



2025 ANNUAL REPORT



Trotter
Space Institute
at McGill

Institut spatial
Trotter
de McGill

TABLE OF CONTENTS

About TSI 2

Welcome2

About TSI3

Research Areas4

Research Highlights..... 6

Front-Row Seat to a Volcanic
Eruption at the Bottom of the
Ocean7

A Telescope Built for the First
Stars Is Also Mapping Arctic
Permafrost8

JWST Watches Giant Planets
Lose Their Atmospheres9

Pinpointing the Brightest Cosmic
Radio Flash Ever Recorded10

Quintessential Dark Energy
Crossing the “Phantom” Divide11

Beyond the “Plunger”: A Radiative
Link Between the Stratospheric
Polar Vortex and Arctic Surface
Climate12

Why Some Heatwaves Feel
Humid and Others Feel Bone-Dry..13

A First Look at the Galactic
Centre with JWST.....14

Education & Engagement..... 15

Public Talks17

Astronomy on Tap18

Observing Nights19

Observing for the Youth20

Science in Space21

Science Festivals.....22

Summer Camps &

School Visits.....24

McGill Physics Hackathon25

Developing New Outreach

Modules26

Social Media27

TSI in the Media28

Inreach..... 31

Seminars32

Journal Clubs34

TSI Lunch Talks.....35

Summer Undergrad Program36

Equity, Diversity, Inclusion38

Research Computing39

People40

Awards.....40

TSI Directory.....41

Summer Undergrad Awards42

TSI Fellowships.....43

TSI Governance46

Impact..... 47

Facilities47

Collaborations.....49

Publications50

DIRECTOR'S WELCOME

It is my pleasure to welcome you to the Trottier Space Institute's Annual Report, and to share with you the remarkable progress our community has made over the past year.

The Trottier Space Institute at McGill University stands at a singular intersection: where fundamental curiosity about the cosmos meets the rigorous, collaborative science needed to answer it. As an interdisciplinary research institute, we bring together researchers from multiple university spheres to pursue world-class research across the full spectrum of modern space science — from observational and theoretical astrophysics to the design and development of the next generation of scientific instrumentation. It is this breadth, combined with the depth of expertise our faculty and researchers bring to every question, that makes TSI a distinctive and vital presence in the Canadian and indeed global scientific community.



At the heart of our mission is people. Training the next generation of scientists is not a secondary ambition — it is central to everything we do. Our graduate students and postdoctoral researchers are not merely learners; they are active contributors to discoveries that matter. They present at international conferences, lead observational campaigns, develop thought-changing theories and game-changing instruments, publishing research that shapes the direction of the field. Beyond the walls of our institute, our public outreach programs ensure that the excitement of space science reaches citizens of all ages and backgrounds, fostering a broader culture of scientific literacy and wonder.

This year, I am especially proud to share a milestone that speaks to the confidence our partners and community place in TSI's future. Construction has begun on a new five-story building that will rise in the footprint directly behind our beloved home at 3550 University, nestled alongside the storied Rutherford Physics building. Made possible through the extraordinary generosity of the Trottier Family Foundation and through additional funds from the Province of Québec, this new facility will dramatically expand our capacity to pursue ambitious research programs, host collaborators, and provide our students and researchers with the infrastructure they deserve. It is a tangible expression of a shared belief: that investing in fundamental science is investing in humanity's future.

To our university partners, donors, government supporters, and colleagues at peer institutions — thank you. Your trust and collaboration make this work possible. We hope this report conveys not only what we have accomplished, but the excitement of what lies ahead.

ABOUT TSI

The Trottier Space Institute at McGill (TSI) is an interdisciplinary research centre that brings together researchers engaged in astrophysics, planetary science, atmospheric science, astrobiology and other space-related research at McGill University. We have a vibrant and interactive community of over 120 researchers at all levels, including faculty members, postdoctoral researchers, graduate students, and undergraduate students. TSI was established in 2015 thanks to a generous gift from the Trottier Family Foundation.

The main goals of the Institute are to:

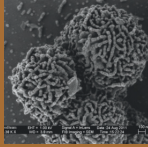
- provide an intellectual home for faculty, research staff, and students engaged in astrophysics, planetary science, and other space-related research at McGill;
- support the development of technology and instrumentation for space-related research;
- foster cross-fertilization and interdisciplinary interactions and collaborations among Institute members in Institute-relevant research areas;
- share with students, educators, and the public an understanding of and an appreciation for the goals, techniques and results of the Institute's research.

The intellectual hub of the Institute is at 3550 University, where many of the Institute members work, collaborate with visitors, and Institute events are held.



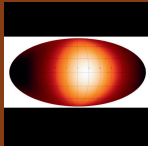
TSI RESEARCH AREAS

Astrobiology & Extraterrestrial Biosignatures • *Nicolas Cowan, Nagissa Mahmoudi, Lyle Whyte*



The Astrobiology and Extraterrestrial Biosignatures group examines microbial biodiversity and ecology in unique ecosystems like the Canadian High Arctic and the Antarctic dry valleys, studying microbial communities using classical microbiology and novel genomics-based molecular techniques. Understanding what types of microorganisms survive in these types of soils and detecting biosignatures provides insight into what to look for in near surface water ice on Mars or other cold, rocky places in the solar system. Members of the group also use cutting-edge telescopes to establish the habitability of nearby temperate terrestrial exoplanets and to search their atmospheres for signs of life.

Climates and Atmospheres of Exoplanets • *Nicolas Cowan, Andrew Cumming, Yi Huang*



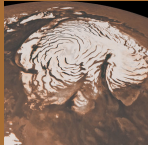
The extrasolar planet climate and atmosphere group characterizes exoplanets using observational evidence and climate modelling. Observational evidence for exoplanetary atmospheres comes from a variety of sources, including changes in brightness of the planet over time, spectroscopy, and upcoming next-generation direct-imaging experiments. Members also use computer models to expose the physical mechanisms of planet atmospheres by expanding climate models beyond the conditions found on Earth, to simulate the wide range of possibilities of atmospheres on exoplanets. Much of this work is carried out as part of the Institute for Research on Exoplanets (iREx).

Formation and Evolution of Stars and Planets • *Andrew Cumming*



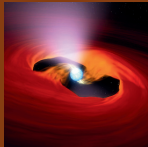
The quantity and diversity of known exoplanets provides an opportunity to learn about planetary formation, evolution, and the physical processes that operate in their atmosphere and interiors. The challenge is to connect observed properties of planets with theories of their formation, structure, and evolution. The group uses theoretical tools to identify the key physical processes behind the observed diversity of planetary systems, from super-Earths to gas giants. They study the earliest evolution of star-forming environments, protoplanetary disk evolution, disk-star-planet interaction, formation of planetary atmospheres, and dynamical interactions within planetary systems.

Planetary Surfaces • *Natalya Gomez*



Members of the planetary surface group, led by Natalya Gomez, research models of the interactions between ice, water, climate and planetary interiors, and how these connections change planets' surfaces through time. These models are applicable to both the Earth and other rocky, icy planets and moons in the Solar System.

Nuclear Astrophysics • *Andrew Cumming*



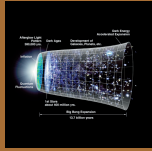
Nuclear astrophysics is the study of the origin of the chemical elements in stars and supernovae, explosive events such as supernovae, classical novae, and X-ray bursts, and the properties of matter at high densities as found in the interiors of neutron stars. We focus on developing connections between nuclear properties and astrophysical observations through the study of neutron stars, in particular by modelling the transient behaviour of accreting neutron stars on timescales of seconds to years. McGill is an Associate Member of the Joint Institute for Nuclear Astrophysics - Centre for Evolution of the Elements (JINA/CEE).

Experimental Particle Astrophysics • *David Hanna, Ken Ragan*



The Gamma Ray Astrophysics group is part of the VERITAS collaboration, which operates an array of four 12-m imaging atmospheric Cherenkov telescopes in southern Arizona. They carry out a program of very-high-energy (VHE) gamma-ray astronomy, observing photons with energy in the range from 50 GeV to 50 TeV. Sources of such photons are among the most violent and exotic in the Universe and include supernova remnants and pulsar wind nebulae in our galaxy, as well as blazar-class active galactic nuclei (AGNs) at cosmological distances. They also develop instrumentation for the VERITAS detector including calibration and characterization devices.

Early Universe and Theoretical Cosmology • *Robert Brandenberger, Jim Cline, Katelin Schutz*



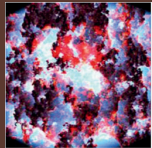
The theoretical cosmology group works to explain the history of the very early Universe and to provide an explanation of the large scale structure in the Universe. They create models using input from new fundamental physics such as superstring theory, dark matter particle theories, and particle physics beyond the standard model. They also explore ways to test these new models with cutting-edge observations of the cosmic microwave background, large-scale structure, the neutral hydrogen 21-cm line, cosmic rays, and data from the Large Hadron Collider.

Experimental and Observational Cosmology • *Cynthia Chiang, Matt Dobbs, Adrian Liu, Jonathan Sievers*



The McGill Experimental Cosmology group designs and builds new instrumentation for observational cosmology and develops analysis techniques for upcoming large cosmological surveys, including surveys of the cosmic microwave background and the 21 cm line of neutral hydrogen. They deploy and operate instruments wherever the observing conditions are best — from the geographic South Pole to the top of the stratosphere to the South African desert, as well as analyze and interpret the data from these experiments to gain a better understanding of the origin, fate, and fundamental constituents of the Universe.

Low Frequency Cosmology • *Cynthia Chiang, Adrian Liu, Jonathan Sievers*



The low-frequency radio sky represents a new frontier in observational astrophysics and cosmology. This regime is a largely unobserved band of the electromagnetic spectrum, and holds the promise of revealing new astrophysical phenomenology. Our 21cm cosmology telescopes (ALBATROS, HERA, MIST, PRIZM) targeting this band have the potential to provide the first observations of a poorly understood portion of the cosmic timeline: Cosmic Dawn, when the first stars and galaxies lit up our Universe, and the Epoch of Reionization, when they dramatically transformed our Universe by ionizing almost all the hydrogen in the intergalactic medium.

Compact Objects • *Andrew Cumming, Daryl Haggard, Jason Hessels, Vicky Kaspi*



The compact object group studies white dwarfs, pulsars and other highly magnetized neutron stars, and stellar-mass black holes. The observational pulsar group's work includes searches for radio pulsars, pulsar timing, and X-ray observations of energetic pulsars and magnetars. The multi-messenger group identifies and characterizes kilonova and other electromagnetic counterparts to gravitational wave sources. The theory group studies neutron stars' structure and how to use observations to constrain the physical processes operating in their interiors. They also investigate the origin and evolution of neutron stars' spin and magnetism and the properties of neutron stars in close binary systems.

Galaxy Evolution, Active Galactic Nuclei • *Daryl Haggard, Tracy Webb*



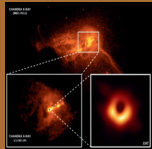
The galaxy evolution group is interested in understanding when galaxies form the bulk of their stellar mass; what drives and later shuts down this process; how the local environment of galaxies affect their evolution and growth; and how growing supermassive black holes (AGN) interact with their host galaxies and within galaxy clusters. We also study our own supermassive black hole, SgrA*, and its interactions with the Milky Way galaxy.

Radio Transients • *Matt Dobbs, Jason Hessels, Vicky Kaspi, Jonathan Sievers*



The radio transients group studies short-duration flashes of radio waves from new and unexpected astrophysical phenomena. Their most active area of research is in Fast Radio Bursts (FRBs), mysterious, powerful, millisecond-long flashes of radio waves that originate outside of the Milky Way galaxy. To study these phenomena, the group uses several world-class radio observatories, particularly the CHIME telescope located in Penticton, British Columbia.

Supermassive Black Holes • *Daryl Haggard, Tracy Webb*



Our studies of supermassive black holes span from their large scale environments to photons circling at the edge of the event horizon. The supermassive black hole group is a part of the Event Horizon Telescope Collaboration and the LISA Consortium, along with several international teams that coordinate multi-wavelength (and soon multi-messenger) programs to characterize these systems and probe fundamental questions including: is general relativity valid in the strong-gravity regime? How are jets launched? What physics governs accretion flows near the event horizon?

02

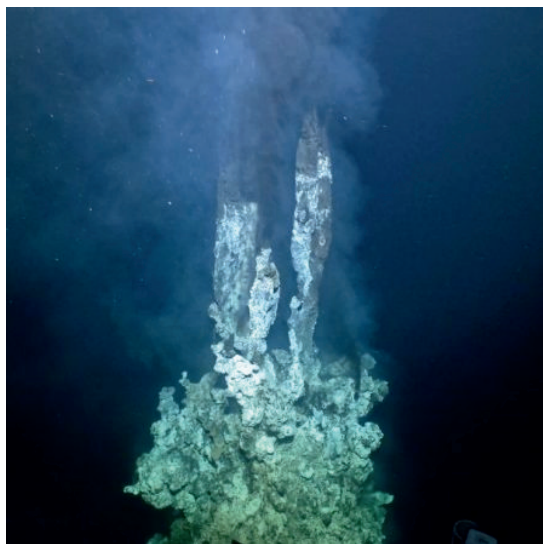
RESEARCH HIGHLIGHTS

- **Front-Row Seat to a Volcanic Eruption at the Bottom of the Ocean**
- **A Telescope Built for the First Stars Is Also Mapping Arctic Permafrost**
- **JWST Watches Giant Planets Lose Their Atmospheres**
- **Pinpointing the Brightest Cosmic Radio Flash Ever Recorded**
- **Quintessential Dark Energy Crossing the “Phantom” Divide**
- **Beyond the “Plunger”: A Radiative Link Between the Stratospheric Polar Vortex and Arctic Surface Climate**
- **Why Some Heatwaves Feel Humid and Others Feel Bone-Dry**
- **A First Look at the Galactic Centre with the James Webb Space Telescope**

Front-Row Seat to a Volcanic Eruption at the Bottom of the Ocean

Key contributors: Sam McNichol is a PhD candidate in Professor Nagissa Mahmoudi's lab in McGill's Department of Earth & Planetary Sciences, where he studies marine microbial ecology; his fascination with the sea traces back to his two oceanographer parents.

When Sam McNichol boarded the research vessel Atlantis on Costa Rica's Pacific coast, he expected to spend a month collecting deep-sea samples for his PhD work in the Mahmoudi Lab. On April 3, the ship, led by University of Delaware oceanographer Andrew Wozniak and carrying a crew from McGill, Delaware, Rensselaer Polytechnic Institute, and Middle East Technical University, sailed roughly 2,100 kilometres west of Costa Rica to a site along the East Pacific Rise — a mid-ocean mountain chain where tectonic plates pull apart and new oceanic crust is continuously formed by volcanic activity. As seawater circulates through this young, hot crust, it emerges from hydrothermal vents laden with dissolved minerals and complex carbon compounds; the team's goal was to characterize those compounds to better understand the dynamics of the ocean, Earth's largest carbon reservoir.



A hydrothermal vent rising from the sea floor and releasing minerals into the ocean.

During the expedition's final days, Wozniak and a student piloting the submersible Alvin surfaced with more than routine footage: they had become the first scientists to witness — and photograph magma droplets from — an active eruption at this specific site on the mid-ocean ridge. The crew convened an emergency research meeting and voted to stay three extra days at sea, launching what McNichol called “a flurry of analysis” to capture the immediate chemical and biological aftermath of seafloor creation, one of the most fundamental yet least-observed processes in the ocean.

McNichol is now sequencing genomic samples collected above the vents to identify which microorganisms populated the site before the eruption — and, uniquely, has the matching post-eruption samples needed to track how that community is rebuilt from scratch. “Oceanography is a very collaborative field,” McNichol noted: the ocean sits at the intersection of physics, chemistry, biology, and geology, so answering any one question about it requires specialists in all four.

Why this matters?

Hydrothermal systems drive chemical exchange between Earth's crust and its largest carbon reservoir, the ocean. A rare before-and-after microbial dataset, bracketing an eruption at a single site, offers a uniquely direct test of how life colonizes freshly formed seafloor.

A Telescope Built for the First Stars is Also Mapping Arctic Permafrost

Key contributors: *Ian Hendricksen is a PhD student in the McGill Radio Lab (under the supervision of Prof. Cynthia Chiang) working at the intersection of radio cosmology and cryospheric science, applying geophysical techniques to calibrate antennas built to study some of the oldest light in the universe.*

In astronomy, it goes without saying that our telescopes should normally be pointing... well, up! However, the McGill Radio Lab has been using radio telescopes to look down in order to simultaneously probe the surface properties of the Earth.

Our team develops exciting new instrumentation and techniques at the crossroads of radio cosmology and geophysics. The Mapper of the IGM Spin Temperature (MIST) collects measurements of the low-frequency radio sky from the McGill Arctic Research Station (MARS) on Umingmat Nunaat (Axel Heiberg Island). MIST is hunting for a faint imprint on the radio sky at wavelengths spanning several metres, carrying buried secrets about the very first stars and galaxies to light up our Universe. It uses a relatively simple antenna which is sensitive to radio waves from a wide field of view on the sky. Measuring our antenna's sensitivity to a high degree of accuracy is crucial to extract the cosmological signal from our data. However, our antennas can also receive radio waves that bounce off the ground, or even different sub-surface layers! Thus, the antenna's sensitivity changes whether it is situated above snow, ice, or different soils, as well as the number of surface layers and their thicknesses. We therefore need to precisely assess the characteristics of the surface beneath to study the first luminous objects in our universe.

Why this matters?

Low-frequency, single-antenna radio cosmology experiments require exquisite knowledge of the antenna's spatial sensitivity, which is impacted by the surface properties beneath the antenna. Our method for studying the surface properties for cosmology can also be used as a potential tool to advance research in permafrost and other cryospheric sciences.



Ian Hendricksen at the McGill Arctic Research Station, 79°N in Nunavut. Credit: Aman Choksh.

In a recent paper, we used a special calibration device to periodically emit radio waves and measure the signals reflected off surface and sub-surface soil layers at a site near MARS. Using electromagnetic simulations to model these reflected signals, we determined the physical and electrical properties of the ground that best explained our data. Our results matched expectations from the site's geophysical soil layers—a thin layer of thawed, damp soil atop a deeper layer of permafrost. Further, we demonstrated that the thawed layer grew in size over our observation period, in agreement with expectations of thawing tundra soils during the summer.

Given the continuous and non-invasive nature of our technique, it could enable long-term monitoring of permafrost from a variety of different locations, offering a new tool to study its effects on the local environment, northern infrastructure, and relationship to climate change.

