Fellow Guifre Vidal (Google) employed Google's powerful tensor processing units (TPUs) to discover the potential cause of measurement-induced errors in circuit QED, and develop a mitigation strategy to prevent some of the issues. These results potentially resolve the architecture's almost 20-year old measurement problems, taking a major step towards building more successful, fault-tolerant quantum computers.

HARNESSING THE POWER OF SILICON

Silicon, the basis of today's global semiconductor industry through which silicon-based devices could be inexpensively produced at scale, has a number of properties that make it a promising candidate platform for quantum computers and a future quantum internet. CIFAR Fellow Stephanie Simmons' (Simon Fraser University) team created silicon chips with more than 100,000 individual "T centres"— defects in the silicon that can act as long-lived qubits and can also emit light to enable communication with each other. The research team also optically measured, for the first time, the properties of a single spin qubit in silicon. These results pave the way to creating silicon-based quantum communication networks.

> "Thanks to CIFAR, I initiated a research project with an industry researcher. This collaboration led to solving a long-standing mystery of the field and may help towards building useful quantum computers."
>
> **ALEXANDRE BLAIS**, CIFAR Fellow, Quantum Information Science, Université de Sherbrooke, Québec, Canada
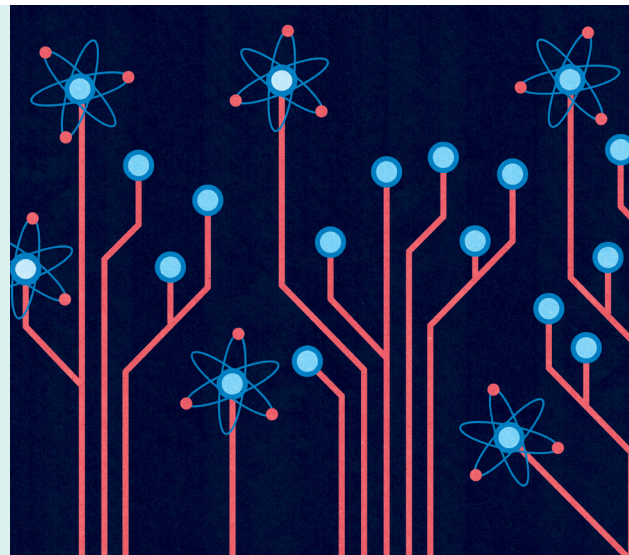
FOUNDED: 2002

PROGRAM DIRECTOR:

Aephraim Steinberg
University of Toronto

FELLOWS (excl. directors): 11	**CIFAR AZRIELI GLOBAL SCHOLARS:** 3
ADVISORS: 5	**ASSOCIATE FELLOWS:** 4

QUANTUM MATERIALS

SHEDDING LIGHT ON THE 'DARK PHASE' OF SUPERCONDUCTORS

CIFAR researchers are helping uncover more insights about the pseudogap phase: a mysterious "dark phase" of cuprate superconductors, the most promising class of "high temperature" superconductors that could form the basis for important new technologies. CIFAR Azrieli Global Scholar Brad Ramshaw (Cornell University) and Program Co-Director Louis Taillefer (Université de Sherbrooke) showed that transitions in cuprate superconductors from the metallic phase to the pseudogap phase are transformations of their Fermi surface — essentially the "fingerprints" of the materials' electronic properties — indicating a fundamental change in the materials. Fellow Subir Sachdev (Harvard University) then proposed a theory to explain this change in terms of a new phase of matter.

ADVANCES IN SUPERCONDUCTIVITY

CIFAR Fellows Liang Fu (Massachusetts Institute of Technology) and Pablo Jarillo-Herrero (Massachusetts Institute of Technology) demonstrated that superconductivity is achievable in trilayer twisted graphene quasicrystals — materials that lack true periodicity, normally considered a foundational building block of superconductivity theory. This is a paradigm-shifting discovery that will challenge how scientists understand and create superconducting materials. Meanwhile, Fellows Vidya Madhavan (University of Illinois Urbana-Champaign) and Johnpierre Paglione (University of Maryland) are growing unique crystalline films of the material UTe2, and characterizing them with a technique called scanning tunnelling microscopy. This material may support so-called triplet superconductivity, which is a fascinating new ground for exploring the behaviour of interacting electrons and discovering new materials with potential uses in quantum technologies.

