Trottier Institute for Research on Exoplanets

ANNUAL REPORT 2022-2023

iREx

Université de Montréal

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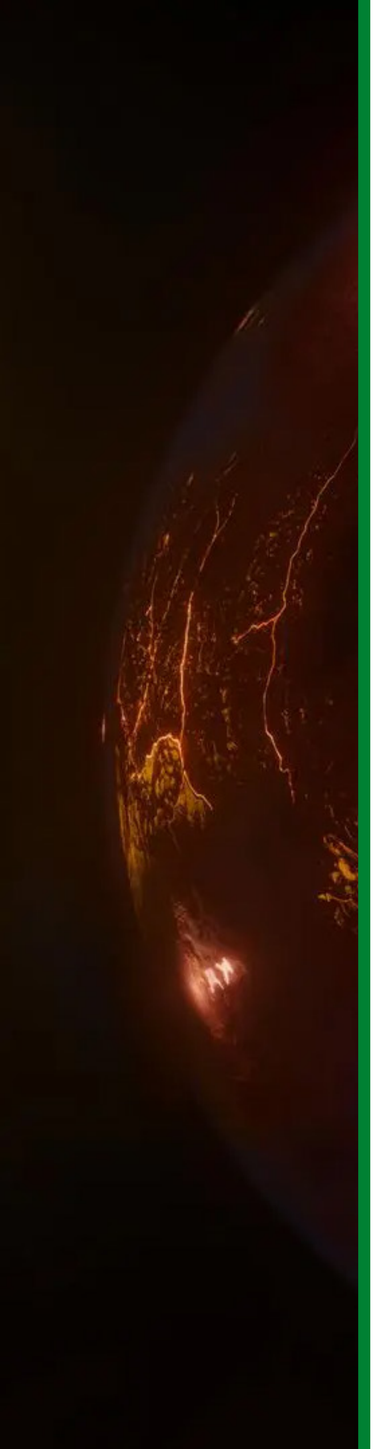