Citation: *Hendricksen, I. et al. (2026). Estimating Soil Electrical Parameters in the Canadian High Arctic From Impedance Measurements of the MIST Antenna Above the Surface. Geophysical Research Letters, 53(2), e2025GL116618.*

JWST Watches Giant Planets Lose Their Atmospheres

Key contributors: Vigneshwaran Krishnamurthy is a postdoctoral researcher at TSI and the Trottier Institute for Research on Exoplanets (iREx), working in close collaboration with TSI Profs. Nicolas Cowan and René Doyon, as well as several other TSI trainees; Romain Allart is a close iREx collaborator.

Two studies, led by researchers at McGill and Université de Montréal, used JWST's Canadian-built Near Infrared Imager and Slitless Spectrograph (NIRISS) to capture the clearest views yet of exoplanets shedding their atmospheres into space. Both targets orbit dangerously close to their stars, where intense radiation heats their outer atmospheres to thousands of degrees and drives gas escape.

The team led by Vigneshwaran Krishnamurthy observed a giant cloud of helium escaping from WASP-107b, a low-density “super-puff” planet, nearly 1.5 hours before it moved in front of its star. This was the first time JWST detected such strong “pre-transit” helium absorption, providing one of the clearest examples yet of atmospheric escape in action. The observations also confirmed water vapor in the atmosphere and revealed evidence of strong atmospheric mixing deep within the planet.



Artist's concept of WASP-121b and its two escaping helium tails.

Why this matters?

These are the most statistically confident and extensive atmospheric-escape observations yet obtained for any exoplanet, enabled by Canada's NIRISS instrument. They let astronomers watch, in real time, the process reshaping close-in planets over their lifetimes, opening a new window into their life cycles across the galaxy.

The team led by Romain Allart observed WASP-121b, an “ultra-hot Jupiter,” with JWST for nearly 37 continuous hours, revealing helium escaping the planet via two enormous tails: one trailing the planet like a comet, the other curving ahead of it, likely shaped by the host star's gravity. Together the structures span more than 100 times the planet's diameter — the longest, most detailed atmospheric-escape event ever recorded for an exoplanet.

Both worlds likely formed farther from their stars before migrating inward, where sustained heating gradually strips their envelopes; over billions of years, this process can reshape a giant planet or strip it down to a bare rocky core.

Citations: Krishnamurthy, V. et al. (2026). Continuous helium absorption from the leading and trailing tails of WASP-107b. *Nature Astronomy*, 10, 258. — Allart, R. et al. (2025). A Complex Structure of Escaping Helium Spanning More Than Half the Orbit of the Ultra-Hot Jupiter WASP-121b. *Nature Communications*, 16, 10822.

Pinpointing the Brightest Cosmic Radio Flash Ever Recorded

Key contributors: The discovery was led by Amanda Cook, a Banting Postdoctoral Fellow at TSI and McGill Physics, within the roughly 100-member CHIME/FRB Collaboration co-led by TSI Professor Victoria Kaspi.

Since their discovery in 2007, fast radio bursts (FRBs) have been one of astrophysics' most intriguing puzzles. These millisecond-long flashes of radio waves originate far beyond our Galaxy and release enormous amounts of energy. While some FRBs have been observed to repeat, suggesting they cannot all arise from cataclysmic events, most have been seen only once, and their physical origin remains unknown.

For the past eight years, the CHIME radio telescope in British Columbia has been casting a broad net to discover thousands of these once-rare astrophysical events, hence transforming the field. Despite the step forward, a key challenge remained the localization of FRBs. To understand their source, astronomers must additionally routinely identify their host galaxies. To meet this challenge, the CHIME/FRB collaboration, including many TSI faculty, postdoctoral researchers, and students developed a network of Outrigger telescopes spanning North America. Together, these instruments can localize FRBs with extraordinary precision, down to tens of milliarcseconds: like spotting a quarter from 100 kilometres away!

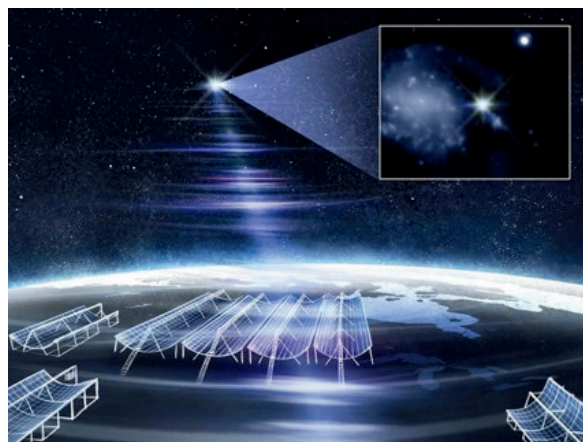
The resulting power of this array was demonstrated for the first time with FRB 20250316A, nicknamed "RBFLOAT" (Radio Brightest FLash Of All Time), the highest signal-to-noise FRB ever detected by CHIME/FRB.

Why this matters?

Resolving exactly where and in what kind of environment FRBs occur is the key to identifying what produces them. RBFLOAT's precise localization and apparent lack of repetition reopens the case for cataclysmic (one-time) progenitor models.

At RBFLOAT's exceptionally nearby distance of only 130 million light-years, the precision offered by the full CHIME/FRB Outrigger array allowed us to determine not only the host galaxy, but the exact stellar neighbourhood from which the FRB originated. The burst was traced to a region only 45 light-years across. This level of localization precision is well matched by flagship NASA observatories, and follow-up JWST observations led by collaborators at Harvard revealed a mysterious infrared source at the burst location.

RBFLOAT is particularly intriguing because no repeat bursts have been detected from the source despite nearly six years of observations. The extreme brightness of the source and apparent lack of repetition may be the best evidence for a distinct population of truly non-repeating FRBs, challenging prevailing ideas about the origins of these enigmatic signals. At the same time, its young, actively star-forming environment appears broadly like those of previously localized repeating FRBs.

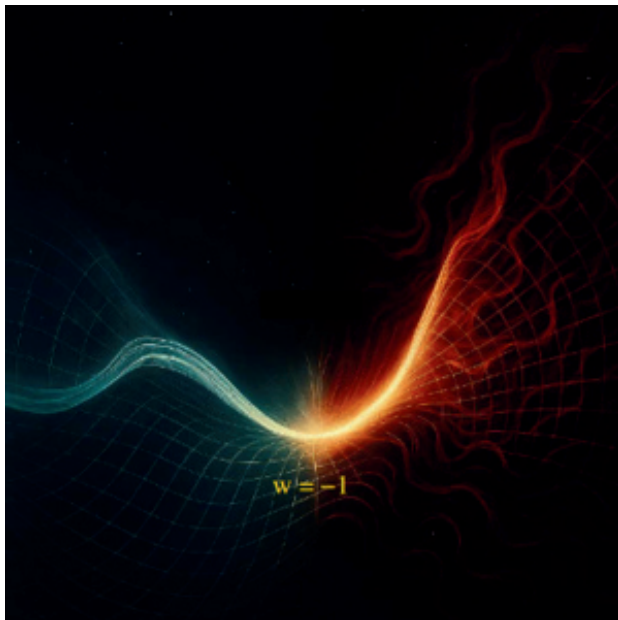


Artist's rendition of the CHIME radio telescope and its 'outriggers' localizing FRB 20250316A. Inset: The host galaxy (NGC 4141) as imaged by the MMT Observatory (PI: Yuxin (Vic) Dong), illustrating the origin. (Image: Daniëlle Futselaar/MMT Observatory)

Quintessential Dark Energy Crossing the “Phantom” Divide

Key contributors: This analysis was carried out by TSI students Rich Chen (undergraduate), Varun Muralidharan (graduate), and Benjamin Salewicz (undergraduate), under the supervision of Prof. Jim Cline. They work as part of the theoretical cosmology group at TSI, which develops and stress-tests models of dark energy and dark matter against results from galaxy-redshift surveys such as DESI.

The Dark Energy Spectroscopic Instrument (DESI) experiment is a survey that measures the redshifts and distances of thousands of faint galaxies. It created waves during the last year by presenting evidence for dark energy that evolves with time, as opposed to the simplest theory, Einstein's cosmological constant (a fixed dark-energy density with equation-of-state parameter $w = -1$), that is one of the ingredients of standard cosmology.



Artist's impression comparing how dark energy's inferred behaviour compares to Einstein's cosmological constant ($w = -1$).

Why this matters?

Dark energy makes up roughly 70% of the universe's energy budget, yet its physical nature is unknown. Determining whether DESI's surprising signal reflects genuinely exotic dark energy, evolving dark matter, or a statistical artifact is central to building the next standard model of cosmology.

Moreover, the rate of observed growth of the dark energy suggested it was in the "phantom" regime, where its negative pressure exceeded its energy density in magnitude in the recent past. Normal theories of evolving dark energy should not have this behavior. In our study, we examined the potential for phantom models, having negative kinetic energy, to give a good fit to the data. We also found that non-phantom theories could simulate the observed behavior, if they caused the mass of dark matter to decrease with time.

Citation: Chen, R. et al. (2026). Quintessential dark energy crossing the phantom divide. *Journal of Cosmology and Astroparticle Physics*, 03(2026), 044

Beyond the “Plunger”: A Radiative Link Between the Stratospheric Polar Vortex and Arctic Surface Climate

Key contributors: The study was led by researchers at Beijing Normal University and Peking University, in collaboration with McGill's Prof. Yi Huang, whose group studies the radiative physics of Earth's atmosphere and climate system.

Why this matters?

This cloud-mediated radiative pathway helps resolve two long-standing puzzles in Arctic climate dynamics — surface warming without dynamical propagation, and warming that outlasts the dynamical signal — and could improve subseasonal forecasts of rapid Arctic warming and sea ice loss.

For decades, atmospheric scientists have understood the impact of the “stratospheric polar vortex” (SPV) on surface climate through the lens of “dynamical coupling”: the vortex acts like a giant “atmospheric plunger,” pushing air downward to drive surface weather. However, this traditional view has limitations:

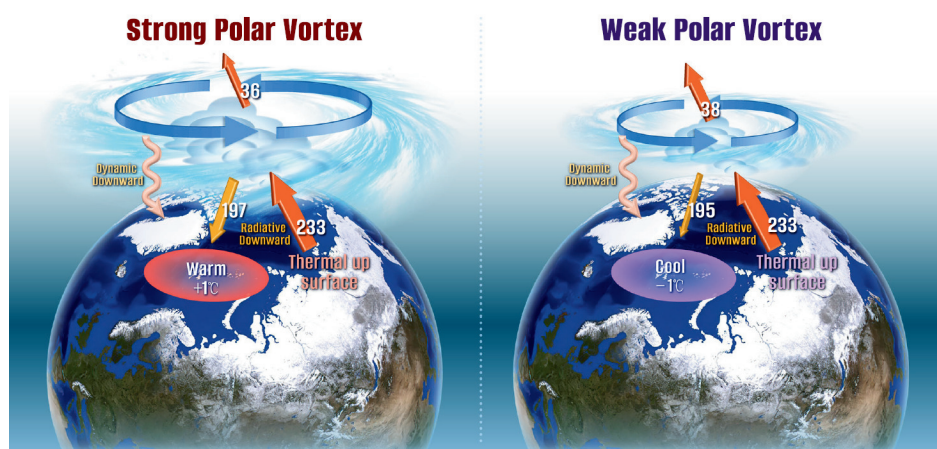
Unexplained surface response: Not all dynamic signals successfully “propagate” to the surface—in fact, about one-third of extreme events vanish midway. Despite this lack of downward propagation, significant temperature responses are still frequently observed at the surface over the Arctic.

Unexplained time delay: Even when the dynamical signal does reach the ground, its direct impact over the Arctic Ocean is short-lived, often vanishing within about a week. Why, then, do Arctic temperature anomalies often persist for nearly a month after this dynamical signal fades?

Cloud radiative effect

By analyzing the daily evolution of extreme SPV events, we find the answer lies in the Arctic clouds and their radiative impact. Changes in the atmospheric temperature associated with SPV lead to changes in static stability, which in turn modulates high clouds above 500 hPa. The increase in high-cloud cover generates a lasting positive net radiative effect to warm the surface. This mechanism can cause up to 1.7K of Arctic Ocean warming during the delayed phase of strong SPV events and can accelerate sea ice loss over the Barents-Kara Sea region.

Citation: Yan, X., Xie, F., Luo, F., Hu, Y., Huang, Y., Bian, J., Zhou, L., & Zhao, C. (2026). Stratospheric polar vortex shapes Arctic surface climate via a radiative pathway. *Nature Communications*, 17, 5996.



Schematic of the radiative effect of the stratospheric polar vortex on Arctic surface climate.

Why Some Heatwaves Feel Humid and Others Feel Bone-Dry

Key contributors: The lead author of this work, Dingrui Cao is a postdoctoral researcher in the Department of Atmospheric and Oceanic Sciences at McGill University, co-supervised by Prof. Yi Huang and Prof. Hai Lin. Her research focuses on dynamics and predictability of climate extremes.

Heatwaves are prolonged periods of unusually high temperatures, and their development depends strongly on energy exchange between the land surface and the atmosphere. Atmospheric water vapour affects this exchange by absorbing and re-emitting infrared radiation. Yet, water vapour during heatwaves is not controlled by temperature alone; it also depends on evaporation, soil moisture, moisture transport, and regional circulation. Because these processes vary across regions, heatwaves can be associated with moist conditions in some areas, but dry conditions in others.

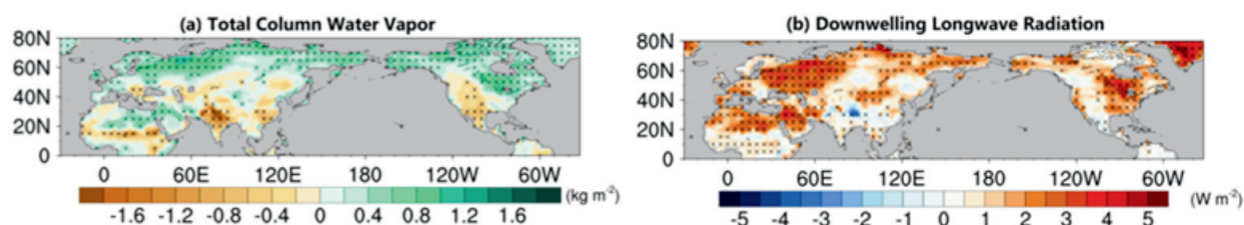
In this study, we examine year-to-year variations of summertime heatwaves in the Northern Hemisphere and use a "radiative kernel" technique to separate the radiative effects of water vapour along with other geophysical variables such as clouds. We find that heatwaves show contrasting water vapour anomalies across regions. In mid- and high-latitude regions, increased atmospheric water vapour enhances downwelling longwave radiation and adds to surface warming. In India and western North America, by contrast, heatwave summers are often associated with reduced water vapour, due to a weaker summer monsoon and soil-moisture deficits.

Why this matters?

The effects of atmospheric water vapour on warming during a heatwave depend on several local factors and can vary from region to region — a distinction relevant to predicting the health and infrastructure risks of specific heatwave events as they become more frequent.

In these dry-heatwave regions, reduced water vapour partly offsets the longwave warming caused by higher air temperature. These results show that atmospheric water vapour can either amplify or partly counteract heatwave warming, depending on regional water supply, land surface conditions, and atmospheric circulation.

Citation: Cao, D., Lin, H. & Huang, Y. (2026). Atmospheric water vapor contribution to interannual variability of Northern Hemisphere summer heatwaves. *npj Climate and Atmospheric Science*, 9, 88.



Water vapour anomalies and their radiative effects in Northern Hemispheric heatwaves.

A First Look at the Galactic Centre with the James Webb Space Telescope

Key contributors: Prof. Daryl Haggard is an Associate Professor of Physics at McGill and TSI, holds a Canada Research Chair in Multi-Messenger Astrophysics, and leads the McGill Extreme Gravity and Accretion (M.E.G.A.) group. Mayura Balakrishnan is a Banting Postdoctoral Fellow in the group, and Nicole Ford and Zach Sumners are TSI graduate students.



TSI researchers and international collaborators at the ISSI Bern (Switzerland) workshop on the Galactic Centre.

Sagittarius A* (Sgr A*), the supermassive black hole at the centre of the Milky Way and the closest supermassive black hole to Earth, produces hours-long flares that have been observed in radio, near-infrared, and X-ray light — but never, until now, in the mid-infrared, a wavelength band where Earth's atmosphere had prevented a clean detection. In April 2024, an international team including TSI's Daryl Haggard, Nicole Ford, and Zach Sumners used JWST's MIRI instrument to monitor Sgr A* over several days, in simultaneous coordination with sub-millimetre (Submillimeter Array), X-ray (Chandra, NuSTAR) telescopes.

The team detected a 40-minute mid-infrared flare with JWST, whose behaviour varied across the different mid-infrared wavelengths observed and appeared slightly later in the lower-energy sub-millimetre data — with no corresponding flare seen in X-rays.

As the flare faded, its spectral index steepened, a signature of synchrotron cooling: electrons losing energy as they spiral through magnetic fields estimated at roughly 40–70 Gauss. The team's models suggest the flare originates either from magnetized turbulence or a magnetic reconnection event — where twisted magnetic field lines briefly trap and then rapidly eject material — a mechanism broadly analogous to the solar flares that drive Earth's aurorae.

This result was one of several to emerge from two TSI-led international workshops hosted at the International Space Science Institute (ISSI) in Bern, Switzerland (October 2024 and June 2025), which brought together Galactic Centre researchers from McGill, Amsterdam, Toronto/CITA, Innsbruck, Maryland, Harvard, and the Max Planck Institute for Radio Astronomy. The collaboration has already produced several related 2025 papers — on mid-infrared extinction toward the Galactic Centre and on photometric constraints on intermediate-mass black holes — with roughly five more in progress for 2026.

Citation: von Fellenberg, S.D., Roychowdhury, T., Michail, J.M., et al. (incl. Ford, N., Haggard, D., Sumners, Z.). First mid-infrared detection and modeling of a flare from Sgr A*. *The Astrophysical Journal Letters*, 979, L20 (2025).

Why this matters?

Mid-infrared light penetrates dust that obscures other wavelengths, filling the last major gap in the multiwavelength coverage of Sgr A*. The detection provides direct evidence for magnetic fields and synchrotron cooling as drivers of the flares, bridging the lower- and higher-energy behaviour of our galaxy's black hole and demonstrating JWST's unique capability for studying it in the infrared.

03

EDUCATION & PUBLIC ENGAGEMENT

One of the core tenets of TSI's mission is to communicate astronomy with the public. TSI runs a variety of public outreach programs, from large events targeted at a general audience, to programs tailored to the needs of specific communities. Our approach to outreach emphasizes inclusion, relationship-building, iteration, and co-creation, with the overarching goal of demystifying astronomy research, showing that science is interesting, accessible, and human. TSI Outreach promotes the research that we do at TSI and the people who do it, providing multiple opportunities for trainees to develop science engagement skills.