"**What I like most about CIFAR is its unique ability to generate and foster an atmosphere of openness and trust amongst researchers from around the planet, which leads to the long-term collaborations that are crucial for the progress of discovery in research areas where different complementary types of expertise are essential.**"

LOUIS TAILLEFER, CIFAR Co-Director, Quantum Materials,
Université de Sherbrooke, Québec, Canada

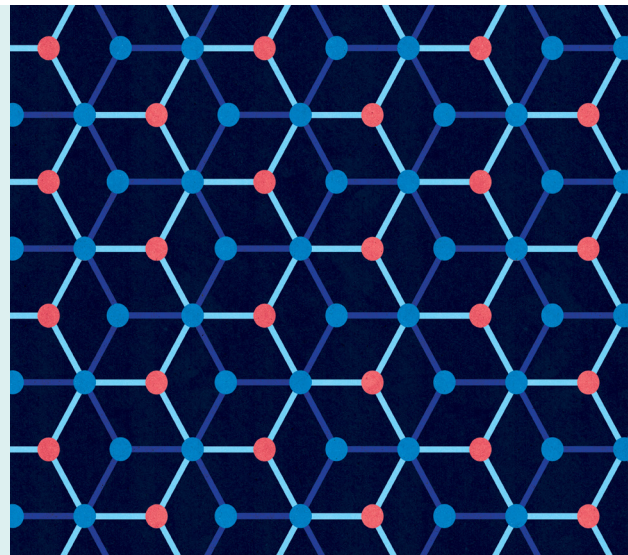**FOUNDED:** 1987

PROGRAM CO-DIRECTORS:

Leon Balents
University of California,
Santa Barbara

Louis Taillefer
Université de Sherbrooke

**FELLOWS
(excl. directors):** 15

**CIFAR AZRIELI
GLOBAL SCHOLARS:** 3

ADVISORS: 5

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THE FRASER MUSTARD LEGACY SOCIETY

CIFAR thanks the following donors for sharing their intention to leave a Legacy gift in their Will.

Elizabeth Gerrits

Richard Ivey

Lawrence Tanenbaum

GOVERNMENT

CIFAR is grateful for commitments and investments made between April 1, 2022 and March 31, 2023.

CANADA

$25,000,000 AND ABOVE	GOVERNMENT OF CANADA	Innovation, Science and Economic Development Canada
		The International Development Research Centre
$500,000 - $1,000,000	GOUVERNEMENT DU QUÉBEC	Fonds de recherche du Québec – Nature et technologies
		Fonds de recherche du Québec – Santé
		Fonds de recherche du Québec – Société et culture

INTERNATIONAL

	GOVERNMENT OF FRANCE	Centre national de la recherche scientifique

FINANCIAL OVERVIEW

REVENUE 2023

- **Federal: Pan-Canadian AI Strategy** (53%)
- **Provincial** (1%)
- **Federal: Operational** (21%)
- **Partnerships** (1%)
- **Foundations** (13%)
- **Individuals** (3%)
- **Investment income** (5%)
- **Corporations** (3%)