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ABOUT THE INSTITUTE

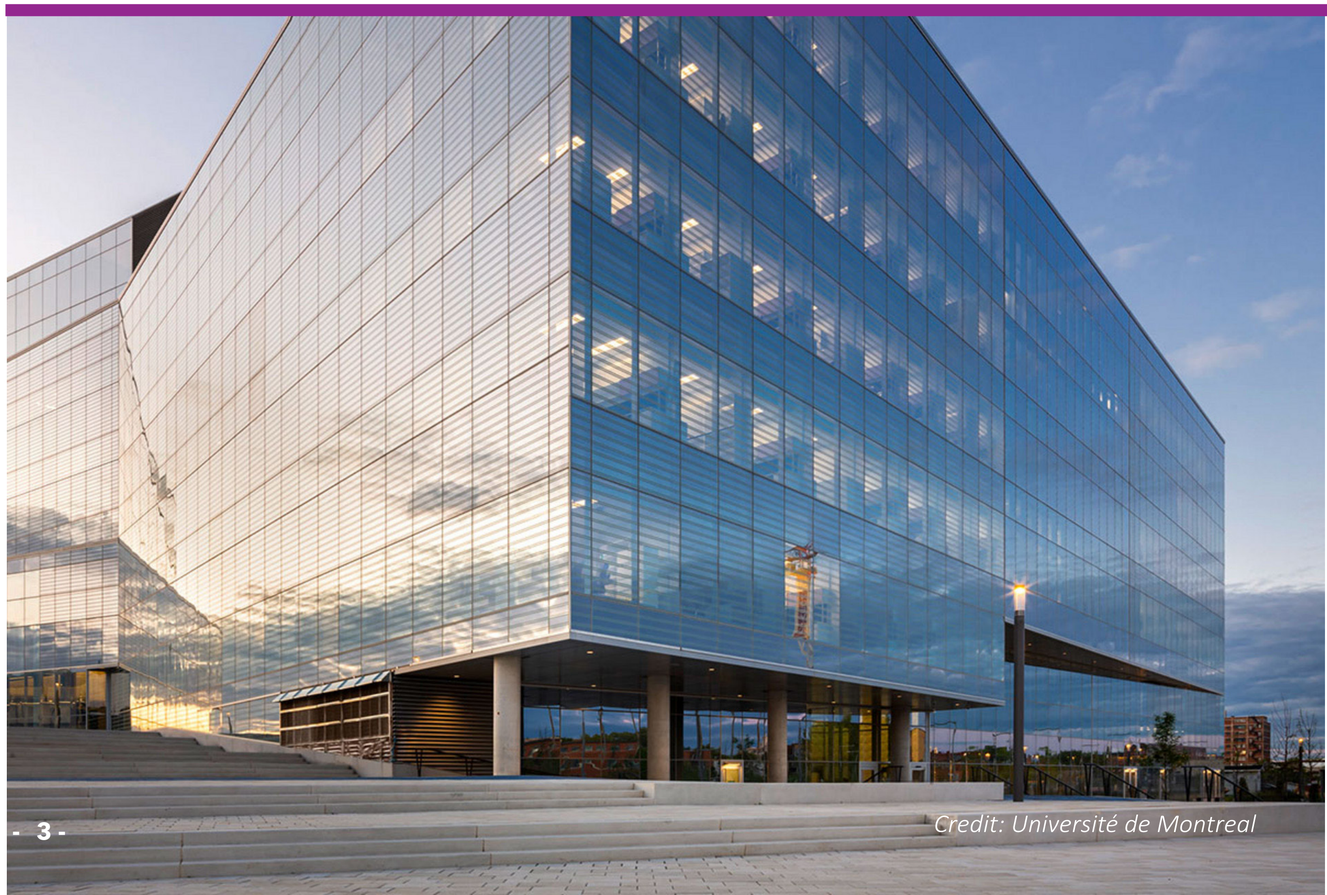
MISSION AND OBJECTIVES

The **Trottier Institute for Research on Exoplanets** (iREx) was created to find new worlds beyond the Solar System and answer one of the greatest questions facing mankind: **Are we alone in the Universe**?

This question alone justifies multi-billion dollar investments in robotic exploration of our Solar System and the construction of powerful astronomical observatories, both on the ground and in space.

Since the discovery of the first planet to orbit a star other than the Sun in 1995, astronomers have confirmed the existence of many **thousands of exoplanets**. Thousands more candidates have also been identified, including rocky Earth-like planets and types of planet that defy our theories of planetary formation. For the first time, a new generation of telescopes and instruments is now making it possible to probe the atmospheres of these extrasolar planets, and progress over the next few decades suggests that the planets most resembling Earth may soon reveal **biosignatures** – specific ratios of oxygen, ozone, water vapour, methane or other molecules.

The iREx brings together the best researchers and a team of dynamic, motivated students who are taking full advantage of the major observational projects underway or planned and are promoting this research through our sustained efforts to educate and popularise science, with the ultimate goal of finding **life elsewhere in our Universe.**



Credit: Université de Montreal

A WORD FROM OUR DIRECTORS

Credit: Radio-Canada
M. Ouellet-Diotte

A Word from our Director

This annual report, which covers the period from **September 1, 2022 to August 31, 2023**, was again marked by the James Webb Space Telescope with the publication of its first scientific results, over 750 papers in the first year alone, which quickly followed its first images that so dazzled the world in July 2022.

On the exoplanet scene, it is worth highlighting a fundamental discovery in which several iREx researchers and students played an active part: the first spectral signature of carbon dioxide in the atmosphere of a gaseous exoplanet, more specifically the hot Jupiter WASP-39 b. Carbon dioxide is that infamous molecule whose greenhouse effect is largely responsible for climate change on our planet. Detecting and measuring the concentration of this molecule is therefore very important for determining the atmospheric temperature of exoplanets of all sizes. This discovery illustrates the power of Webb to study the atmospheres of exoplanets, and ultimately to determine whether small, temperate Earth-like planets have habitable surface conditions. Observations of some of these temperate planets have already been initiated by Webb this year – an exciting chapter to follow, with iREx researchers at the forefront!