We have forged multiple partnerships with other outreach groups, both within and outside of McGill, in order to offer a robust set of education and public engagement activities for the Montréal community. We regularly collaborate with outreach groups in the TSI's member departments (Physics Outreach, SMORes), the Faculty of Science's outreach groups, the Institute for Research on Exoplanets (iREx), and the Centre de recherche en astrophysique du Québec (AstroQuébec). TSI has also made a name for itself in the broader Montréal community and is often invited to participate in events organized by various organizations in Montréal and its surroundings.



2025 was a fruitful year for TSI Outreach, with events that brought people of Montréal closer to astronomy through public talks, science fairs, and more! Our public talk series, which run in collaboration with Physics Outreach, featured a broad variety of topics and formats, including traditional talks, Q&As, and panel events from locals and external speakers (see page 17). Astronomy on Tap's popularity continued to grow, filling their venue at Siboire to capacity every month (see page 18). Public Observing Nights (see page 19) continued to run at maximum capacity every month, giving the public the opportunity to tour the Anna McPherson Observatory and look through the telescope.

Strong relationships continued to be the backbone of our outreach programming. We worked closely with the McGill Physics Outreach Committee, co-organizing Science in Space (see page 21), and developing new astronomy-themed modules to deploy through Space Explorers and science festivals. We also collaborated with the Committee to host "From Sea to Space: An Exploration Mini-Fair", for Science Literacy Week in October 2025, which once again drew hundreds of people to campus (see page 22), as well as sponsoring the McGill Physics Hackathon (see page 25). We partnered with the McGill School of Continuing Studies and Physics lab techs to offer activities for the Explore the World of STEM workshop over the summer.

The success of TSI's Outreach programs is due in no small part to the team of students, postdocs, faculty, and staff who volunteer their time to make our broad portfolio of programming possible. We would like to thank the over 160 volunteers who gave us their time in 2025. We're thrilled to see where their dedication and ingenuity take TSI Outreach next!



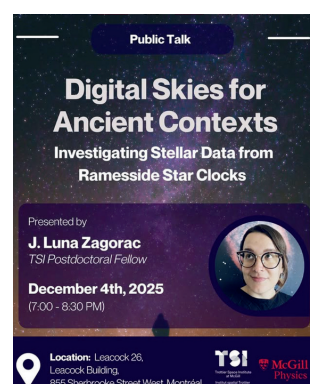
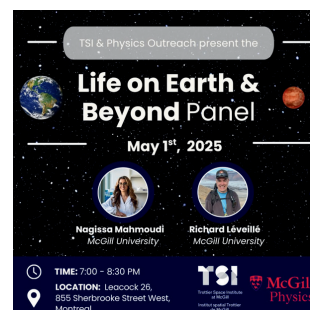
PUBLIC TALKS

Public AstroNights, our monthly public talk series, have been a mainstay of the Montréal astronomy scene since 2011. Originally founded by AstroMcGill in 2011, they are now run by TSI Outreach in collaboration with the Physics Department. The monthly Public Talks rotate between a variety of formats designed to increase interactivity, including panel events that bring together multiple researchers, Q&A sessions, and traditional talks. Speakers are usually TSI or McGill Physics professors, postdoctoral fellows, or graduate students, although we also welcome invited speakers from other institutions.

Our Public Talks take place in person on the McGill campus and are livestreamed on our YouTube channel. These talks attract an average of 200 people each month. The accompanying live-stream provides opportunities for our online audience to actively participate as well. Recordings of our livestreams are posted to our YouTube channel after the event, where they continue to garner hundreds (sometimes thousands) of views. We are continually astonished by the enthusiasm of our audience, who return month after month and engage speakers in lively Q&A sessions!

From exoplanet research to theoretical cosmology to next generation telescopes, we're looking forward to the future of this monthly public talk series!

22 Jan	Prof. Daryl Haggard (<i>TSI & McGill Physics</i>) "Into the Deep: Touring a Supermassive Black Hole (or Two!)"
18 Feb	Dr. Lauren Rhodes (<i>TSI & McGill Physics</i>) "50 Years of Gamma-ray Bursts - Lauren Rhodes"
26 Mar	Prof. Bill Coish (<i>McGill Physics</i>), Prof. Claude Crépeau (<i>ÉTS</i>) "Quantum Science & Technology Panel"
01 May	Prof. Nagissa Mahmoudi , Prof. Richard Léveillé (<i>TSI & McGill EPS</i>) "Life on Earth & Beyond Panel"
09 Oct	Prof. David Hanna (<i>TSI & McGill Physics</i>) "The Flight of the HELIX - Measuring the Galaxy from 40km above Greenland"
28 Oct	Prof. Bruno Tremblay (<i>McGill AOS</i>) "Arctic Climate Change"
04 Dec	Dr. J. Luna Zagorac (<i>TSI & McGill Physics</i>) "Digital Skies for Ancient Contexts"

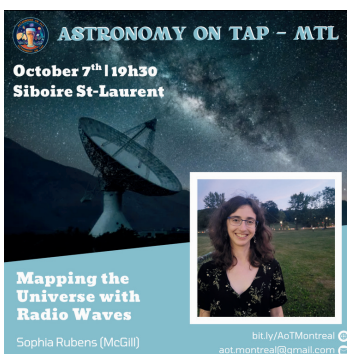


ASTRONOMY ON TAP MTL



Montréal has been a satellite location of the popular Astronomy on Tap (AoT) series since 2017. Astronomy On Tap MTL – Astronomie En Fut MTL (AoT MTL) is now organised by a team of postdoctoral researchers and graduate students at McGill and UdeM, in collaboration with the Center for Research in Astrophysics of Quebec (AstroQuébec), the Trottier Institute for Research on Exoplanets (iREx), and the TSI.

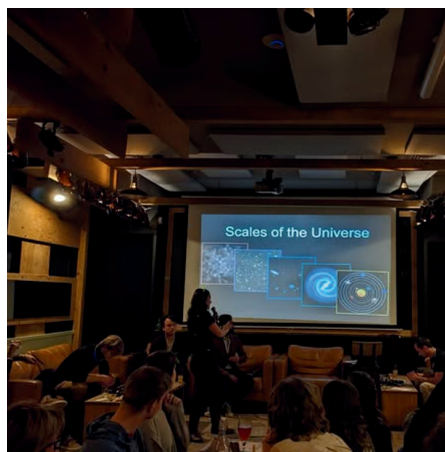
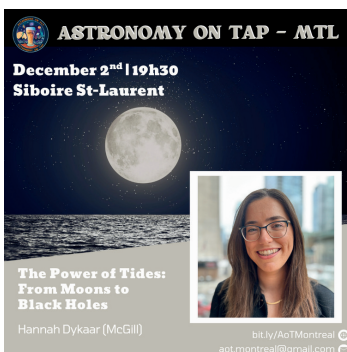
AoT events are free and aimed at making space-related research more accessible to the community. They consist of 15-minute engaging talks accompanied by themed trivia games and prizes in a social venue, typically pubs or locations with open bars. Events are held once a month and alternate between Astronomy on Tap (EN) and Astronomie en fût (FR) every month, with the occasional fully bilingual edition. AoT is informal, engaging, and posits itself as more relatable than traditional hour-long lecture formats of academic public talks. This unique format often reaches audiences in their 20s that may be new to astronomy and space sciences.



In 2025, AoT re-established itself as a fixture of the Montréal astronomy scene and continued to grow its audience. AoT continued to be hosted at the Siboire Saint-Laurent and exceeded the venue's 70-seat capacity every month, with an overwhelmingly enthusiastic audience participation. We're thrilled to say that AoT MTL is here to stay!



TSI graduate students and postdocs are an integral part of these events. Half of the members of the AoT organizing committee continue to be TSI members, contributing to everything from recruiting volunteers to developing astronomy trivia games. AoT also offers a unique opportunity for scientists at all levels to hone their science communication skills by delivering talks to a general audience without a technical background. Over a dozen TSI researchers spoke at AoT this year, sharing their research in both English and French with the Montréal community.



OBSERVING NIGHTS

Atop the Rutherford Physics Building at McGill is the Anna I. McPherson Observatory. This consists of a 14-inch Celestron telescope in the observing dome, several smaller portable optical telescopes on tripod mounts, and a small 1400 MHz radio telescope. The rooftop location provides one of the best observing experiences in Montréal for objects such as the moon, Saturn, Jupiter, and even deep-sky objects.

The observatory is run by students in TSI and the Department of Physics, led by the Observatory Coordinator, graduate student Samantha Wong. The Observatory Coordinator and a team of dedicated volunteers run a variety of observing nights aimed at different audiences, inside and outside McGill. While a majority of observing nights take place in the Anna McPherson Observatory, our coordinators also host off-site events using our portable telescopes and solar scopes.

In 2025, we hosted roughly 500 members of the public at our various observing nights, reaching people of all ages and scientific backgrounds. These events were made possible by the help of fifteen volunteers, over half of whom are undergraduate students in the Physics Department.

The observatory opens its doors every month to the public for Public Observing Nights. These nights feature guided observing of assorted astronomical objects, which change depending on the season, as well as a presentation on what can currently be observed by the naked eye and a tour of the observatory facilities. They have proved wildly popular, with the 70 open slots often filling up within hours of the event being advertised on our social media channels and many participants returning more than once.

The Public Observing Nights are advertised on the TSI Instagram, in collaboration with the McGill Physics Instagram, as well as during events that TSI sponsors, such as Astronomy on Tap Montréal. The success of these monthly sessions is closely tied to TSI's direct involvement in astronomy public outreach in the Greater Montréal Area as well as a dominant online presence.

Many participants at our public observing nights are members of the McGill community, including students, staff, and faculty. We have used the observatory for dedicated physics groups including classroom visits from McGill courses. Additionally, the observatory serves as a resource for use in undergraduate projects for McGill physics courses, PHYS 182, PHYS 183, PHYS 258, and PHYS 339, and "open house" events for physics department members. Most of our volunteers are McGill undergraduate students, graduate students, or postdocs, giving a unique hands-on experience for many early-career researchers to learn more about observational astronomy.



OBSERVING FOR THE YOUTH

Telescopes at Science Festivals



Harsh Montréal winters and snow accumulation paired with longer days during the summer severely limit the observatory's year-round operation. However, portable solar scopes and telescopes make it possible for Observatory coordinators and volunteers to offer solar observing during the summers in festivals such as 24 Hours of Science in May, AstroFest at the Montréal planetarium in May/June, and the Eureka Festival in June. In 2025, Solar Observing was a highlight of the 24 hrs of Science event which hosted more than 200 children, aged 5-12.

Observing with Schools

Schools and CÉGEPs in the Montréal area can also request a guided observing experience either at our observatory, or an observing visit at the school with our smaller telescopes directly. For the past three years, we have been invited by JPPS-Bialik, a Jewish primary school, to be a part of a yearly Shabbat event, bringing together understandings of the sky from the Jewish faith with the work that astronomers do. We set up the portable telescopes for the Grade 3 class and their families, who were all delighted to not only look through the telescopes, but also to interact with the graduate student volunteers. In 2025, we garnered about 50 attendees during our visit to JPPS-Bialik.

We also host school groups and student groups on-site. In 2025 we hosted a group of 40 high school students and 2 teachers from St. Francis Xavier Catholic High School, Ottawa. The group had an exceptionally positive experience and plans to visit us again in May, 2026.



SCIENCE IN SPACE: HOW TO TELESCOPE

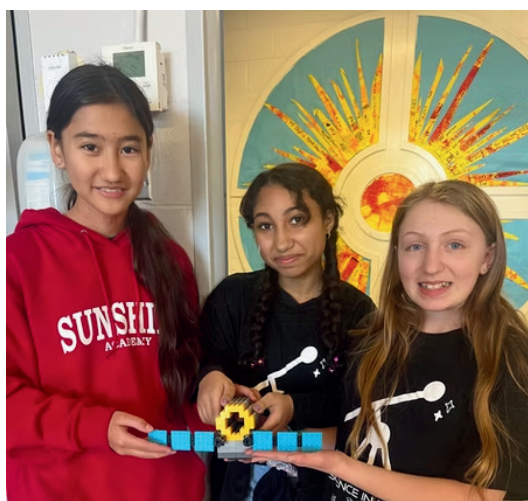
Science in Space: How to Telescope is an informal science learning program co-founded in 2022 by the Trottier Space Institute, McGill Physics, and Dell Technologies/Girls Who Game. The program is aimed at girls and nonbinary children between the ages of 10 and 12 (grades 5-6), as research shows that the years immediately preceding the transition to high school are a crucial determinant of retention of girls in STEM.

The program is inquiry-based and student driven. In the first half of the program, facilitators and mentors deliver the basics of astronomy through game-based activities, giving the students the foundation they need to tackle designing and building their telescope. The program ends with a celebratory pizza party and a showcase, where each group presents their telescope to the other groups, mentors, and teachers. Through this program, students gain familiarity with observational astronomy, develop collaborative project design skills, and gain a sense of community in STEM. The students not only develop a network within their own schools, but also with the graduate and undergraduate student mentors who support them in their project and act as role models.



Since its conception, the program has run at five elementary schools across Montréal – Springdale Elementary, Sunshine Academy, Coronation Elementary, Verdun Elementary, and Sinclair Laird. In 2025, the program ran in the Winter/spring at Coronation Elementary, Verdun Elementary School, Springdale Elementary, and Sunshine Elementary. In the spring, Science in Space was invited to present an activity at CIBC's STEM Camp in Toronto as part of Girls Who Game. In the Fall of 2025, a new module began being drafted for piloting in the spring of 2026.

Overall, we reached approximately 81 students through around 40 total visits to the schools with a team of 8 volunteers. Activities developed for the Science in Space program have also been run at our sister programs and on-campus minifair, From Planets to Particles, which we host for festivals such as 24hrs of Science, Science Literacy Week, Eureka Festival, and more. Having a wider variety of venues gave us the opportunity to experiment with different approaches to delivering content, including in a more compressed fashion. We now have four versions of the original program, ranging from a compressed 1-day version to a more relaxed 12-week version, allowing us to adapt to schools that have longer or shorter lunch periods. We also began developing a 2nd set of modules in 2024, focused on exploring habitability on other planets, which we were able to deploy in late 2025. The success of this program and its impact as a McGill Outreach initiative was featured in McGill Reporter on April 28, 2025, garnering campus-wide attention. We look forward to what 2026 will bring! To learn more about the program, visit <https://www.scienceinspace.ca/>



SCIENCE FESTIVALS AND LARGE EVENTS

In addition to our regular programming, TSI Outreach also participates in events organized by external partners that seek to increase awareness of and access to science in general and astronomy in particular.

24 Hours of Science

24 Hours of Science is a Québec-wide initiative that celebrates science and technology through interactive activities. TSI, Physics Outreach, and EPS Outreach joined forces to host "From Planets to Particles: An Exploration Mini-Fair" as a part of 24 Hours of Science on 3 May, 2025. We offered 9 activities and physics demos geared towards children aged 6-12 and hosted over 100 families and approximately 400 children throughout the day.

Children were given "activity passports" that they could get stamped at each station, and many of them stayed for hours trying out all the activities in order to fill up their passports! The reactions from attendees were overwhelmingly positive; parents enthusiastically thanked us for putting on the event and told us how much their kids enjoyed the activities. The energy was palpable and electrifying, and seeing the children's joy and engagement was well worth the effort that went into planning an event of this size. The event would not have been possible without the invaluable contributions of the over 56 graduate students, undergraduates, postdocs, and staff who volunteered their time on a Saturday, nor without the hard work of the TSI & Physics Outreach Committee. We're thrilled to count "From Planets to Particles" among our regular annual events and hope to offer it again at festivals in 2026!



Science Literacy Week

On October 4 2025, TSI and Physics Outreach Committee joined forces to host "From Sea to Space: An Exploration Mini-Fair" as a part of Science Literacy Week programming at McGill. Over the course of six hours, we welcomed over 100 people to the Rutherford Physics Building to engage in ten hands-on activities and demos focused on a variety of topics within physics and astronomy, and planetary sciences. Children could design parachutes to experiment with gravity, build their own space stations out of LEGO, use lessons learned from extremophiles on Earth to design a lifeform that could survive on other planets, use potatoes to power a lightbulb, design their own planetary system, and observe the sun through our solar telescope. The Physics Department's lab technicians also set up a half-dozen demos, to the delight of parents and children alike!



AstroFest at the Planetarium

On June 7 and 8, 2025 Montréal's Planétarium Rio Tinto Alcan hosted AstroFest, a weekend-long event for astronomy enthusiasts of all ages. TSI once again hosted a booth where children could learn about exoplanets and habitability through two complementary hands-on crafting activities – fan-favourite from 2023 “Life Finds a Way” and a brand-new module on planetary systems. In “Make Your Own Planetary System”, children learn about the different kinds of planets by making a planetary system mobile; we use our own Solar System as a starting point and then children are asked to imagine and design their own planets. “Life Finds a Way” asks them to take a step further and think about what could live on those planets, introducing the concepts of habitability and extremophiles by designing a creature that could live on one of the planets they created. Both activities proved immensely popular, welcoming over 400 children (and their parents!) over the course of the weekend. A team of 14 graduate and undergraduate students, along with the TSI Program Admin, volunteered their time to ensure the booth's success. We look forward to participating in AstroFest again in 2026!



McGill Open House

TSI joined the Physics Department for McGill's Open House on October 25, 2025. TSI in partnership with the Physics Outreach Committee took the lead in organizing activities in the Rutherford Physics Building to give prospective undergraduates a glimpse into what life is like in the Physics Department and TSI.



We coordinated demonstrations and lab tours throughout the day in seven different labs, including the McGill Cosmology Instrumentation Lab, where the tour was run by volunteers from TSI Prof. Matt Dobbs' research group. Several undergraduate student clubs also ran booths where they showcased their work and talked about their experience in TSI and the department. The event was a success, welcoming over 200 visitors in more than 20 groups over the course of six hours.

SUMMER CAMPS & SCHOOL VISITS

TSI is often contacted by summer camps and other groups organizing summer programming. In 2025, we organized 2 events for visiting high school students. One school group visited us from Mexico in July as a part of the Explore the World of STEM program conducted by the McGill School of Continuing Studies. A second group of high school students visited us in December. We showcased our newly piloted “Seeing Light in Space” module for both groups. “Seeing Light in Space” is an interactive workshop about how we see astronomical objects and how we process images.

Students get to process their own astronomical images using the tools provided by the NASA Astrophoto Challenge. A subset of the module also includes the Beading activity, where students use perler beads to make their own astronomical images and learn about pixel resolution and how resolution is impacted by limited resource allocation. Both of the activities were well-received, with enthusiastic student participation.