EXPENSES 2023

- **Pan-Canadian AI Strategy** (55%)
- **Knowledge Creation** (25%)
- **Knowledge Mobilization & Communications** (4%)
- **Advancement** (5%)
- **Next Generation** (7%)
- **Governance & Administration** (2%)
- **Public Sector** (2%)
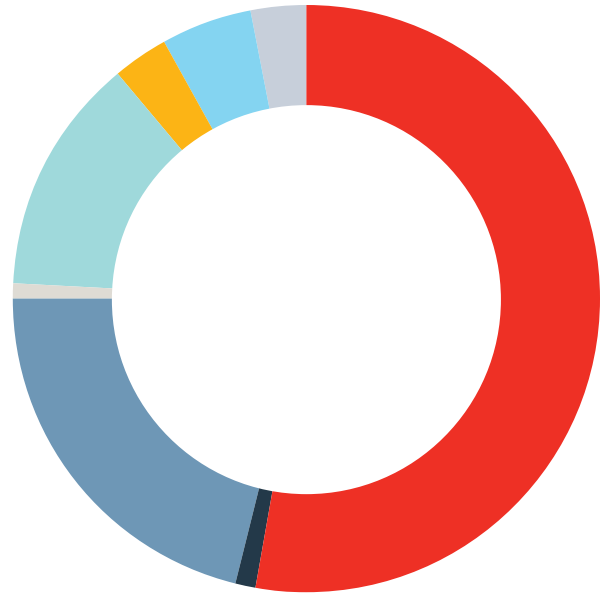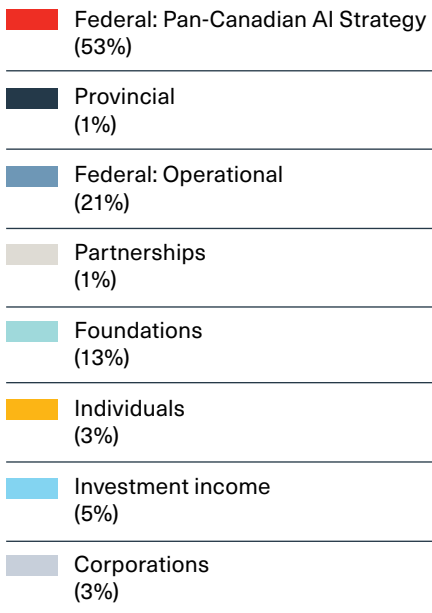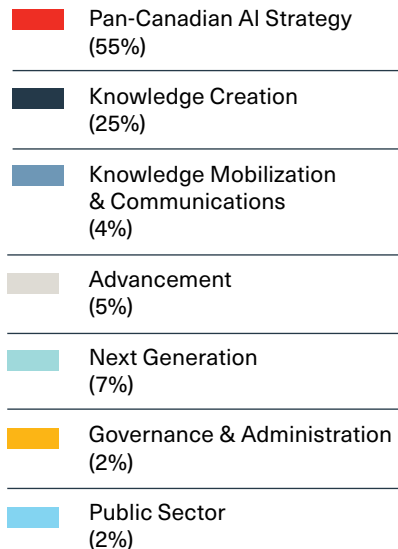
STATEMENT OF FINANCIAL POSITION

(In thousands of dollars) March 31, 2023, with comparative information for 2022

	2023	2022
ASSETS		
Current assets:		
Cash	$ 13,303	$ 21,998
Accounts receivable	1,438	621
Prepaid expenses	612	328
	15,353	22,947
Investments	26,119	26,020
Property, equipment and leasehold improvements	769	952
Intangible assets	137	254
	$ 42,378	$ 50,173
LIABILITIES AND NET ASSETS		
Current liabilities:		
Accounts payable and accrued liabilities	$ 16,546	$ 14,109
Deferred revenue	3,134	10,423
Deferred tenant allowance	40	40
	19,720	24,572
Deferred revenue	799	1,515
Deferred tenant allowance	130	170
	20,649	26,257
Net assets:		
Invested in property, equipment, leasehold improvements and intangible assets	736	996
Externally restricted endowment fund	500	500
Internally restricted reserve	11,000	11,000
Unrestricted	9,493	11,420
	21,729	23,916
Economic dependence		
Commitments		
	$ 42,378	$ 50,173

STATEMENT OF OPERATIONS

(In thousands of dollars) March 31, 2023, with comparative information for 2022

	2023	2022
REVENUE:		
Program contributions:		
Government funding:		
Federal:		
Operational funding	$ 10,800	$ 8,650
Pan-Canadian AI Strategy	27,523	20,654
Provincial	742	1,158
	39,065	30,462
Partnerships:		
Research organizations	296	185
Universities and others	200	550
	496	735
Private sector:		
Corporations	1,726	1,970
Foundations	6,841	5,110
Individuals	1,543	1,295
	10,110	8,375
Investment income	2,166	3,655
	51,837	43,227
EXPENSES:		
Program expenses:		
Knowledge creation	13,012	10,040
Pan-Canadian AI Strategy	28,573	22,220
Communications	1,770	3,265
Next generation	3,754	2,348
	47,109	37,873
Non-program expenses	5,016	3,190
	52,125	41,063
Excess (deficiency) of revenue over expenses	(288)	2,164
Unrealized loss on investments	(1,899)	(2,032)
Excess (deficiency) of revenue over expenses	$ (2,187)	$ 132

To learn more about CIFAR's
visionary leadership, visit
cifar.ca/leadership

CIFAR

CIFAR is a global research organization that convenes extraordinary minds to address the most important questions facing science and humanity. We are supported by the governments of Canada and Québec, as well as foundations, individuals, corporations, and Canadian and international partner organizations.