René Doyon,
iREx Director

Credit: A. Philibert/UdeM

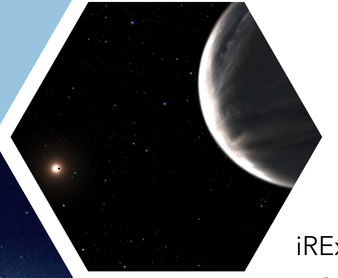
A Word from our Deputy Director

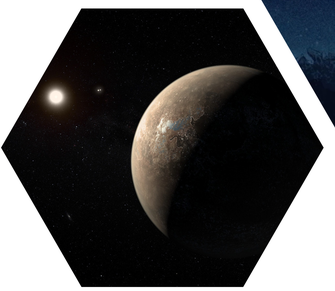
It has been an absolute pleasure and a great honour for me to see the iREx and its members continue to flourish in 2022-2023, my first year as Deputy Director.

Of course, I can't help but highlight the avalanche of impressive discoveries and images from the James Webb Space Telescope during its first year of scientific operations. The iREx is proud to be the largest scientific hub for Webb in Canada!

The iREx's influence across Montreal, Quebec, Canada and even internationally continues to grow, whether through our scientific research or our outreach and education initiatives. While our performances broke many records this year, it was the participation of our members at all career levels in a wide variety of activities that I found particularly inspiring. Whether it be the relaunch of the “Astronomy on Tap MTL” events led by iREx students and postdoctoral researchers, or the ongoing success of the InitiaSciences program founded by some of our students, the ambition and dynamism of the next generation is very much evident here. I'm sure you'll be as amazed as I am at the success of our Institute, and I thank you for reading and supporting us!

Nathalie Nguyen-Quoc Ouellette,
iREx Deputy Director





THE YEAR IN REVIEW

iREx researchers investigated many **distant worlds**, making several **crucial discoveries** that have influenced our understanding of the formation, evolution, and habitability of exoplanets, as well as their great diversity.

These worlds include an **exoplanet around Proxima Centauri**, the closest star to the Sun; the **hot Jupiter WASP-39 b and its atmosphere**; the **water worlds Kepler-138 c and d; LP 791-18 d, an exoplanet potentially covered with volcanoes**; the **ultra-hot Jupiter WASP-18 b** mapped by the Webb telescope; the **scorching exoplanet WASP-76 b**, and the very **first Y+Y brown dwarf binary system**.

For the revolutionary **James Webb Space Telescope**, 2022-2023 represents the first year of science operations, with **156 hours of observing time for programs led by iREx researchers**. The **Canadian JWST Science Support Team**, made up of iREx members, was also able to **renew their contract with the Canadian Space Agency**.

The winter and spring of 2023 were a crucial period for the **NIRPS instrument**, which was finally **delivered to ESO's 3.6-m telescope in La Silla, Chile, and commissioned**, thanks in part to the work of iREx and OMM researchers. The exoplanet-hunting instrument finally captured its **first light on the sky in June 2023**.

iREx members contributed to **126 scientific papers** published in peer-reviewed journals. This is a record number for a 12-month period!

The iREx continued to increase its presence in the media, with **32 television interviews, 39 radio interviews, and 75 print and online interviews**, for a total of **146 interviews**, many delivered by our students.

Membership at iREx has increased since last year, with **79 members** during our summer peak. This includes **13 summer interns** and a cohort of **35 graduate students** almost as large as last year's record cohort. Most remarkably, **the iREx has never included as many researchers and employees as this year – 20**, or almost twice as many as in recent years.

We reached tens of thousands of people in Quebec and internationally, in person and virtually, at **78 talks given in primary and secondary schools, CEGEPs and universities, 50 public lectures and 7 public events**, and through several content creation initiatives… another record number for iREx!