MCGILL PHYSICS HACKATHON

The McGill Physics Hackathon is a friendly programming competition where students team up to write programs to visualize or calculate something related to physics. After many years supporting the Hackathon, TSI became an official co-organizer of the annual event in 2024. The Hackathon draws students at all levels, from upper high school all the way to graduate school, all of whom have access to mentors who can provide advice on how to design, implement, and present their projects.

The 10th annual McGill Physics Hackathon was held February 13-15, 2026. While there was no formal Hackathon event in 2025, the year saw most of the organizational work leading to the grand event. This involved gathering funds totaling over \$21,800 from McGill-based organizations (Physics Department, TSI, Faculty of Science, etc), companies (Stingray Music, Desjardins, BNC, etc) and other groups for covering logistical costs, apparel, food, participation gifts, and prizes in twelve different categories. The TSI sponsored \$3,000 for the hackathon, and an order of \$400 for prizes in the “Astro” category. TSI’s support of the Astro prize incentivized Hackathon participants to meaningfully engage with the coding aspect of astronomy, which is crucial to professional astronomy, yet not entirely covered by traditional physics curricula.

MCGILL PHYSICS HACKATHON REGISTRATION OPENS:

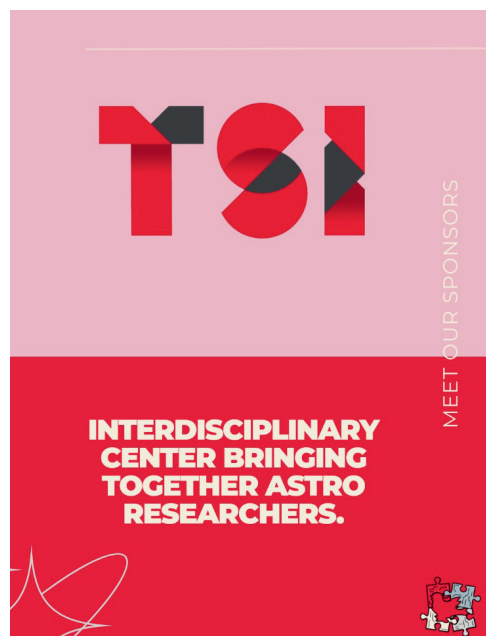
3 DEC 2025

Join us for the 10th annual McGill Physics Hackathon for the opportunity to meet and learn from like-minded, curious, and passionate individuals. Experts from both academia and industry will also be present, either to help you with your projects, or just to chat!

13-15 Feb 2026



Our Website
www.hackathon.physics.mcgill.ca



The 2026 Hackathon had a ‘theme’ for the first time. A theming of ‘10’ was picked to commemorate the event’s 10th anniversary. The event hosted 120 participants ranging from high school to graduate level. Of these participants, 61% were undergraduate students, 33% were CÉGEP students, 3% were graduate students, and 3% were high school students. As a key sponsor and organizer of the event, the TSI Inreach/Outreach Co-ordinator gave an overview of the TSI and its resources in the welcome session and ran a dedicated TSI booth during the inaugural Meet and Greet dinner.

TSI members had a large role in the organization of the Hackathon in 2025-26. Two out of eight members of the organizing committee were TSI affiliates, whereas 19 out of 47 volunteers that helped with event execution were TSI graduate students, faculty, and staff. Their roles at the Hackathon ranged from general operations, to judging and mentoring participants.

DEVELOPING NEW OUTREACH MODULES

One of the core objectives of TSI's outreach program is to provide early career researchers and trainees with the opportunity to hone the science communication skills that they'll need to thrive in their careers. One of the ways that we do this is by providing them assistance in the development of new outreach modules that are informed by their research interests. Below are the outreach modules that were developed by TSI members in conjunction with members of our affiliate departments.

Understanding the Early Universe

The motivation for this outreach module is based on the research areas of the McGill Radio Lab. The development of this module started out with very broad learning objectives that lie at the core of cosmology and instrumentation. The project was led by undergraduate student Félix St-Amour and the material was developed by Physics undergraduate students working at the McGill Radio Lab with TSI Prof. H. Cynthia Chiang, with input and support from TSI graduate students and the former Program Administrator.

Initial goals were to use a basic Radio Astronomy Demonstration (RAD) kit to impart a deeper understanding of the electromagnetic spectrum, constituents of the universe, introduce extragalactic structures, and to garner appreciation for signal contamination and interference. The RAD kit consists of a circuit board with LEDs assembled with miniature models of the MIST and ALBATROS telescopes. The model responds to audio signals and has various modes to illustrate a range of concepts related to electromagnetic waves and signals. An initial module was developed aimed at 12-year-old students to help them explore concepts of light, early Universe, and cosmology in a workshop format. The material was then expanded to encompass a range of levels. Undergraduate students Andrei Li, Audrey Bernier, and Félix St-Amour ran this module for high school students at Collège Jean-Eudes and Mariah Zeroug and Félix St-Amour ran the module for elementary school students at École Atelier. There are plans to further expand the reach of this module to beyond Montréal and to communities in Northern Québec, where the facilities themselves are situated.

Habitability Program

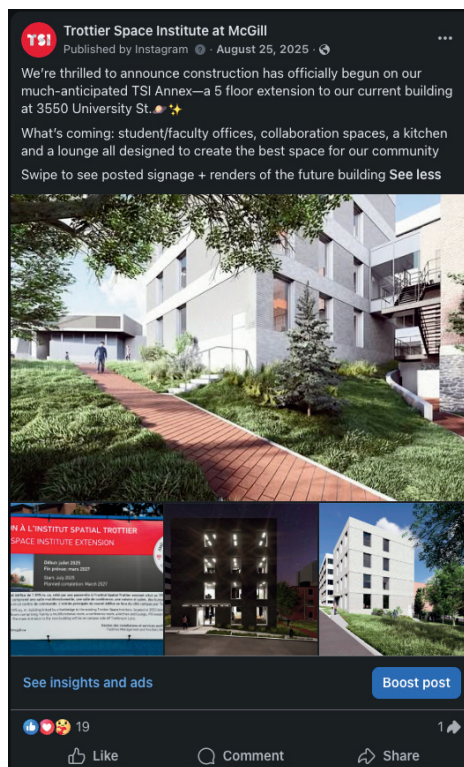
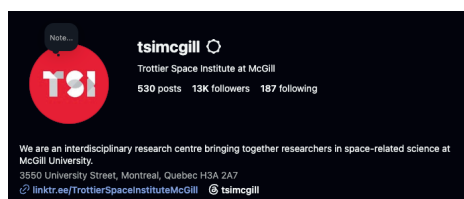
A 10-week outreach module to introduce habitability on exoplanets was designed for the Science in Space program (see page 21) by Science in Space Coordinator Georgia Mraz, and former TSI Program Administrator, Carolina Cruz-Vinaccia. The program is aimed at 11-12 year old students. It begins with an introduction to planets, exoplanets, and our cosmic address and goes on to explore what constitutes life on Earth. Activities in subsequent weeks utilize these ideas to introduce the basics of habitability. Using interactive tools such as 'travel brochures' for exoplanets based on data from NASA's Exoplanet Catalog, students are motivated to think about possible biomes and living organisms these planets could host. The students then recreate these biomes in Minecraft

and explain how they think life could survive on their chosen planet. This program was developed in Fall 2025, to be piloted as a part of the Science in Space program in Spring 2026.



SOCIAL MEDIA

Since 2022, we have strived to boost our online presence and actively engage with online spaces to effectively use the web as a medium for outreach. We use our platforms to advertise our events, boost stories from the press that feature TSI members, and to highlight the work being done at TSI. Instagram and Facebook continue being our most active social media platforms.



Our Facebook page has a follower count of over 2,500 and got a total of 2.9K views in 2025. Our content was viewed and revisited 13.8K times over the year, yielding a total of 144 interactions in the form of comments, likes, and shares. Our Instagram page is currently outperforming our Facebook account, with a follow count over 10,000. Our page received about 4.5K visits on Instagram over the course of 2025. Our Instagram content was viewed, revisited, and replayed about 36.3K times, almost three times more than our Facebook content, and garnered 256 interactions in the form of likes, shares, comments, and reposts. Our topmost content on Facebook in 2025 was the announcement of the TSI annex construction with 5.8K views while reels and posts featuring our graduate students performed the best on our Instagram. Our metrics show that the broader online community is interested in more than our public facing events. The people visiting our online platforms seek and interact extremely well with posts highlighting behind-the-scenes research work that often stays hidden from public eyes. In the coming year, we will strive to learn from our trends and social media insights from 2025, and look forward to further boosting TSI research and accomplishments on the web!

TSI IN THE MEDIA

'Researchers Link Mysterious Cosmic Signals To Collapsed Stars'; McGill Newsroom, 2025-01-02 [Ryan Mckinven & Aaron Pearlman]

'Deep space radio waves originated from a surprising source'; earth.com , 2025-01-03 [TSI]

'Dead galaxies, live signals: Astronomers uncover a fast radio burst's surprising location'; McGill Newsroom, 2025-01-21 [Vishwangi Shah]

'First fast radio burst traced to old, dead, elliptical galaxy'; Northwestern Now, 2025-01-21 [Vishwangi Shah]

'Astronomers thought they understood fast radio bursts. A recent one calls that into question.'; UC Berkeley News, 2025-01-21 [Vishwangi Shah]

'First Fast Radio Burst Traced to Old, Dead, Elliptical Galaxy'; Keck Observatory, 2025-01-21 [Vishwangi Shah]

'Astronomers discover repeating radio bursts from distant 'dead' galaxy'; ABC News , 2025-01-24 [Vishwangi Shah]

'Two mysterious fast radio bursts originated from wildly different places in space'; CNN, 2025-01-24 [Ryan Mckinven, Vishwangi Shah]

'FRBs from dead stars?'; MIT News, 2025-01-25 [Vishwangi Shah]

'A recent fast radio burst calls into question what astronomers believed they knew'; Phys.org, 2025-01-25 [Vishwangi Shah]

'First-ever fast radio burst (FRB) found in an ancient, elliptical galaxy'; The Brighter Side of News, 2025-01-25 [Vishwangi Shah]

'Fast radio burst detected in 'dead' galaxy raises questions about mysterious signals'; USA Today, 2025-01-27 [Vishwangi Shah]

'Scientists detect 'alien' signal from distant galaxy'; Daily Mail, 2025-01-27 [Vishwangi Shah]

'Mysterious Signal Coming from Dead Galaxy Surprised Scientists'; Earth Press News, 2025-01-27 [Vishwangi Shah]

'An Ancient Dead Galaxy Is Making Radio Signals'; VICE, 2025-01-28 [Vishwangi Shah]

'This Mysterious Radio Burst Came From Nowhere and It's Baffling Experts'; SciTech Daily, 2025-02-01 [Vishwangi Shah]

'A fast radio burst from a dead galaxy puzzles astronomers'; ScienceNews, 2025-02-10 [Vishwangi Shah]

'Did LIGO just see its most important gravitational wave ever?'; BigThink, 2025-02-11 [Amanda Cook]

'Mystery Signal Lights Up a Dead Galaxy, Baffling Astronomers'; SciTech Daily, 2025-02-13 [Vishwangi Shah]

'Mysterious fast radio burst traced back to massive 'cosmic graveyard' of ancient stars'; space.com, 2025-02-25 [Vishwangi Shah]

'Searching for the 'explosive stuff of the universe''; McGill News, 2025-03-01 [Daryl Haggard]

'Fast Radio Bursts Explained? Scientists Zero In on Their Mysterious Origins'; SciTech Daily, 2025-03-16 [Ryan Mckinven, Aaron Pearlman]

'Seeking beyond radio'; NICER / ISS Science Nugget, 2025-04-03 [Mason Ng, Aaron Pearlman, Amanda Cook]

'The success and impact of Outreach Network Event (ONE) McGill'; McGill BRANCHES, 2025-04-09 [TSI]

'Canada 150's Remote Research Success : From the Stars to the Sea'; C150 Research Chair, 2025-04-17 [Jonathan Sievers]

'McGill outreach initiative introduces astronomy to girls in grades 5 and 6'; McGill Reporter, 2025-04-28 [Alice Curtin, Carolina Cruz-Vinaccia, Kim Metera]

'Eight Faculty of Science professors honoured by Provost for exceptional research achievements'; McGill Faculty of Science News, 2025-04-29 [Robert Brandenberger, Adrian Liu, Nagissa Mahmoudi]

'1,000s of times a day, a burst of radio waves is generated somewhere in the Universe. What are they?'; BBC Sky at Night Magazine, 2025-05-14 [Jason Hessels, Vicky Kaspi]

'First early-career astronomers selected as Canadian SKA Scientists'; NRC Stories, 2025-06-02 [Alice Curtin]

'Strange signals are reaching us from a dead galaxy. Here's what we know...'; BBC Science Focus, 2025-06-05 [Vishwangi Shah]

'2025 Banting Fellows'; McGill Graduate and Postdoctoral Studies, 2025-07-11 [Amanda Cook, Mayura Balakrishnan]

'Construction Starts: Trottier Space Institute Extension'; McGill Facilities News, 2025-07-28 [TSI]

'Discovery Awaits! Chandra Cycle 27 Highlights'; Chandra X-ray Center, 2025-08-01 [Daryl Haggard]

'One of the biggest black holes ever was discovered – with a mass of 35 billion suns'; CBC, 2025-08-12 [Daryl Haggard]

'St. John's College Brings World-Class Speakers To Santa Fe For Fall Dean's Lecture And Concert Series'; Los Alamos Daily Post, 2025-08-19 [Daryl Haggard]

'Brightest fast radio burst seen so far allows researchers to zoom in on the location of origin'; McGill Newsroom, 2025-08-21 [Amanda Cook, Mawson Sammons]

'Root beer FLOAT' burst's home is located with extraordinary precision'; Northwestern Now, 2025-08-21 [Amanda Cook]

'Astronomers detect the brightest fast radio burst of all time'; MIT News, 2025-08-21 [Amanda Cook]

'Origin of Mysterious Radio Signal Possibly Discovered'; Center for Astrophysics | Harvard & Smithsonian, 2025-08-21 [Amanda Cook]

'Brightest Ever Fast Radio Burst to Date Provides Clues to its Origin'; W. M. Keck Observatory, 2025-08-21 [Amanda Cook]

'Astronomers pinpoint the location of the brightest fast radio burst to date'; Dunlap Institute, University of Toronto, 2025-08-21 [Amanda Cook]

'Brightest fast radio burst ever seen lets researchers pinpoint origin with unprecedented precision'; UC Santa Cruz News, 2025-08-21 [Amanda Cook]

'Astronomers pinpoint the source of the brightest one-off fast radio burst ever'; ASTRON, 2025-08-21 [Amanda Cook]

'Brightest fast radio burst seen so far allows researchers to zoom in on the location of origin'; Perimeter Institute, 2025-08-21 [Amanda Cook]

'Brightest fast radio burst seen so far allows researchers to zoom in on the location of origin'; York University News, 2025-08-21 [Amanda Cook]

'Brilliant Cosmic Flash Challenges Fast Radio Burst Theories'; ScienceBlog, 2025-08-21 [Amanda Cook]

'Brightest Ever Fast Radio Burst Allows Researchers To Identify Its Origin'; Green Bank Observatory, 2025-08-21 [Amanda Cook]

'Rekordutbrott i rymden kan lösa astronomernas största gåta'; Chalmers University of Technology, 2025-08-22 [Amanda Cook]

'Astronomers Detect One of the Brightest, Closest FRBs Ever, And Track Its Exact Location'; Tech Explorist, 2025-08-22 [Amanda Cook]

'Root Beer Float's Origins Revealed with Remarkable Accuracy'; Scienmag, 2025-08-22 [Amanda Cook]

'Astronomers discover brightest ever fast radio burst: 'This marks the beginning of a new era'; Space.com, 2025-08-22 [Amanda Cook]

'Scientists Have Identified the Origin of an Extraordinarily Powerful Outer-Space Radio Wave'; WIRED, 2025-08-23 [Amanda Cook]

'Brightest Ever Fast Radio Burst Allows Researchers To Identify Its Origin'; MSN (syndicated), 2025-08-24 [Amanda Cook]

'Brightest fast radio burst ever detected could help solve an enduring cosmic mystery'; CNN, 2025-08-26 [Amanda Cook]

'Astronomers Track Record-Breaking Radio Flash Across 130 Million Light-Years'; SciTech Daily, 2025-09-05 [Amanda Cook]

'Clearest signal yet rattles gravitational wave detector at risk from Trump budget cut'; Globe and Mail, 2025-09-10 [Daryl Haggard]

'We Asked Astronomers What Their Favorite Thing in Space Is'; EXPLORERSWEB, 2025-10-15 [Vicky Kaspi]

'Physics researchers Amanda Cook and Alice Curtin organize FRB2025, celebrating the 10th anniversary of a major finding in the field'; McGill Faculty of Science News, 2025-10-23 [Amanda Cook, Alice Curtin, Vicky Kaspi, Jason Hessels, Matt Dobbs]

'NASA tracks strange pulse to galactic heart – Signal 'RBFLOAT' echoes from 130 million light-years out'; The Pulse, 2025-10-26 [Amanda Cook]

'Forrest Fellowships recognise superb talent'; UWA News, 2025-11-25 [Aman Chokshi]

'James Webb Space Telescope watches our Milky Way galaxy's monster black hole fire out a flare'; Space.com, 2025-11-28 [Daryl Haggard, Mayura Balakrishnan, Nicole Ford, Zach Sumneres]

'Exoplanet Caught Shedding Its Atmosphere in Real Time '; IREX, 2025-12-01 [Vigneshwaran Krishnamurthy]

'Exoplanet is observed shedding its atmosphere in real time'; McGill Newsroom, 2025-12-01 [Vigneshwaran Krishnamurthy]

'James Webb telescope spots strange 'super-puff' planet frantically chasing its own atmosphere through space'; Live Science, 2025-12-03 [Vigneshwaran Krishnamurthy]

'A 'super-puff' exoplanet is losing its atmosphere, and the James Webb Space Telescope had a look'; Space.com, 2025-12-03 [Vigneshwaran Krishnamurthy]

'James Webb telescope observes an exoplanet losing its atmosphere in real time for the first time'; NEWS.am, 2025-12-05 [Vigneshwaran Krishnamurthy]

'James Webb Space Telescope spots bizarre 'super-puff' exoplanet shedding its atmosphere in space'; Knewz, 2025-12-05 [Vigneshwaran Krishnamurthy]

'Dish drive: Hundreds of antennas take root in B.C.'s Okanagan Valley for an ambitious project to monitor signals from space'; Globe & Mail, 2026-01-27 [Matt Dobbs]

04

INREACH

Fostering cross-fertilization of ideas, interdisciplinary interactions, and collaborations among Institute members is one of the main missions of TSI. We strive to provide as many opportunities as we can for students, postdoctoral fellows, faculty members, and visiting scholars to share their research and learn from each other. Our approach to inreach has two main tenets: 1) professional development of trainees, and 2) building community and fostering Interactions among TSI members.