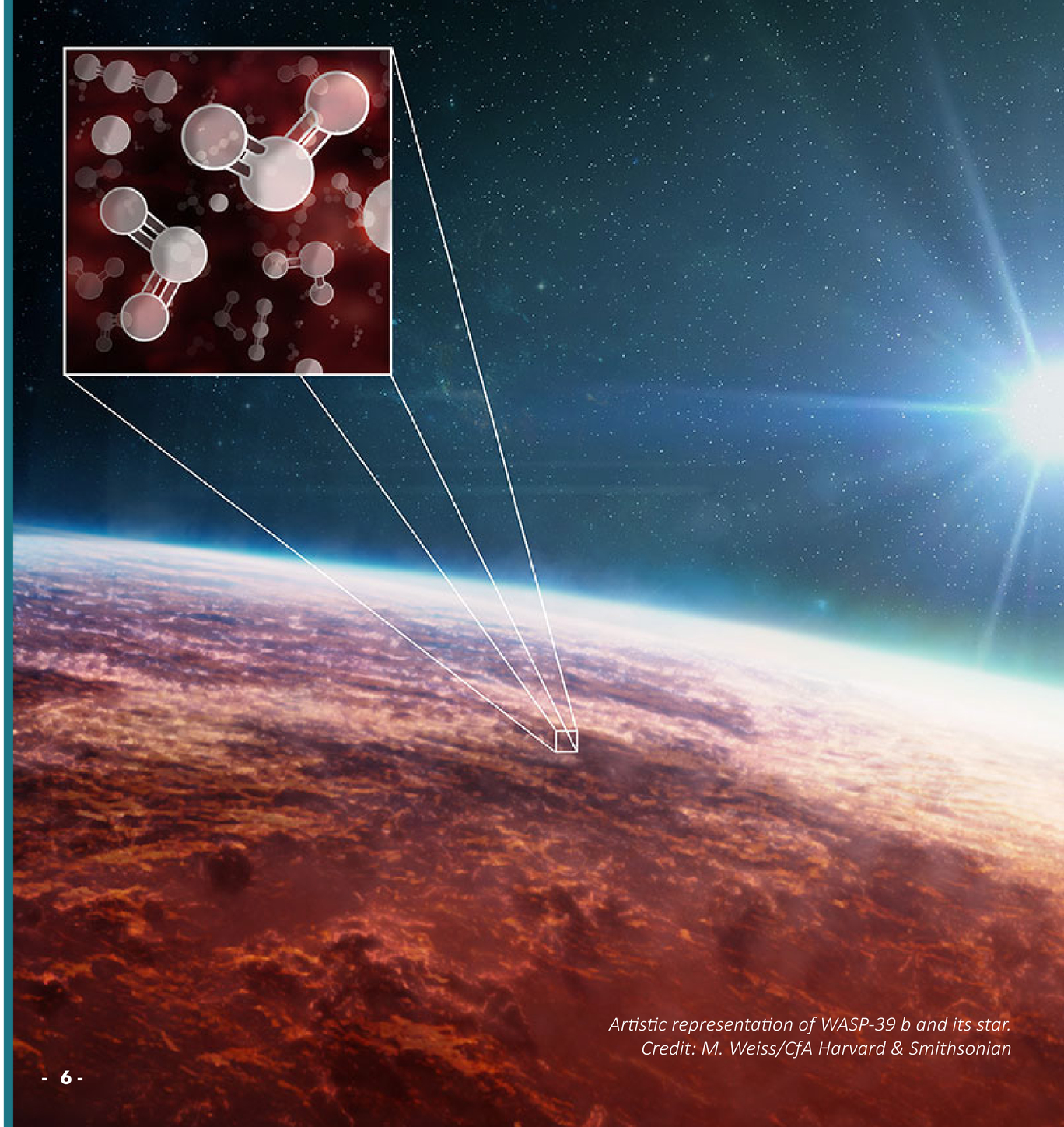
SCIENTIFIC OVERVIEW

To carry out their mission, iREx researchers focus their research projects on three main themes: **observation, instrumentation, and theory**.

Various observational methods are used to detect exoplanets, both directly and indirectly. The observations carried out by iREx researchers exploit a variety of methods: **high-contrast direct imaging, high-precision infrared velocimetry, and transit spectroscopy**.

In addition to **exoplanets**, iREx researchers are interested in other celestial bodies such as **stars, brown dwarfs, white dwarfs, moons, comets, and asteroids**. In addition, several iREx members specialise in the study of **planet formation and evolution** using theoretical models.

Through its collaborations with the **Experimental Astrophysics Laboratory** (LAE) of the **Mont-Mégantic Observatory** (OMM), the iREx has unrivalled access to a wide range of high-performance scientific instruments dedicated to the observation of exoplanets. Its researchers study, develop and improve data analysis techniques, pushing iREx to the pinnacle of exoplanet research. iREx instrumentation projects include the **FGS/NIRISS** instrument, Canada's contribution to the James Webb Space Telescope, the **SPIRou** and **NIRPS** high-precision infrared spectrographs, installed in Hawai'i and Chile respectively, the **GPI** imager at the Gemini-North Observatory and the **PESTO** optical camera at the OMM.