TSI was busier than ever in 2025. Our discussion groups and journal clubs kept going strong, experimenting with new formats to increase and maintain engagement from longtime TSI members and newcomers alike. Our portfolio of professional development programs expanded with the implementation of the programming workshops organized by our TSI Computing Fellow. The Debug Den and Writing Circle also became a mainstay, drawing around a dozen attendees every week who either had programming questions to debug or just wanted to work in a collaborative environment with others.

From seminar series to discussion groups to social events, there's never a dull moment at TSI!

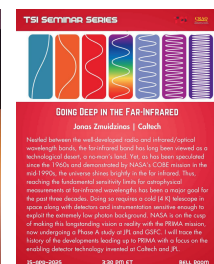
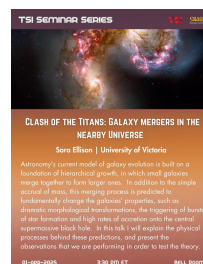
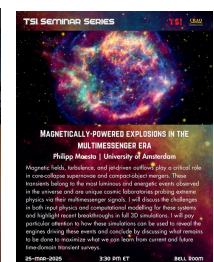
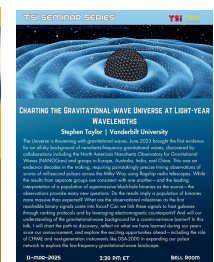
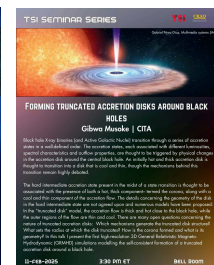
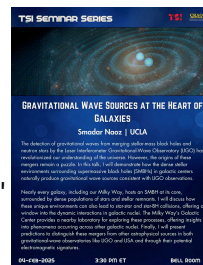
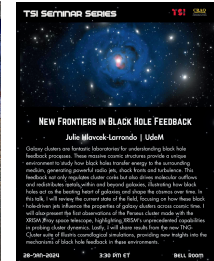


SEMINARS

TSI hosts weekly seminars featuring speakers from across North America and beyond. TSI seminars are intended to be accessible to scientists from the entire breadth of backgrounds at TSI, including physics, planetary science, geology, atmospheric science, and astrobiology. Our seminar series is made possible by a generous gift from the Trottier Family Foundation and by funding from the Centre de recherche en astrophysique du Québec (AstroQuébec).

Winter/Spring 2025

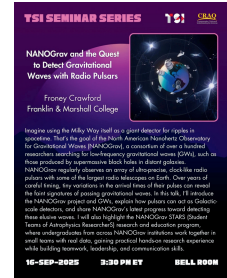
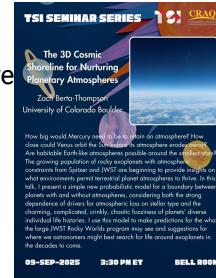
- 14 Jan** **Michael L. Wong** (*Carnegie Science*)
'Pondering Our Place in the Universe'
- 28 Jan** **Julie Hlavacek-Larrondo** (*Université de Montréal*)
'New Frontiers in Black Hole Feedback'
- 4 Feb** **Smadar Naoz** (*UCLA*)
'Gravitational Wave Sources at the Heart of Galaxies'
- 11 Feb** **Gibwa Musoke** (*CITA*)
'Forming truncated accretion disks around black holes'
- 18 Feb** **Alex Pedersen** (*McDonald Inst., Queen's University*)
'Shaping the Future of Astroparticle Physics: Innovation Through Inclusion'
- 25 Feb** **Keith McBride** (*University of Chicago*)
'Balloon-borne particle astrophysics with HELIX'
- 11 Mar** **Stephen Taylor** (*Vanderbilt University*)
'Charting the Gravitational-wave Universe at Light-year Wavelengths'
- 18 Mar** **Anna Ho** (*Cornell University*)
'Finding Relativistic Stellar Explosions as Fast Optical Transients'
- 25 Mar** **Phillip Moesta** (*Universiteit van Amsterdam*)
'Magnetically-powered explosions in the multimessenger era'
- 1 Apr** **Sara Ellison** (*University of Victoria*)
'Clash of the Titans: Galaxy mergers in the nearby Universe'
- 8 Apr** **Gwen Eadie** (*University of Toronto*)
'Studying the Universe with Astrostatistics'
- 15 Apr** **Jonas Zmuidzinas** (*Caltech*)
'Going Deep in the Far-Infrared'



Fall 2025

9
Sep

Zach Berta-Thompson (*University of Colorado Boulder*)
'The 3D Cosmic Shoreline for Nurturing Planetary Atmospheres'

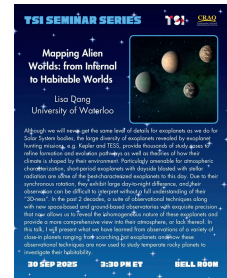
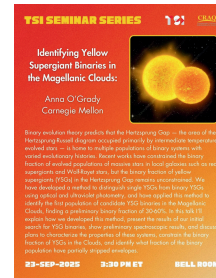


16
Sep

Froney Crawford (*Franklin & Marshall College*)
'NANOGrav and the Quest to Detect Gravitational Waves with Radio Pulsars'

23
Sep

Anna O'Grady (*Carnegie Mellon University*)
'Identifying Yellow Supergiant Binaries in the Magellanic Clouds'

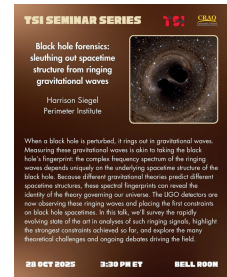


30
Sep

Lisa Dang (*University of Waterloo*)
'Mapping Alien Worlds: from Infernal to Habitable Worlds'

7
Oct

Celia Elliott (*University of Illinois, Urbana-Champaign*)
'Communicating in Science—Celia's Tips for Science Talks'

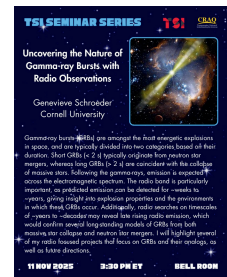
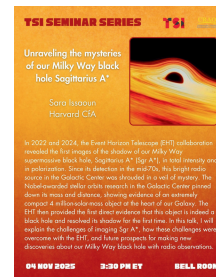


28
Oct

Harrison Siegel (*Perimeter Institute*)
'Black hole forensics: sleuthing out spacetime structure from ringing gravitational waves'

4
Nov

Sara Issaoun (*Harvard Center for Astrophysics*)
'Unraveling the mysteries of our Milky Way black hole Sagittarius A*'

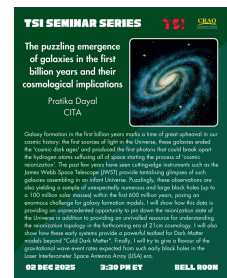
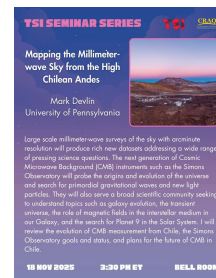


11
Nov

Genevieve Schroeder (*Cornell University*)
'Uncovering the Nature of Gamma-ray Bursts with Radio Observations'

18
Nov

Mark Devlin (*University of Pennsylvania*)
'Mapping the Millimeter-wave Sky from the High Chilean Andes'



2
Dec

Pratika Dayal (*CITA*)
'The puzzling emergence of galaxies in the first billion years and their cosmological implications'

JOURNAL CLUBS

TSI members organize a variety of journal clubs and discussion groups that span across the various disciplines represented at TSI. From general discussions like astro-ph, to niche topics, there's something for everyone at TSI!

Astro-ph

Astro-ph is a weekly journal discussion that takes place every Wednesday afternoon at TSI over donuts and coffee. It is an open discussion group where people can feel free to share something they've learned from an interesting paper in a constructive environment. It serves as a space where the McGill astronomy community can learn from one another. It runs for about 30 minutes and bears the name of the arXiv tag where nearly all astronomy papers come from: astro-ph!

Transients Discussion

Transient Discussion is a weekly journal club centred around transients – astrophysical phenomena that change their brightness over a relatively short time. It brings together researchers from across TSI to discuss any topics that are related to transients, such as supernovae, pulsars, FRBs, accreting binaries, and more. Each week, a different person walks the group through a relevant paper over the course of about 30 minutes. Transient Discussion also occasionally has guest speakers or visitors.

Cosmo-ph

Cosmo-ph is a weekly journal club at TSI focused on keeping up with recent results in observational and theoretical cosmology. Discussions are generally led by graduate students and postdocs, and feature papers that have appeared on the arXiv in the past few weeks. Attendees include researchers at all career stages, with expertise spanning a broad range, from instrumentation, to observations and data analysis, to high-energy particle theory.

A Week at TSI

MON Lunch Talks
12:30 PM

TUE TSI
Seminars
3:30 PM

WED Astro-ph
3:30 PM

THU Transients
Discussion
3:30 PM

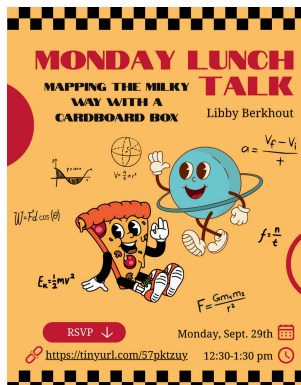
FRI Cosmo-ph
2:15 PM

TSI LUNCH TALKS

The Monday Lunch Talk Series has been a mainstay of TSI's inreach programs since the very beginning, featuring TSI grad students, postdoctoral fellows, and faculty members for short presentations over lunch, then followed by extended, informal discussions. Lunch talks are held every other Monday during the Fall and Winter terms, and regularly draw upwards of 35 participants. Any TSI member can give a lunch talk. The series serves as a great avenue for new students and postdocs to introduce themselves!

Lunch Talks provide an environment for speakers and attendees alike to explore topics beyond their own research. As such, both the format and content of talks tend to be flexible. The series has welcomed any and all formats of talks; the only "rule" is to be light on prepared material and leave plenty of space for discussion! Anything goes as long as it's somewhat under the umbrella of space, space-related topics, or any of the other work we do at TSI, including outreach, education, and EDI. Speakers are welcome to practise a conference talk, tell us about a proposal, brainstorm a new idea, test a workshop, or talk about an interesting side-project or interest.

2025 featured talks from speakers within the TSI as well as the broader astronomy community, including talks from SETI's Artist-in-Residence, Bettina Forget. From art and photography to interstellar travel, Winter 2025 encompassed the range of impact astronomy has on scientific progress, people's careers, and lifestyles. The community's enthusiasm for the Lunch Talk carried over to Fall 2025, where members presented talks on various aspects of their work and life at TSI. Find a partial roster of the talks below. We're thrilled to have TSI Lunch Talks back on our roster for 2026 and look forward to the creative topics TSI members will propose!

Nagissa Mahmoudi	"Polar Bear Paradise: A Photographic Journey Through Churchill, Manitoba"	Libby Berkhout	"Mapping the Milky Way with a Cardboard Box"
Mahesh Herath	"Interstellar Travel"	Ian Hendricksen, Aman Chokshi	"McGill Arctic Research Station: 2025 Deployments"
Vishwangi Shah, Bridget Andersen	"CHIME Outriggers Digital & Analog Deployment "	Wasi Naqvi	"Bayesball"
Aman Chokshi	"Astrophotography"		
Bettina Forget (SETI)	"Converging Art and Astronomy"		
Jojo Boyle	"Science with the Sun-Earth System"		

**A glimpse
into TSI
Lunch
Talks: 2025**

SUPPORTING SUMMER UNDERGRADUATE RESEARCHERS

Every summer since its inception, TSI has hosted undergraduate summer research students from McGill and universities across the world. An integral part of the summer research experience at TSI is the TSI Summer Undergraduate Research Program, which consists of weekly professional development discussions and an end-of-the-summer Undergraduate Research Showcase. Due to the success of the program and the impact it has on students, TSI expanded the program to also encompass researchers working in other fields of Physics in 2019, a collaboration that persists to this day. The program is open to all undergraduates conducting summer research with TSI-affiliated or Physics-affiliated professors. In 2025, we hosted 20-30 students on average in the weekly sessions and closed with a research showcase.

Although undergraduate researchers are hired to work in a particular professor's research group, they are encouraged to take part in all TSI activities, including seminars, journal clubs, informal discussions, and public outreach. Thanks to the friendly community and welcoming environment of TSI, summer undergraduate researchers gain exposure to many different research areas well beyond their own group.

A unique feature of the TSI summer undergraduate experience is our weekly workshop series. In 2025, these weekly meetings were in the format of facilitated discussions, led by TSI Postdoc Lauren Rhodes and Physics Undergraduate Advisor Kim Metera, in collaboration with TSI and Physics postdocs. The goal of these weekly meetings is twofold: 1) to provide guidance and mentorship for students at the earliest stage of their research careers, and 2) to foster a sense of community amongst the undergraduate summer researchers, providing space for them to connect with peers outside of their immediate research groups.

Discussions centre issues that are relevant to those embarking on their first research experience, focusing on knowledge assumed to be fundamental but that isn't always formally taught. The first set of topics includes an introduction to research life and communicating effectively with your research group, time-management, and structuring a research project. We then target specific skills that are necessary for researchers now and at future stages of their careers, including how to give effective talks, scientific writing, applying to graduate school, and pursuing non-academic careers. The program takes a holistic approach to what it means to be a researcher, emphasising topics around mental health and workplace climate, such as dealing with frustration, how to tackle impostor syndrome, and equity and inclusion in STEM.

Topics covered in the 2025 Weekly Workshops

- Intro to research life
- Time-management and mapping out project timelines
- Dealing with frustration
- Scientific research computing
- Literature reviews and talking about papers
- Academic Talks
- EDI in STEM
- Informal SciComm
- 3-min talks
- Academic Writing

Science communication to a variety of audiences is another central focus of our program. Students are given multiple opportunities to practise their oral communication skills, including workshops on distilling the essence of their research to people outside their field, giving 3 minute talks about their research, and 5-minute scientific talks showcasing the results of their summer research project. This year, they also honed their writing skills through workshops on scientific writing.

The community that forms during the summer program is as important as the skills that students learn. Student feedback consistently shows that our summer undergraduate researchers appreciate the opportunity to interact with their peers, especially those in other research groups. Students also form connections to department members further along in their research careers, such as the postdoctoral researchers who facilitate some of the sessions, thus expanding their support networks and their perspectives of what a research career entails.

Summer Undergraduate Research Showcase

We cap off the Summer Program with a Research Showcase, where undergraduate summer researchers present their projects to the entire TSI and Physics Department. This year's showcase took place in person over the course of an entire afternoon, with a Zoom option that also allowed people to attend remotely. This year's showcase was the largest yet; there were four blocks of presentations, where a total of 29 undergraduates gave 5-min talks about their research. The audience was enthusiastic and interactive, asking more questions than we had time for! The showcase was followed by a reception in the Rutherford lounge, where presenters and audience members alike were able to celebrate a summer of hard work.



The undergraduate research projects covered a wide range of topics that reflected the diverse and interdisciplinary nature of the TSI. The presentations were evaluated by a panel of postdoc and graduate student judges, whose job was made difficult by the impressive quality of the presentations. Students received prizes and recognitions for their presentation and communication skills and their achievements were celebrated in an 'afterparty' at the end of the Showcase.

EQUITY, DIVERSITY, & INCLUSION DISCUSSION GROUPS

TSI is committed to equity, diversity, and inclusion (EDI) within the community. Fostering and sustaining an equitable and inclusive environment that recognizes the diversity of backgrounds, identities, and expectations, strengthens our community and our research. We aim to build EDI into our activities as we develop them, taking advantage of the fact that we are still a young research institute with a promising future ahead of us. We have focused on creating space for discussion of EDI and workplace climate issues, identifying and addressing areas of underrepresentation in the immediate TSI community, and embedding equity into our inreach and outreach activities.

APIERY Discussion (Astronomy/Physics Inclusion, Engagement, Reimagining pedagogy) was a weekly discussion group run by the TSI Program Admin that focuses on science engagement, education, and pedagogy, in order to make our astronomy and physics spaces and practices more inclusive. It was the successor of the EPOD Discussion, which ran from 2016 to 2022. 2024-25 APIERY continued in Winter 2025, and was open to everybody at TSI and any of our member departments, regardless of position within the university or level of knowledge. While Astronomy and Physics were in the title, discussions also drew upon and were relevant to other areas of science education. Topic selection was a collective effort; at the beginning of each term, we ran a brainstorming session where everyone was encouraged to suggest topics.

APIERY operated primarily like a journal club; the discussion was based on an academic paper (though other sources like blogs, podcasts, and YouTube videos were also used). The paper served as a jumping-off point to discuss a broader topic. We also ran APIERY Hack Sessions, where we agreed on a collaborative project related to a topic we've previously discussed. Hack sessions were meant to help APIERY participants use the knowledge they've gained to produce something concrete and actionable, even if it's small. In February 2025, a Hack Session on creating an AI/ML (Artificial Intelligence/Machine Learning) Wiki was organized. The Wiki would serve as a one-stop shop for information on how research groups use AI/ML, best practices in AI/ML usage, interdisciplinary applications, and things that could go wrong when employing Large Language Models (LLMs).

Following in the footsteps of the APIERY (Astronomy/Physics Inclusion, Engagement, Reimagining pedagogy) discussion group started by TSI staff, the Physics and Society discussion group was run in Fall 2025 by TSI and Physics graduate students serving in the Physics EDI Committee. These sessions focused on discussion of topics where astronomy and physics intersect with society, with the goal of creating awareness and inclusivity within astronomy and physics spaces. Unlike APIERY, this group expands its material beyond that of a journal club, including discussions of non-academic sources like documentaries, non-peer reviewed articles/essays, blogs, podcasts, or YouTube videos. The discussion material serves as a conversation starter and serves to raise awareness of issues outside of the academic ivory tower. We hope to continue our collaboration with the Physics EDI Committee in offering this discussion group in 2026 to the TSI community.

RESEARCH COMPUTING SUPPORT

Research computing remained an active and developing area within the Trottier Space Institute (TSI) throughout 2025, with efforts focused on fostering computational skills, supporting collaborative development, and building infrastructure for future initiatives.

A key initiative this year was the planning and execution of a software engineering and computational research event (RSC) in March–April 2025. This event, aimed at researchers with strong computational backgrounds in Physics and TSI, was designed to include lightning talks and community knowledge sharing. Invitations were structured to first engage computational research professionals, followed by broader participation from graduate students. This reflects a continued effort to formalize spaces for computational exchange and interdisciplinary collaboration.

TSI also explored participation in Google Summer of Code (February 2025), led in part through computing-focused coordination. While participation was not achieved due to an insufficient number of project proposals, the initiative demonstrated clear interest in connecting TSI researchers with open-source software ecosystems and structured mentorship opportunities.

These efforts contributed directly to improved collaboration and long-term sustainability of computational research practices.

TSI's Computing Fellow also supported computational engagement through coding-oriented activities, including participation in Advent of Code (January 2025), which encouraged algorithmic problem solving and programming practice within the community. The Debug Den and Writing Circle, a weekly informal get-together, where people come to work in a social setting, seek help for issues with code or writing or attend a dedicated session—such as website development, research proposals, info sessions or preparation sessions for future workshops—continued to be organized through April 2025, when our Computing Fellow Ste O'Brien concluded his tenure at TSI.

In addition, hiring efforts for a new Computing Fellow progressed significantly during 2025, with an offer accepted and a start date planned for March 2026. This role is expected to continue and expand TSI's capacity for delivering structured workshops, tutorials, and computational support in future years.

05 PEOPLE

AWARDS

Faculty Members

Robert Brandenberger

*Affiliate, Kavli Institute for Physics and Mathematics
of the Universe (Kavli Institute, Kashiwa, Japan)
Distinguished James McGill Professor (McGill
University)*

Victoria Kaspi

*Rittenhouse Lectureship (University of Pennsylvania)
Francis E. Walker Lecture (George Washington
University)*

Postdoctoral Researchers

Aaron Pearlman

*NASA Hubble Fellowship (NASA Hubble Fellowship
Program)*

Amanda Cook

*Banting Postdoctoral Fellowship (NSERC)
Student Paper Award (American Statistical Association
Astrostatistics Interest Group)*

Mayura Balakrishnan

Banting Postdoctoral Fellowship (NSERC)

Graduate Students

Aditya Krishna Karigiri Madhusudhan

*Murata Family Fellowship (McGill University)
Mitacs Globalink Research Award (Mitacs)*

Élise Leclerc

Graduate Excellence Scholarship (McGill University)

Hannah Fronenberg

*L'Oréal Canada France-Canada Research Fund Award
D.W. Ambridge Prize (McGill University)*

Kim Morel

NSERC Canada Graduate Scholarship - Doctoral (CGS D)

Matias Castro-Tapia

FRQNT Doctoral Scholarship

Patrick Horlaville

NSERC Canada Graduate Scholarship - Doctoral (CGS D)

Sophia D'Agostino Rubens

Graduate Excellence Scholarship (McGill University)

Wasi Naqvi

*Kharusi Family Science Fellowship (McGill University)
Carl Reinhardt Fellowship (McGill University)*

Zach Sumners

Chalk-Rowles Fellowship (McGill University)

TSI DIRECTORY

Faculty Members

Robert Brandenberger (Phys)
Cynthia Chiang (Phys)
Jim Cline (Phys)
Nicolas Cowan (Phys/EPS)
Andrew Cumming (Phys)
Matt Dobbs (Phys)
Natalya Gomez (EPS)
Daryl Haggard (Phys)
David Hanna (Phys)
Jason Hessels (Phys)

Yi Huang (AOS)
Vicky Kaspi (Phys)
Adrian Liu (Phys)
Nagissa Mahmoudi (EPS)
Ken Ragan (Phys)
Katelin Schutz (Phys)
Jonathan Sievers (Phys)
Tracy Webb (Phys)
Lyle Whyte (NRS)

Associate Members Staff

René Doyon (UdeM)
Yashar Hezaveh (UdeM)
Vahid Kamali (Bu-Ali Sina U.)
Richard Léveillé (EPS)
Laurence Perrault-Levasseur (UdeM)

Carolina Cruz-Vinaccia
Maxime Mutombo
Stephan O'Brien

Postdoctoral Researchers

Mayura Balakrishnan (Phys)
Lindsay Berkhout (Phys)
Casey Brinkman (Phys)
Arnab Chakraborty (Phys)
Aman Chokshi (Phys)
Amanda Cook (Phys)
Alice Curtin (Phys)
Tatsuya Daniel (Phys)
Wellington De Oliveira Avelino (Phys)

Melissa Diamond (Phys)
Hannah Dykaar (Phys)
Affan Khadir (Phys)
Vigneshwaran Krishnamurthy (Phys)
Richard Labrie (EPS)
Robert Main (Phys)
Ryan Mckinven (Phys)

Joshua Montgomery (Phys)
Mason Ng (Phys)
Giang Nguyen (Phys)
Ayush Pandhi (Phys)
Aaron Pearlman (Phys)
Lauren Rhodes (Phys)
Mawson Sammons (Phys)
Debanjan Sarkar (Phys)

Elena Savidge (EPS)
Yitian Sun (Phys)
William Tyndall (Phys)
Sophia Waddell (Phys)
Mike Wilensky (Phys)
Yong Xu (Phys)
Luna Zagorac (Phys)

Graduate Students

Thomas Abbott (Phys)
Michel Adamic (Phys)
Mohan Agrawal (Phys)
Roman Akhmetshyn (Phys)
Avery Albert (NRS)
Laurie Amen (Phys)
Daniel Amouyal (Phys)
Bridget Andersen (Phys)
Srobona Basak (Phys)
Matteo Blamart (Phys)
Olivia Blenner-Hasset (NRS)
Nirmalya Brahma (Phys)
Matias Castro Tapia (Phys)
Paul Chouha (Phys)
Vincent Comeau (Phys)
Rachel Darlinger (Phys)
Evan Davies-Veile (Phys)
Natnael Debru (Phys)
Caitlin Mackenzie Dewar (Phys)
Dhvani Doshi (Phys)
Stephen Fay (Phys)

Nicole Ford (Phys)
Hannah Fronenberg (Phys)
Kit Gerodias (Phys)
Jennifer Glover (Phys)
Joshua Goodeve (Phys)
Berkin Gurbuz (Phys)
Rebecca Hamel (Phys)
Raphael Hardy (Phys)
Ian Hendricksen (Phys)
Mahesh Herath (EPS)
Lawrence Herman (Phys)
Steven Hsueh (Phys)
Jeff Huang (Phys)
Michael Jafs (Phys)
Naman Jain (Phys)
Patrick Janulewicz (Phys)
Hao Jiao (Phys)
Zarif Kader (Phys)
Aditya Karigiri Madhusudhan (Phys)
Numa Karolinski (Phys)
Melisa Kozey (NRS)

Magnus L'Argent (Phys)
Élise Leclerc (Phys)
Han Lei (Phys)
Katherine Lei (Phys)
Anan Lu (Phys)
Matthew Lundy (Phys)
Keza (Kevin) Marimbu (Phys)
Francis McGee (Phys)
Kyle McGregor (Phys)
Samuel McNichol (EPS)
Marcus Merryfield (Phys)
Kyle Miller (Phys)
Kim Morel (Phys)
Georgia Mraz (Phys)
Nicole Mulyk (Phys)
Varun Muralidharan (Phys)
Lisa Nasu-Yu (Phys)
Wasi Naqvi (Phys)
Robert Pascua (Phys)
Julia Pasiecznik (Phys)
Guillaume Payeur (Phys)

Syed Nayyer Raza (Phys)
Diego Allan Reyna (Phys)
Marlon Josue Rivera Valladares (Phys)
Leandro Rizk (Phys)
Maclean Rouble (Phys)
Jean-Samuel Roux (Phys)
Sophia Rubens (Phys)
Ketan Sand (Phys)
Vishwangi Shah (Phys)
Chris Sheridan (Phys)
Sarah Silverman (EPS)
Jared Splinter (EPS)
Zachary Steinberg (Phys)
Zach Sumners (Phys)
Afura Taylor (Phys)
Sachin Thulicheri (Phys)
Shronim Tiwari (Phys)
Nicolas Vieira (Phys)
Samantha Wong (Phys)
Wenke Xia (Phys)
Shu Zhang (Phys)

Undergraduate Students

Airene Ahuja
Audreanne Bernier
Thomas Bolder
Justin Bourdignon
Jasmine Boyd
Kieron Brandt
Ruiqi (Rich) Chen
Samuel Collins
Sean Collins
Ben Coull-Neveu
Ethan Coulthard
Zachary Desy
Marek Detière-Venkatesh
Anahita Deylemi
Gabriel Dinsmore-Savage

Tomoji Duggan
Stella Eleftheriotis
Victory Friesen
Daphne Gavras
Samuel Gultom
Michael Hetu
Dinah Ibrahim
Piotr Jakuc
Philippe Joly
Louna Kautz
Mathis Lechaume-Robert
Chloé Legué
Valerie Lehar
Arnaud Lemay-Bossu
Gershon Levin

Andrei Li
Yue Ma
Rae Maracle
Natalia Martorella
Loïc Mas
Thomas Meunier-Bolduc
Nicolas Montano Grajales
Maya Mori
Valeria Mossotsekilkina
Wasi Naqvi
Natalie Oosterman
Olivia Pereira
Emma Pimentel
Emma Rancourt
Sandhya Rottot

Benjamin Salewicz
Akash Shah
Maya Smith
Thato Sotashe
Nisrine Sqalli
Félix St-Amour
Savas Stroica
Jesse Sutherland
Melanie Szpigel
Rémi Tellier
Di Tian
Yifan Wang
Samuel Weinbaum
Rosalind (August) Wignall-Torrey
Fannie (Fangyu) Zhao

TSI SUMMER UNDERGRADUATE RESEARCH AWARDS

TSI Summer Undergraduate Research Awards (TSI SURAs), established in 2021, fund excellent undergraduate students interested in pursuing research with TSI faculty members. The program acts as a financial complement to our existing Summer Undergraduate Research Program and aims to make more opportunities for summer research accessible, existing alongside other McGill summer undergraduate fellowship programs (NSERC USRA & McGill SURA). Applications are open to students pursuing an undergraduate degree in relevant fields at any Canadian university, at any point in their programs.

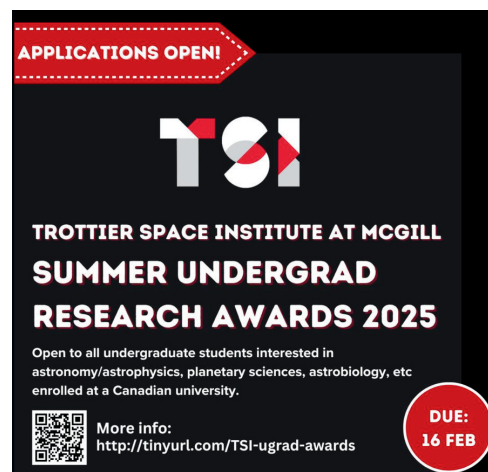
In recognition of the growing importance of having access to research opportunities, we actively encourage applications from students in the early stages of their program. The evaluation process was designed with TSI's commitment to equity, diversity, and inclusion in mind. Applications are evaluated by the TSI Summer Undergraduate Award Committee (see page 46).

Applications are evaluated on four criteria: 1) motivation for pursuing research, 2) preparedness for research, 3) capacity for engagement, and 4) academic excellence. This more expansive definition of success allows applicants to showcase their achievements inside and outside their academic programs. During the deliberation process, the committee also takes care to ensure that a diversity of interests, research fields, and background are represented on the short list of candidates.

In this fifth year of the program, we received over 120 applications from students enrolled in universities across Canada. We awarded 8 TSI SURAs: below are the members of the 2025 cohort.

Marek Detière-Venkatesh • McGill University • Prof. Adrian Liu
Samuel Gultom • University of Toronto • Prof. Matt Dobbs
Dinah Ibrahim • McGill University • Prof. Daryl Haggard
Philippe Joly • McGill University • Prof. Jonathan Sievers

Maya Mori • McGill University • Prof. Cynthia Chiang
Maya Smith • McGill University • Prof. Jason Hessels
Thato Sotashe • University of Toronto • Prof. Tracy Webb
Melanie Szpigel • University of Toronto • Prof. Vicky Kaspi



TSI FELLOWSHIPS

Trottier Space Institute Fellowships are made possible by a generous donation from the Trottier Family Foundation to support TSI postdoctoral researchers and undergraduate summer researchers.

TSI Postdoctoral Fellows

TSI Postdoctoral Fellowships recognize excellence in research and are awarded by a committee of faculty members across different fields of TSI.



Libby Berkhout

Physics • Prof. Matt Dobbs' & Prof. Cynthia Chiang's Group

Dr. Berkhout joined TSI in Fall 2024. She designs and tests instruments that focus on understanding the history and evolution of the Universe. Using a technique called intensity mapping, these instruments study the distribution of matter throughout cosmic history. Dr. Berkhout specifically works on the unique engineering challenges these telescopes face as they observe some of the oldest and farthest away light in the Universe.



Casey Brinkman

Physics • Supervisors

Dr. Brinkman joined TSI in June 2025. She studies the diversity of rocky planet compositions and whether most exoplanets are similar to the Earth. She also studies the chemical composition of the stars they orbit and whether the star and planet have the same chemical ratios, since they're all made of star stuff!



Arnab Chakraborty

Physics • Prof Matt Dobbs' Group

Dr. Chakraborty joined TSI in Fall 2021. His research focuses on understanding and mitigating instrumental systematics and foregrounds to extract the faint cosmological 21-cm signal. He works on auto-correlation measurements with the Canadian Hydrogen Mapping Experiment (CHIME) and also contributed to developing the calibration algorithm for the upcoming Canadian Hydrogen Observatory and Radio-transient Detector (CHORD).



Tatsuya Daniel

Physics • Prof. Robert Brandenberger's Group

Dr. Daniel joined TSI in Fall 2025. His research is in theoretical astrophysics and cosmology, covering topics such as early Universe cosmology, general relativity, dark matter, modified theories of gravity, gravitational waves, and machine learning.



Saniya Heeba

Physics • Prof Katelin Schutz's Group

Dr. Saniya Heeba has been a TSI Postdoctoral Fellow since Fall 2021. She studies dark matter phenomenology at the intersection of particle physics and cosmology. Her recent work explores how interactions with an ambient particle environment can alter dark matter properties, potentially revealing new ways to detect it.



Richard LaBrie

EPS • Prof. Nagissa Mahmoudi's Group

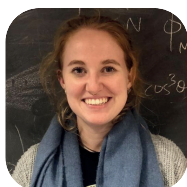
Dr. Labrie joined TSI in June 2023. Using the deep ocean as a model for Ocean Worlds, his research explores how microbes survive in extreme environments. Although life is harsh in the deep ocean, microbes fail to use most of the organic carbon (their food source). Using laboratory experiments, he studies how they utilize different organic molecules and how they impact the ocean's carbon cycle.



Aaron Pearlman

Physics • Prof. Vicky Kaspi's Group

Dr. Pearlman has been a TSI postdoctoral fellow since Fall 2020. He studies fast radio bursts (FRBs), extragalactic radio flashes of unknown origin. He has been playing a leadership role in building three new Outrigger radio telescopes across North America, which are being used with the CHIME/FRB telescope to localize large numbers of FRBs with sub-arcsecond precision.



Lauren Rhodes

Physics • Prof. Daryl Haggard's Group

Dr. Rhodes has been a TSI postdoctoral fellow since Fall 2024. Her research focuses on using radio telescopes to study transient events associated with the formation and growth of compact objects, which helps to improve our understanding of some of the most extreme environments in the Universe.



Mawson Sammons

Physics • Prof Vicky Kaspi's Group

Dr. Sammons joined TSI in October 2023. His research focuses on understanding how Fast Radio Bursts (FRBs) propagate through our Universe and how they can be used to explore it. Specifically, he's been investigating how clusters of galaxies gravitationally lens FRBs, a phenomenon which could help unveil the origins of FRBs as well as the nature of dark matter itself.



Debanjan Sarkar

Physics • Prof. Adrian Liu's Group

Dr. Sarkar joined TSI in August 2023. He uses galaxy surveys and line intensity mapping to study cosmology and astrophysics, focusing primarily on modeling and inference. His current work includes developing a simulation pipeline for the 21-cm signal expected from the CHORD telescope and an inference pipeline for the observations with the HERA telescope. Additionally, he is estimating various summary statistics from LIM observations.



Elena Savidge

EPS • Prof. Natalya Gomez's Group

Dr. Savidge joined TSI in September 2025. She uses reflected GNSS signals to measure sea level in the Canadian High Arctic. By analyzing their reflections from the ocean surface near a shore-mounted antenna at Grise Fjord, Nunavut, she tracks tides and sea level change in a harsh, remote environment where traditional instruments are difficult to maintain and observations are sparse.



Tobias Schroeder

Physics • Prof. Robert Brandenberger's Group

Dr. Schroeder joined TSI in Fall 2025. He studies the link between cosmic strings and the gravitational wave background (GWB). Specifically, he has shown that models of GWB generated by low-tension strings differ qualitatively from those of higher-tension strings, and more recently has applied his findings to the results of pulsar timing arrays.



Emilie Storer

Physics • Prof. Jonathan Siever's Group

Dr. Storer joined TSI in Fall 2023. She analyzes data collected from a variety of telescopes. These telescopes are used to peer back in time to when the Universe was much younger and in some ways simpler, to get information about the properties of the Universe as a whole and to understand the formation of the first stars and galaxies.



Yitian Sun

Physics • Prof. Katelin Schutz's Group

Dr. Sun has been a TSI postdoctoral fellow since Fall 2024. He searches for interactions between dark matter and the visible Universe. Using simulations and Machine Learning, he looks for signals in astrophysical data that may reveal dark matter's particle nature. He is focused on looking for any energy-injecting dark matter, the promising axion model, and the mysterious gamma-ray glow in the Galactic Center that may be of dark matter origin.



William Tyndall

Physics • Prof. Cynthia Chiang's Group

Dr. Tyndall joined TSI in Fall 2024. He is interested in developing and testing radio instrumentation for 21cm intensity mapping experiments. He is also developing and improving drone-based calibration techniques for radio telescopes and interferometers.



Sophia Waddell

Physics • Prof. Daryl Haggard's Group

Dr. Waddell has been a TSI postdoctoral fellow since December 2024. She studies active galactic nuclei (AGN), supermassive black holes with masses millions to billions of times greater than our sun, that lie at the centre of most galaxies. The AGN she studies are special in that they are actively accreting material. To study them, she uses X-ray telescopes, which allow us to probe the hottest material closest to the black hole.



Michael Wilensky

Physics • Prof. Adrian Liu's Group

Dr. Wilensky joined TSI in Fall 2024. He uses measurements from radio interferometers to look for ancient, yet-to-be-detected, signals from the early Universe that will tell us about its history. He specialises in developing formal statistically-motivated methods for extracting information from data, such as identifying corrupted data or describing the instrument's behaviour.