Artistic representation of WASP-39 b and its star.
Credit: M. Weiss/CfA Harvard & Smithsonian

ADMINISTRATIVE OVERVIEW

Organisational

Board of Directors

The iREx is managed by the Board of Directors, which is made up of the **Université de Montréal's** (UdeM) **Dean of the Faculty of Arts and Sciences**, who chairs the Board, a **representative of the Head of the UdeM Physics Department, the iREx Director, a professor who is a member of the iREx, a member of the Board of Governors, the iREx Deputy Director, and a representative of the UdeM Development and Alumni Relations Office** as an observer. The duties of the Board of Directors include appointing the iREx Director, appointing members on the recommendation of the Scientific Committee, approving the iREx scientific program defined by the Scientific Committee, and approving financial reports and budget forecasts.

2022-2023 Members: Frédéric Bouchard (Chair), Normand Mousseau, René Doyon, Patrick Dufour, Philippe Sureau, Nathalie Ouellette, Marie-Claude Giguère

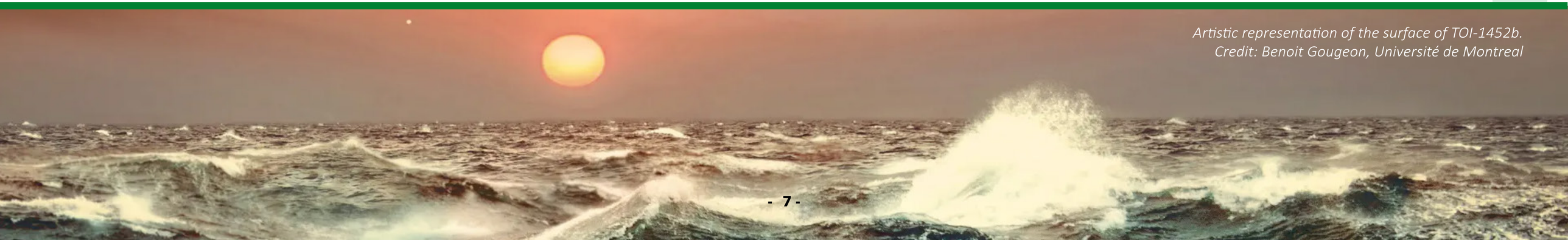
Scientific Committee

The Scientific Committee advises the Director on the scientific development of iREx and defines its program of activities. It is made up of the **iREx Director, the Vice-Dean for Research and Creation of the UdeM Faculty of Arts and Science, two professors who are iREx members, the iREx Deputy Director, and a professor in astronomy-astrophysics** from an institution other than UdeM.

2022-2023 Members: René Doyon, Éric Montpetit, Björn Benneke, David Lafrenière, Nathalie Ouellette, Nicolas Cowan