Yong Xu

Physics • Prof. Jim Cline's Group

Dr. Xu joined TSI in Fall 2025. He works in theoretical particle cosmology, connecting quantum field theory with the dynamics of the early Universe. His research develops predictive frameworks to uncover the microphysics of the pre-Big Bang Nucleosynthesis epoch through gravitational waves, dark matter, and precision cosmological observables.



Luna Zagorac

Physics • Prof. Katelin Schutz's Group

Dr. Zagorac joined TSI in September 2025. She is deeply curious about what the Universe is up to and how humans interact with and understand it. She enjoys working in radically interdisciplinary ways, from marrying quantum-inspired techniques and numerical simulations of wave dark matter to using Python to map ancient Egyptian star data from hieroglyphs to virtual skies.

TSI GOVERNANCE

TSI Board 2025

External Members

Lorne Trottier • Co-founder • Matrox

Marc Guilbert • Founder • Hard Climate

Fiona Harrison • Benjamin M. Rosen Professor of Physics • California Institute of Technology

Internal McGill Members

Chris Manfredi • Provost

Dominique Bérubé • VP - Research & Innovation

Alanna Watt • Dean - Faculty of Science

Fellowships Committee

Adrian Liu [chair] • Assoc. Professor, Physics

Nicolas Cowan • Assoc. Professor, Phys./EPS

Andrew Cumming • Assoc. Professor, Physics

Tracy Webb • Assoc. Professor, Physics

TSI Seminar Committee

Jim Cline [co-chair] • Professor, Physics

Jason Hessels [co-chair] • Professor, Physics

Matt Dobbs • Professor, Physics

Casey Brinkman • Postdoc. Resear., Physics

Hannah Dykaar • Postdoc. Researcher, Physics

Mason Ng • Postdoc. Researcher, Physics

Lauren Rhodes • Postdoc. Resear., Physics

Mawson Sammons • Postdoc. Resear., Physics

TSI Members

Vicky Kaspi • TSI Director; Professor, Physics

Jim Cline • Professor, Physics

Daryl Haggard • Associate Professor, Physics

Nagissa Mahmoudi • Assistant Professor, EPS

Amanda Cook • Postdoc. Researcher, Physics

Sophia Rubens • PhD student, Physics

Undergraduate Summer Awards Committee

Carolina Cruz-Vinaccia • TSI Program Admin.

Stephan O'Brien • TSI Computing Fellow

Libby Berkhout • Postdoc. Researcher, Physics

Richard Labrie • Postdoc. Researcher, EPS

Giang Nguyen • Postdoc. Researcher, Physics

Lauren Rhodes • Postdoc. Resear., Physics

Mawson Sammons • Postdoc. Resear., Physics

Mike Wilensky • Postdoc. Researcher, Physics

06

IMPACT

FACILITIES USED BY TSI MEMBERS

Laboratory and Computing Facilities

Béluga supercomputer

(Cumming, Haggard, Hessels, Liu, Kaspi)

Owned and administered by Digital Research Alliance of Canada (formerly Compute Canada) and Calcul Québec.

Digital Research Alliance of Canada Computing and Storage Facilities

(accessible to all TSI members and their research groups)

Supercomputers including Rorqual, Narval, Arbutus, Fir and Cedar, owned and administered by Digital Research Alliance of Canada (formerly Compute Canada) and Calcul Québec.

The Gamma-ray Astronomy Laboratory

(Hanna, Ragan)

Develops instrumentation for astroparticle and particle physics detectors.

Graham supercomputer

(Cumming, Haggard)

Owned and administered by Digital Research Alliance of Canada (formerly Compute Canada).

Guillimin supercomputer

(Haggard, Hanna, Hessels, Huang, Kaspi, Gomez, Ragan)

Owned and administered by Digital Research Alliance of Canada (formerly Compute Canada) and Calcul Québec.

The McGill Arctic Research Station (MARS)

(Chiang, Whyte)

Supports field research activities consisting of sample acquisition, some limited laboratory microbial and molecular analyses, and in situ analyses for microbial activity. Also used for low-frequency radio astronomy observations.

The McGill Cosmology Instrumentation Laboratory

(Dobbs)

Develops complex digital and ultra-low noise analog cryogenic electronics for astrophysics. Includes separate labs for radio instrumentation and mm-wave instrumentation.

McGill Radio Lab

(Chiang)

Develops radio instrumentation for observational cosmology experiments.

Prof. Whyte's laboratory

(Whyte)

One of the few laboratories worldwide with the facilities to perform fundamental studies at subzero temperatures for molecular biology/microbiology and astrobiology-related investigations.

Ground-based Telescopes

Anglo-Australian Telescope
(Webb)

Atacama Large Millimeter Array
(Haggard, Webb)

Australian Telescope Compact Array
(Haggard)

Canada-France-Hawaii Telescope
(Cowan, Haggard, Webb)

The Canadian Hydrogen Intensity Mapping Experiment - CHIME
(Dobbs, Hessels, Kaspi)

The Canadian Hydrogen Observatory and Radio transient Detector - CHORD
(Chiang, Dobbs, Hessels, Kaspi, Liu, Sievers)

Event Horizon Telescope Array
(Haggard)

European Southern Observatory: La Silla 3.6 m Telescope
(Cowan)

Gemini Observatory
(Cowan, Haggard, Webb)

Green Bank Telescope, Radio wavelengths
(Kaspi)

The Hydrogen and Intensity Real-time Analysis eXperiment (HIRAX)
(Chiang, Dobbs, Sievers)

The Hydrogen Epoch of Reionization Array (HERA)
(Liu, Sievers)

James Clerk Maxwell Telescope
(Haggard)

Jansky Very Large Array, Radio wavelengths
(Haggard, Kaspi, Webb)

Large Millimeter Telescope Alfonso Serrano
(Haggard, Webb)

Low-Frequency Array (LOFAR)
(Hessels)

Observatoire du Mont-Mégantic
(Cowan)

POLARBEAR & the Simons Array, mm-wave, Cosmic Microwave Background
(Dobbs)

Probing Radio Intensity at high-Z from Marion (PRIZM)
(Chiang, Sievers)

Pulsar backend recording and analysis system for CHIME
(Dobbs, Kaspi)

South Pole Telescope, mm-wave, Cosmic Microwave Background
(Dobbs)

W.M. Keck Observatory
(Haggard, Webb)

VERITAS Gamma-ray Observatory
(Hanna, Ragan)

Space-based Telescope Facilities

ESA/XMM-Newton X-ray Telescope
(Haggard, Kaspi, Webb)

NASA/Chandra X-ray Observatory
(Haggard, Kaspi, Webb)

NASA/Fermi mission
(Haggard, Ragan)

NASA/Hubble Space Telescope
(Cowan, Haggard, Webb)

NASA/James Webb Space Telescope
(Cowan, Haggard)

NASA/Neutron Star Interior Composition Explorer, NICER
(Haggard, Kaspi)

NASA/NuSTAR X-ray Mission
(Haggard, Kaspi)

NASA/Swift X-ray Telescope
(Haggard, Kaspi)

NASA/Transiting Exoplanet Survey Satellite
(Cowan)

FACULTY COLLABORATIONS

Ariel (European Space Agency's M4 mission) • (Cowan)

CASE - Contribution to Ariel Spectroscopy of Exoplanets • (Cowan)

CSA's CASTOR - Cosmological Advanced Survey Telescope for Optical and Ultraviolet Research • (Cowan, Haggard)

CHIME The Canadian Hydrogen Intensity Mapping Experiment • Cosmology (Dobbs) and Fast Radio Burst (Kaspi, Dobbs)

CHORD The Canadian Hydrogen Observatory and Radio transient Detector • (Chiang, Dobbs, Kaspi, Liu, Sievers)

D3A - Deep Dish Development Array • (Chiang, Dobbs, Sievers)

Event Horizon Telescope Collaboration • (Haggard)

GBNCC - The Green Bank North Celestial Cap pulsar survey • (Kaspi)

HELIX - High Energy Light Ion eXperiment • (Hanna)

HERA - The Hydrogen Epoch of Reionization Array • (Liu, Sievers)

HIRAX • (Chiang, Dobbs, Sievers)

JINA/CEE - Joint Institute for Nuclear Astrophysics - Centre for Evolution of the Elements • (Cumming)

Laser Interferometer Space Antenna (LISA) Consortium (European Space Agency's L3 mission) • (Haggard)

MIST - Mapper of the IGM Spin Temperature • (Chiang, Sievers)

NANOGrav The search for gravitational waves using pulsars • (Kaspi)

NASA's Neutron Star Interior Composition Explorer (NICER) • (Kaspi)

Next Generation Event Horizon Telescope Collaboration • (Haggard)

NIRISS - Near-InfraRed Imager and Slitless Spectrograph, James Webb Space Telescope • (Cowan)

NIRPS - Near Infrared Planet Spectrograph • (Cowan)

PALFA - Pulsar Arecibo L-Band Feed Array survey • (Kaspi)

POLARBEAR • (Dobbs)

PITCH BLACK - JCMT Large Program • (Haggard)

PRIZM/ALBATROS • (Chiang, Sievers)

The Simons Array • (Dobbs)

The Simons Observatory • (Sievers)

SpARCS - Spitzer Adaptation of the Red-Sequence Cluster Method • (Webb)

SPIRou (Spectro-Polarimetre InfraRouge) Science Legacy Survey • (Cowan)

SPT - The South Pole Telescope • (Dobbs)

VERITAS • (Hanna, Ragan)

PUBLICATIONS

Abac, A. G. et al. (2025) Search for Continuous Gravitational Waves from Known Pulsars in the First Part of the Fourth LIGO-Virgo-KAGRA Observing Run. *ApJ*, 983, 99

Abbott, T. C. et al. (2025) frb-voe: A Real-time Virtual Observatory Event Alert Service for Fast Radio Bursts. *AJ*, 169, 39

Acharyya, A. et al. (2025) VERITAS and Multiwavelength Observations of the Blazar B3 2247+381 in Response to an IceCube Neutrino Alert. *ApJ*, 982, 80

Acharyya, A. et al. (2025) An In-depth Study of Gamma Rays from the Starburst Galaxy M82 with VERITAS. *ApJ*, 981, 189

Adams, C. B. et al. (2025) HAWC, VERITAS, Fermi-LAT, and XMM-Newton Follow-up Observations of the Unidentified Ultra-high-energy Gamma-Ray Source LHAASO J2108+5157. *ApJ*, 991, 192

Adams, C. B. et al. (2025) Multiwavelength Observation of a Candidate Pulsar Halo LHAASO J0621+3755 and the First X-Ray Detection of PSR J0622+3749. *ApJ*, 985, 90

Adams, C. B. et al. (2025) Constraints on axionlike particles from VERITAS observations of a flaring radio galaxy in the Perseus cluster. *PhRvD*, 112, 103044

Ade, P. A. R. et al. (2025) Analysis of Polarized Dust Emission Using Data from the First Flight of SPIDER. *ApJ*, 978, 130

Akhmetshyn, R. et al. (2025) Mapping Atmospheric Features of the Planetary-mass Brown Dwarf SIMP 0136 with JWST NIRISS. *ApJ*, 993, 237

Alaei, A. et al. (2025) Warm little inflation in high dissipative regime in the light of Planck 2018. *PDU*, 50, 102140

Allart, R. et al. (2025) NIRPS detection of delayed atmospheric escape from the warm and misaligned Saturn-mass exoplanet WASP-69 b. *A&A*, 700, A7

Allart, R. et al. (2025) A complex structure of escaping helium spanning more than half the orbit of the ultra-hot Jupiter WASP-121 b. *NatCo*, 16, 10822

Alonso-Álvarez, G. et al. (2025) Dark photon distortions of NOvA and T2K neutrino oscillations. *EPJC*, 85, 635

Altamirano, C. et al. (2025) Using the Antenna Impedance to Estimate Soil Electrical Parameters for the MIST Global 21 cm Experiment. *PASP*, 137, 085002

Alvarez, M. A. et al. (2025) Back-Reaction of Super-Hubble Fluctuations, Late Time Tracking, and Recent Observational Results. *Symm*, 17, 1507

Andrade, C. et al. (2025) CHIME All-sky Multiday Pulsar Stacking Search (CHAMPSS): System Overview and First Discoveries. *ApJ*, 990, 50

Angeloudi, E. et al. (2025) The spatially resolved effect of mergers on the stellar mass assembly of MaNGA galaxies. *A&A*, 703, A290

Archer, A. et al. (2025) Constraints on the X-Ray and Very-high-energy Gamma-Ray Flux from Supernova Remnant W44. *ApJ*, 983, 73

Archer, A. et al. (2025) Measurement of the Photosphere Oblateness of γ Cassiopeiae via Stellar Intensity Interferometry with the VERITAS Observatory. *ApJ*, 995, 191

Bazinot, L. et al. (2025) Quantifying thermal water dissociation in the dayside photosphere of WASP-121 b using NIRPS. *A&A*, 701, A276

Belleau-Magnat, G. et al. (2025) Mineralogy, geochemistry and morphology of Arctic gossans on Axel Heiberg Island, NU, Canada: Spectroscopic investigation and implications for Mars. *P&SS*, 256, 106036

Ben Achour, J. et al. (2025) Quantum Gravity, Hydrodynamics and Emergent Cosmology: A Collection of Perspectives. *GrGr*, 57, 2

Bhardwaj, M. et al. (2025) A Hyperactive Fast Radio Burst Pinpointed in an SMC-like Satellite Host Galaxy. *ApJL*, 992, L35

Bhardwaj, M. et al. (2025) Constraining the Faint-end Slope of the Fast Radio Burst Energy Function Using CHIME/FRB Catalog-1 and Local Volume Galaxies. *ApJ*, 989, 130

Blakely, D. et al. (2025) The James Webb Interferometer: Space-based Interferometric Detections of PDS 70 b and c at 4.8 μ m. *AJ*, 169, 137

Blanchard, P. K. et al. (2025) James Webb Space Telescope Observations of the Nearby and Precisely Localized FRB 20250316A: A Potential Near-IR Counterpart and Implications for the Progenitors of Fast Radio Bursts. *ApJL*, 989, L49

Bocquet, S. et al. (2025) Multiprobe cosmology from the abundance of SPT clusters and DES galaxy clustering and weak lensing. *PhRvD*, 111, 063533

Bouchy, F. et al. (2025) NIRPS joining HARPS at ESO 3.6 m: On-sky performance and science objectives. *A&A*, 700, A10

Boukaré, C.-É. et al. (2025) The role of interior dynamics and differentiation on the surface and in the atmosphere of lava planets. *NatAs*, 9, 1511

Brahma, S. et al. (2025) Collective field theory of gauged multi-matrix models: integrating out off-diagonal strings. *JHEP*, 2025, 159

Brandenberger, R. & Pasiecznik, J. (2025) Origin of the $SO(9) \rightarrow SO(3) \times SO(6)$ symmetry breaking in the type IIB matrix model. *PhRvD*, 112, 026006

Brandenberger, R. (2025) Noninflationary axion and ALP misalignment mechanism. *PhRvD*, 112, 103523

Breuer, J. P. et al. (2025) The thermodynamic structure and large-scale structure filament in MACS J0717.5+3745. *A&A*, 703, A231

Calabrese, E. et al. (2025) The Atacama Cosmology Telescope: DR6 constraints on extended cosmological models. *JCAP*, 2025, 063

Carmona, A. et al. (2025) Characterizing planetary systems with SPIRou: Detection of a sub-Neptune in a 6-day period orbit around the M dwarf Gl 410. *A&A*, 700, A222

Casten, S. et al. (2025) Weak X-Ray Bursts on Slowly Accreting Neutron Stars. *ApJ*, 989, 195

Castro-Tapia, M. & Cumming, A. (2025) Three-component Phase Separation for Ultramassive White Dwarf Models. *ApJ*, 991, 64

Charpentier, P. et al. (2025) A reliable activity proxy in SPIRou spectra of M dwarfs using machine learning. *A&A*, 701, A17

Chawla, P. et al. (2025) LOFAR constraints on the repetition and environments of CHIME FRBs. *MNRAS*, 544, 4079

Chen, K.-F. et al. (2025) Impacts and Statistical Mitigation of Missing Data on the 21 cm Power Spectrum: A Case Study with the Hydrogen Epoch of Reionization Array. *ApJ*, 979, 191