Board of Governors

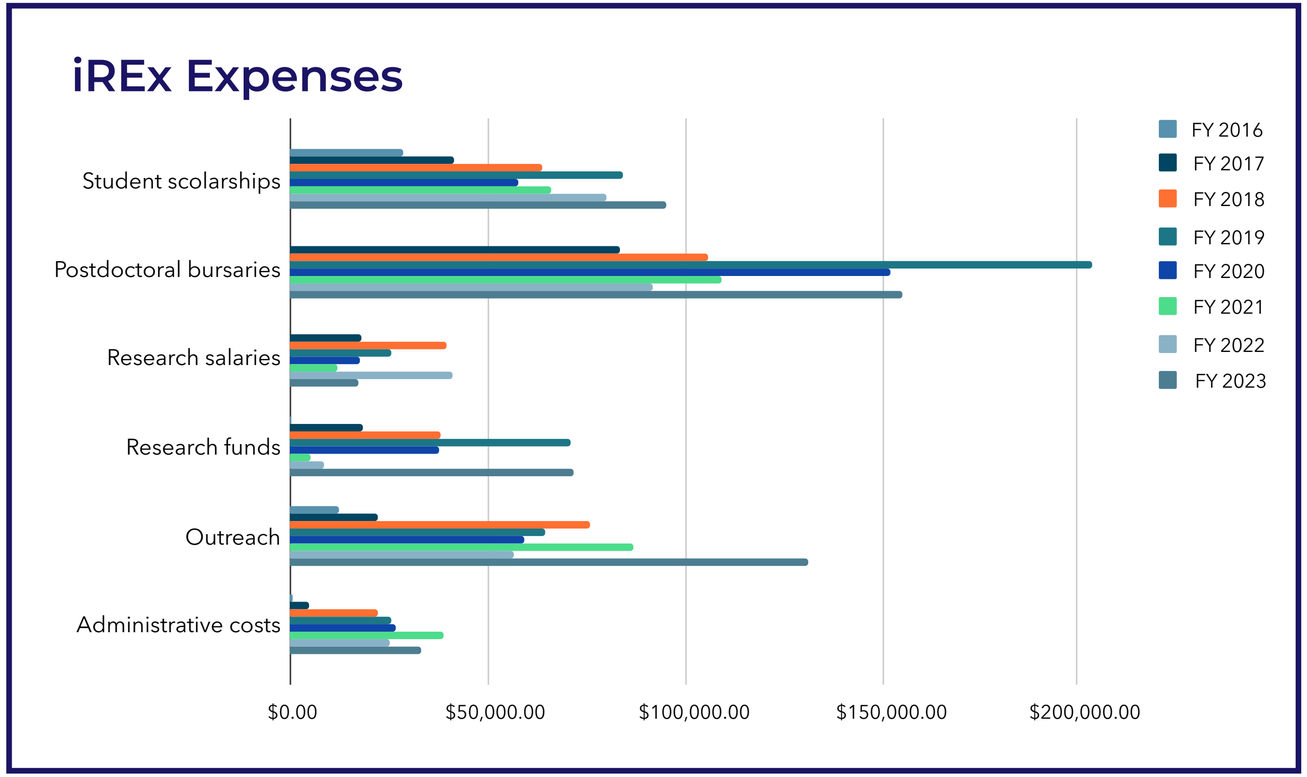
iREx management is also advised by the Board of Governors on all matters concerning the Institute's operations, outreach, and funding. This committee is made up of **external representatives with an interest in iREx's fields of research who come from a variety of backgrounds**.



Artistic representation of the surface of TOI-1452b.
Credit: Benoit Gougeon, Université de Montreal

Financial

The iREx's priority remains its **excellence in astrophysics research**. A significant portion of iREx funds is also dedicated to **education and science outreach**, an important pillar of the Institute's mission.



Our **student scholarships** include bursaries for our undergraduate summer interns, as well as scholarships for our graduate student researchers. Many of our students are also recipients of external scholarships from NSERC, FRQNT, and their home institutions. Our **postdoctoral and research programs** cover the salaries and research funds of all our post-Ph.D. researchers. On average, these three components account for **69% of the iREx budget**. Many of iREx's research expenses are covered by government grants that complement iREx's philanthropic funding. If we were to consider these funding sources, iREx's fraction of research expenses would be considerably higher.

Our **outreach program** includes all our activities for the general public and school-aged audiences, including public talks and events, workshops, communications, online content, and training programs. This portion of the budget, **23% on average**, also covers part of our outreach staff's salary. Finally, iREx **administrative costs**, i.e. the purchase of equipment and software, photocopying and telephony costs, other administrative expenses, a portion of our Deputy Director's salary and the salary of our administrative technician, make up only **8% of our budget**.

The majority of iREx's funding comes from **philanthropic sources**. In addition, several of our specific research and science outreach projects are funded by **government grants** (NSERC, CFI, MEIE, FRQ, etc.) and **contracts** with the Canadian Space Agency.

Credit: NASA, ESA, CSA, Alyssa Pagan (STScI)

OUR DONORS

The iREx could not exist without the precious contribution of its donors. Without their support and vision, it would be impossible to continue our research and educational work, which enables us to learn a little more about our Universe every day and to share these discoveries. We would like to thank ...