- Chichura, P. M. et al. (2025) Pointing Accuracy Improvements for the South Pole Telescope with Machine Learning. *JAI*, 14, 2550001
- CHIME/FRB Collaboration et al. (2025) FRB 20250316A: A Brilliant and Nearby One-off Fast Radio Burst Localized to 13 pc Precision. *ApJL*, 989, L48
- Chime/FRB Collaboration et al. (2025) A Catalog of Local Universe Fast Radio Bursts from CHIME/FRB and the KKO. *ApJS*, 280, 6
- CHIME/FRB Collaboration et al. (2025) CHIME/FRB Outriggers: Design Overview. *ApJ*, 993, 55
- Chou, T.-L. et al. (2025) Measurements of the temperature and E-mode polarization of the cosmic microwave background from the full 500-square-degree SPTpol dataset. *PhRvD*, 111, 123513
- Cline, J. M. & Herrera, G. (2025) Plausible constraints and inflationary production for dark photons. *PhRvD*, 112, 035023
- Cline, J. M. & Laurent, B. (2025) Bubble wall velocity for first-order QCD phase transition. *PhRvD*, 111, 083522
- Cline, J. M. & Muralidharan, V. (2025) Simple quintessence models in light of DESI-BAO observations. *PhRvD*, 112, 063539
- Cline, J. M. et al. (2025) Axion strings from string axions. *PhRvD*, 111, 123558
- Coerver, A. et al. (2025) Measurement and Modeling of Polarized Atmosphere at the South Pole with SPT-3G. *ApJ*, 982, 15
- Côté, P. et al. (2025) The CASTOR mission. *JATIS*, 11, 042202
- Coulombe, L.-P. et al. (2025) Highly reflective white clouds on the western dayside of an exo-Neptune. *NatAs*, 9, 512
- Coustonis, A. et al. (2025) The quest for habitats in the outer Solar System and how to protect exotic pristine environments. *AcAau*, 233, 330
- Curtin, A. P. et al. (2025) Morphology of 35 Repeating Fast Radio Burst Sources at Microsecond Time Scales with CHIME/FRB. *ApJ*, 992, 206
- Dahale, R. et al. (2025) Origin of the ring ellipticity in the black hole images of M87*. *A&A*, 699, A279
- Dang, L. et al. (2025) A Comprehensive Analysis of Spitzer 4.5 μm Phase Curves of Hot Jupiters. *AJ*, 169, 32
- D'Aoust, L. et al. (2025) Testing the Origin of Hot Jupiters with Atmospheric Surveys. *ApJ*, 995, 144
- Das, D. et al. (2025) Simulating evaporative wet and dry cycles in Gale crater, Mars using thermochemical modeling techniques. *M&PS*, 60, 1704
- de Ruiter, I. et al. (2025) Sporadic radio pulses from a white dwarf binary at the orbital period. *NatAs*, 9, 672
- Deslières, A. et al. (2025) The Gl 229 System Revisited with the Line-by-line Framework: Planetary Signals Now Appear as Stellar Activity Ghosts. *AJ*, 169, 182
- Dong, F. A. et al. (2025) CHIME/Fast Radio Burst/Pulsar Discovery of a Nearby Long-period Radio Transient with a Timing Glitch. *ApJL*, 990, L49
- Dong, F. A. et al. (2025) CHIME/Fast Radio Burst Discovery of an Unusual Circularly Polarized Long-period Radio Transient with an Accelerating Spin Period. *ApJL*, 988, L29
- Dong, Y. et al. (2025) Searching for Historical Extragalactic Optical Transients Associated with Fast Radio Bursts. *ApJ*, 991, 199
- Doshi, D. et al. (2025) The Interpolation Constraint in the RV Analysis of M Dwarfs Using Empirical Templates. *AJ*, 170, 269
- Eftekhari, T. et al. (2025) The Massive and Quiescent Elliptical Host Galaxy of the Repeating Fast Radio Burst FRB 20240209A. *ApJL*, 979, L22
- Event Horizon Telescope Collaboration et al. (2025) The persistent shadow of the supermassive black hole of M87: II. Model comparisons and theoretical interpretations. *A&A*, 693, A265
- Event Horizon Telescope Collaboration et al. (2025) Horizon-scale variability of M87* from 2017-2021 EHT observations. *A&A*, 704, A91
- Favero, A. & Brandenberger, R. (2025) A superfluid dark matter cosmic string wake. *EPJC*, 85, 180
- Ford, N. M. et al. (2025) Tracking X-Ray Variability in Next-generation EHT Low-luminosity Active Galactic Nucleus Targets. *ApJ*, 981, 126
- Fournier-Tondreau, M. et al. (2025) Transmission spectroscopy of WASP-52 b with JWST NIRISS: water and helium atmospheric absorption, alongside prominent star-spot crossings. *MNRAS*, 539, 422
- Freyria, N. J. et al. (2025) Transcriptomic Analyses Unveil Hydrocarbon Degradation Mechanisms in a Novel Polar Rhodococcus sp. Strain R1B_2T From a High Arctic Intertidal Zone Exposed to Ultra Low Sulphur Fuel Oil. *EnvMR*, 17, e70218
- Gan, T. et al (2025) A New Brown Dwarf Orbiting an M Star and an Investigation of the Eccentricity Distribution of Transiting Long-period Brown Dwarfs. *ApJL*, 988, L78
- Gao, J. et al. (2025) Estimation Of Aerosol And Cloud Radiative Heating Rate In The Tropical Stratosphere Using A Radiative Kernel Method. *GMD*, 18, 2569
- Ge, F. et al. (2025) Cosmology from CMB lensing and delensed EE power spectra using 2019-2020 SPT-3G polarization data. *PhRvD*, 111, 083534
- Gelfand, J. D. et al. (2025) Understanding Pulsar Wind Nebulae with the SKA. *OJAp*, 8, 54247
- Gilbert, O. et al. (2025) A Host Galaxy Morphology Link between Quasiperiodic Eruptions and Tidal Disruption Events. *ApJ*, 994, 209
- Goddi, C. et al. (2025) First polarization study of the M87 jet and active galactic nuclei at submillimeter wavelengths with ALMA. *A&A*, 699, A265
- Gomes da Silva, J. et al. (2025) Blind search for activity-sensitive lines in the near-infrared using HARPS and NIRPS observations of Proxima and Gl 581. *A&A*, 700, A177
- Gonzalez Moguel, R. et al. (2025) Four years of mobile monitoring show that urban waste is the primary source of large methane emissions hotspots in Montreal, Canada. *ERCom*, 7, 091002
- Gonzalez Moguel, R. et al. (2025) Large Variability in the Radiocarbon Signature of Greenhouse Gases From Incubations of Thermokarst Lake Sediments Linked to Methane Production Rates and CH₄:CO₂ Ratios. *JGRG*, 130, e2024JG008694
- Hardy, R. et al. (2025) Hot Spot Offset Variability from Magnetohydrodynamical Thermoresistive Instability in Hot Jupiters. *ApJ*, 978, 149
- Hardy, R. et al. (2025) Magnetohydrodynamical thermoresistive instability and the Claws of chaos. *Chaos*, 35, 063130
- He, R. & Huang, Y. (2025) Muted Radiative Feedback of Stratospheric Water Vapor Found in a Multimodel Assessment. *JGRD*, 130, e2025JD043676

- Hlavacek-Larrondo, J. et al. (2025) Discovery of Diffuse Radio Emission in a Massive $z = 1.709$ Cool Core Cluster: A Candidate Radio Minihalo. *ApJL*, 987, L40
- Iles, E. et al. (2025) Dark Matter Direct Detection Experiments Are Sensitive to the Millicharged Background. *PhRvL*, 134, 121002
- Jahandar, F. et al. (2025) Chemical Fingerprints of M Dwarfs: High-resolution Spectroscopy on 31 M Dwarfs with SPIRou. *ApJ*, 978, 154
- Janulewicz, P. et al. (2025) Using Neural Networks to Automate the Identification of Brightest Cluster Galaxies in Large Surveys. *ApJ*, 981, 117
- Jiao, H. et al. (2025) Direct-collapse supermassive black holes from ultralight dark matter. *PhRvD*, 112, 043546
- Jin, Z. et al. (2025) Causal Discovery in Astrophysics: Unraveling Supermassive Black Hole and Galaxy Coevolution. *ApJ*, 979, 212
- Kamali, V. & Ramos, R. O. (2025) Thermal effects on warm chromoinflation. *JCAP*, 2025, 048
- Karam, R. et al. (2025) Monitoring observations of SMC X-1's excursions (MOOSE) III. X-ray spectroscopy of a warped, precessing accretion disc. *MNRAS*, 536, 509
- Kharey, G. S. et al. (2025) Pangenomic analysis of three putative hydrocarbon degrading genera *Limnohabitans*, *Aquabacterium*, and *Novosphingobium* collected from freshwater sources. *Genom*, 68, 0099
- Kim, H. et al. (2025) Exploring One-point Statistics in HERA Phase I Data: Effects of Foregrounds and Systematics on Measuring One-point Statistics. *ApJ*, 993, 189
- Kittiwisit, P. et al. (2025) matvis: a matrix-based visibility simulator for fast forward modelling of many-element 21 cm arrays. *RASTI*, 4, rzaf001
- Kollias, P. et al. (2025) Experiment of Sea Breeze Convection, Aerosols, Precipitation, and Environment (ESCAPE). *BAMS*, 106, E310
- Kuiper, D. et al. (2025) Representation learning for fast radio burst dynamic spectra. *MNRAS*, 538, 408
- Larue, P. et al. (2025) Chromaticity of stellar activity in radial velocities: Anti-correlated families of lines on the M dwarf EV Lac with SPIRou and SOPHIE. *A&A*, 701, A216
- Leitgeb, C. E. et al. (2025) Probing the cosmic ray background of gamma-ray astronomy with hadron colliders. *PhRvD*, 112, 083042
- Leung, C. et al. (2025) A VLBI Software Correlator for Fast Radio Transients. *AJ*, 170, 53
- Liang, Z. & Huang, Y. (2025) A Note on the Relation between the Cold-V Brightness Temperature Feature and the Above-Anvil Cirrus. *JATs*, 82, 95
- Liu, L. et al. (2025) Clouds reduce downwelling longwave radiation over land in a warming climate. *Natur*, 637, 868
- Liu, L. et al. (2025) Comparative Experimental Validation Of Microwave Hyperspectral Atmospheric Soundings In Clear-Sky Conditions. *AMT*, 18, 471
- Louis, T. et al. (2025) The Atacama Cosmology Telescope: DR6 power spectra, likelihoods and Λ CDM parameters. *JCAP*, 2025, 062
- Loutet, S. J. T. et al. (2025) Microbial communities in the Hudson Strait amidst rapid environmental change. *CaJMb*, 71, 0154
- Lu, A. et al. (2025) WISDOM project - XXIII. Star formation efficiencies of eight early-type galaxies and bulges observed with SITELLE and ALMA. *MNRAS*, 540, 71
- McCarthy, A. M. et al. (2025) The JWST Weather Report from the Isolated Exoplanet Analog SIMP 0136+0933: Pressure-dependent Variability Driven by Multiple Mechanisms. *ApJL*, 981, L22
- McConachie, I. et al. (2025) MAGAZ3NE: Evidence for Galactic Conformity in $z \geq 3$ Protoclusters. *ApJ*, 978, 17
- McKinven, R. et al. (2025) A pulsar-like polarization angle swing from a nearby fast radio burst. *Natur*, 637, 43
- Mercier, S. J. et al. (2025) Studying the variability of the He triplet to understand the detection limits of evaporating exoplanet atmospheres. *A&A*, 700, A8
- Morel, K. et al. (2025) A Moderate Albedo from Reflecting Aerosols on the Dayside of WASP-80 b Revealed by JWST/NIRISS Eclipse Spectroscopy. *AJ*, 169, 277
- Muralidharan, V. & Cline, J. M. (2025) Can baby universe absorption explain dark energy?. *PhRvD*, 111, 023516
- Naess, S. et al. (2025) The Atacama Cosmology Telescope: DR6 maps. *JCAP*, 2025, 061
- Nasedkin, E. et al. (2025) The JWST weather report: Retrieving temperature variations, auroral heating, and static cloud coverage on SIMP-0136. *A&A*, 702, A1
- Negro, M. et al. (2025) Fast X-ray Transient Detection with AXIS: Application to Magnetar Giant Flares. *OJAp*, 8, 159
- Ng, C. et al. (2025) Polarization Properties of 28 Repeating Fast Radio Burst Sources with CHIME/FRB. *ApJ*, 982, 154
- Nimmo, K. et al. (2025) Magnetospheric origin of a fast radio burst constrained using scintillation. *Natur*, 637, 48
- Oh, K. et al. (2025) Spectral insights and evolutionary pathways of globular cluster ULX in NGC 1399: a two-decade X-ray and optical study. *MNRAS*, 537, 3884
- Ould-Elhkim, M. et al. (2025) The SPIRou Legacy Survey: Near-infrared and optical radial velocity analysis of Gl 480 and Gl 382 using SPIRou, HARPS and CARMENES spectrographs. *A&A*, 696, A152
- Parazin, B. et al. (2025) Ice Sheets Without Dynamic Topography. *GeoRL*, 52, e2025GL115332
- Parc, L. et al. (2025) NIRPS and TESS reveal a peculiar system around the M dwarf TOI-756: A transiting sub-Neptune and a cold eccentric giant. *A&A*, 702, A138
- Park, J. et al. (2025) Multiwavelength Study of HESS J0632+057: New Insights into Pulsar-Disk Interaction. *ApJ*, 991, 28
- Pascua, R. et al. (2025) A Generalized Method for Characterizing 21 cm Power Spectrum Signal Loss from Temporal Filtering of Drift-scanning Visibilities. *ApJ*, 985, 127
- Payeur, G. et al. (2025) Do observations prefer thawing quintessence?. *PhRvD*, 111, 123541
- Pearlman, A. B. et al. (2025) Multiwavelength constraints on the origin of a nearby repeating fast radio burst source in a globular cluster. *NatAs*, 9, 111
- Piaulet-Ghorayeb, C. et al. (2025) Strict Limits on Potential Secondary Atmospheres on the Temperate Rocky Exo-Earth TRAPPIST-1 d. *ApJ*, 989, 181
- Pigarelli, A. et al. (2025) Traversing the Star-forming Main Sequence with Molecular Gas Stacks of $z \sim 1.6$ Cluster Galaxies. *ApJ*, 985, 194

- Radica, M. et al. (2025) Promise and Peril: Stellar Contamination and Strict Limits on the Atmosphere Composition of TRAPPIST-1 c from JWST NIRISS Transmission Spectra. *ApJL*, 979, L5
- Radica, M. et al. (2025) Constraining the scattered light properties of LTT 9779 b using HST/WFC3 UVIS. *MNRAS*, 538, 1853
- Rath, E. et al. (2025) Investigating mutual coupling in the hydrogen epoch of reionization array and mitigating its effects on the 21-cm power spectrum. *MNRAS*, 541, 1125
- Raza, N. et al. (2025) GWSkyNet-Multi. II. An Updated Machine Learning Model for Rapid Classification of Gravitational-wave Events. *ApJ*, 992, 152
- Rhea, C. L. et al. (2025) Deconvolving X-Ray Galaxy Cluster Spectra Using a Recurrent Inference Machine. *AJ*, 169, 268
- Rhodes, L. et al. (2025) Thermal Electrons in the Radio Afterglow of Relativistic Tidal Disruption Event ZTF22aaajecp/AT2022cmc. *ApJ*, 992, 146
- Riot-Bret  cher, B. et al. (2025) Strengthening Atmospheric Greenhouse Effect at the Arctic North Slope of Alaska Site Evidenced by Long-Term Records of the Downwelling Longwave Radiance Spectrum. *JGRD*, 130, e2025JD043680
- R  der, J. et al. (2025) A multifrequency study of sub-parsec jets with the Event Horizon Telescope. *A&A*, 695, A233
- Rodr  guez Hidalgo, P. et al. (2025) Massive Extremely High-velocity Outflow in the Quasar J164653.72+243942.2. *ApJ*, 990, 152
- Rouble, M. et al. (2025) In situ control of the resonant frequency of kinetic inductance detectors with multiplexed readout. *JAP*, 138, 114502
- Roux, J.-S. & Cline, J. M. (2025) Dark sector electroweak baryogenesis in light of the Galactic Center excess. *PhRvD*, 112, 095028
- Roychowdhury, T. et al. (2025) Photometric Constraints on Intermediate-mass Black Holes in the Galactic Centre. *PASP*, 137, 114102
- Sadai, S. et al. (2025) Antarctic meltwater alters future projections of climate and sea level. *NatCo*, 16, 9271
- Sadikov, M. et al. (2025) Galaxy Cluster Characterization with Machine Learning Techniques. *ApJ*, 986, 24
- Sammons, M. W. et al. (2025) Forecasting the Fast Radio Burst Population Observed through Galaxy Cluster Lenses. *ApJ*, 987, 139
- Sand, K. R. et al. (2025) Morphology of 137 Fast Radio Bursts Down to Microsecond Timescales from the First CHIME/FRB Baseband Catalog. *ApJ*, 979, 160
- Sasseville, G. et al. (2025) A Novel Approach to Understanding the Link between Supermassive Black Holes and Host Galaxies. *ApJ*, 978, 48
- Shah, V. et al. (2025) A Repeating Fast Radio Burst Source in the Outskirts of a Quiescent Galaxy. *ApJL*, 979, L21
- Shin, K. et al. (2025) Investigating the Sightline of a Highly Scattered Fast Radio Burst through a Cosmic Sheet Structure in the Local Universe. *ApJ*, 993, 208
- Sikora, J. T. et al. (2025) Seasonal Changes in the Atmosphere of HD 80606 b Observed with JWST's NIRSpec/G395H. *AJ*, 170, 105
- Splinter, J. et al. (2025) Precise Constraints on the Energy Budget of WASP-121 b from Its JWST NIRISS/SOSS Phase Curve. *AJ*, 170, 323
- Su  rez Mascare  o, A. et al. (2025) Diving into the planetary system of Proxima with NIRPS: Breaking the metre per second barrier in the infrared. *A&A*, 700, A11
- Taylor, J. et al. (2025) JWST NIRISS transmission spectroscopy of the super-Earth GJ 357b, a favourable target for atmospheric retention. *MNRAS*, 540, 3677
- Th  lie, E. et al. (2025) Alcock-Paczynski test on reionization bubbles for cosmology. *PhRvD*, 111, 123501
- Vandorou, A. et al. (2025) OGLE-2016-BLG-1195Lb: A Sub-Neptune Beyond the Snow Line of an M-dwarf Confirmed by Keck Adaptive Optics. *AJ*, 169, 319
- Vaulato, V. et al. (2025) Atmospheric composition and circulation of the ultra-hot Jupiter WASP-121b with joint NIRPS, HARPS and CRIRES+ transit spectroscopy. *A&A*, 703, A251
- Vaulato, V. et al. (2025) Hydride ion continuum hides absorption signatures in the NIRPS near-infrared transmission spectrum of the ultra-hot gas giant WASP-189b. *A&A*, 700, A9
- von Fellenberg, S. D. et al. (2025) First Mid-infrared Detection and Modeling of a Flare from Sgr A*. *ApJL*, 979, L20
- Wang, H. et al. (2025) Demonstration of hybrid foreground removal on CHIME data. *PhRvD*, 111, 103531
- Wang, Y. et al. (2025) Amplified tibetan plateau surface warming in CO₂-induced global warming simulations. *CIDy*, 63, 288
- Wang, Z. Q. et al. (2025) Idealized study of representing spatial and temporal variations in the error contribution of surface emissivity for assimilating surface-sensitive microwave radiance observations over land. *QJRM*, 151, e4948
- Wei, Y. et al. (2025) Upper Troposphere Warming Amplification over the Tibetan Plateau. *JCLI*, 38, 5335
- Willard-Stepan, M. et al. (2025) Assessing the exposure of buildings to long-term sea level rise across the Global South. *npjUS*, 5, 72
- Yang, W. et al. (2025) Searching for Axion Dark Matter Gegenschein of the Vela Supernova Remnant with FAST. *ApJ*, 988, 104
- Yu, W. et al. (2025) Contaminating Electromagnetic Transients in LISA Gravitational-wave Localization Volumes. I. The Intrinsic Rates. *ApJ*, 981, 141
- Zebrowski, J. A. et al. (2025) SPT-3G D1: Constraints on inflationary gravitational waves with two years of SPT-3G data. *PhRvD*, 112, 123520
- Zhang, S. et al. (2025) 3D Simulations of Convective Entrainment in Gas Giants: Rotation and Decreasing Luminosity as Barriers to Mixing. *ApJL*, 991, L23
- Zheng, B. et al. (2025) Estimation of Global Ocean TOA Instantaneous Clear-Sky Albedo From CERES for Shortwave Cloud Radiative Effect Analysis Based on a Deep Learning Model. *JGRD*, 130, e2025JD044878



McGill