Foundation familiale Trottier Family Foundation

Philippe Sureau **Martin Périard** **Carole Kleingrib** **Isabelle Morin**

Anne Joli-Cœur **Jean-Marc Lauzon** **Hortense Michaud-Lalanne**

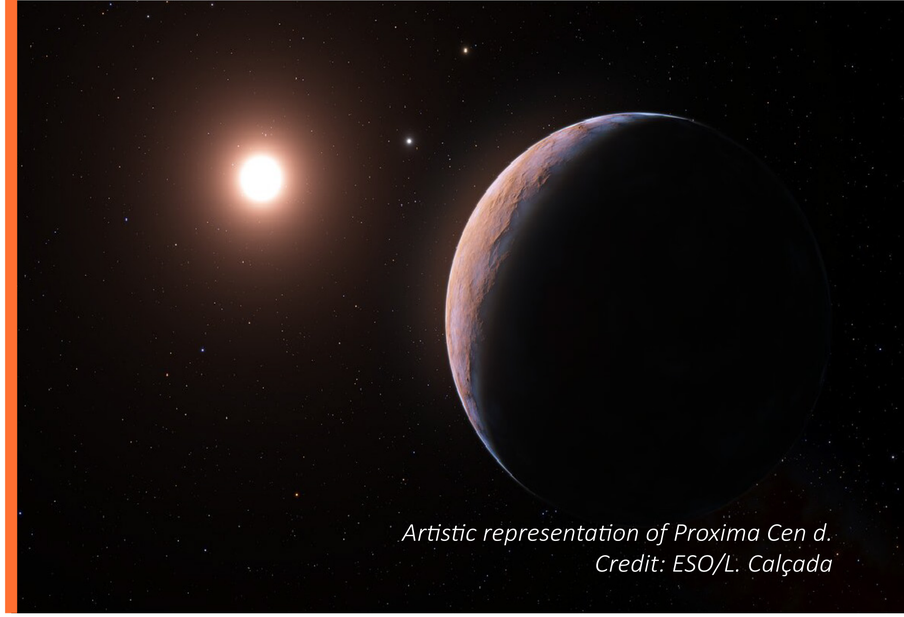
Sylvain Lumbroso **Stéphanie Codsi** **Marie-Hélène Paquette** **Jean-François Bertrand**

...as well as our many supporters across planetary systems near and far!

RESEARCH HIGHLIGHTS

A NEW PLANET AROUND PROXIMA CENTAURI

Last February, a team using the Very Large Telescope (VLT) at the European Southern Observatory (ESO) announced the **discovery of an exoplanet around Proxima Centauri**, the closest star to our Solar System. This revelation was enabled by the ESPRESSO instrument, installed at the VLT in Chile since 2018. **Romain Allart**, iREx Trottier Postdoctoral Fellow, **contributed to this discovery by developing an innovative method for correcting data obtained with this instrument**.

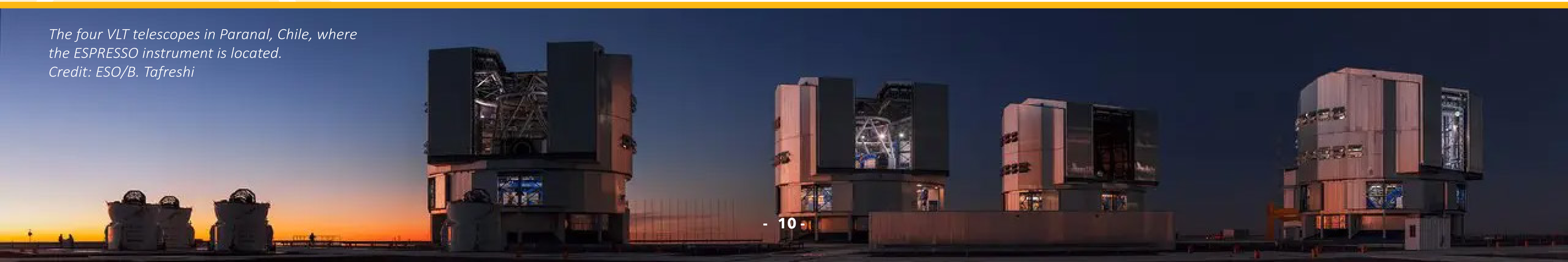


Artistic representation of Proxima Cen d.
Credit: ESO/L. Calçada

The new exoplanet, **Proxima Centauri d**, is one of the smallest ever detected, with a **mass that could be as small as a quarter that of the Earth**. It orbits very close to its star, making it too hot to be habitable. ESPRESSO is particularly effective at detecting such low-mass planets, thanks to its ability to measure the minute variations in velocity imprinted by such planets on their star.

Romain Allart developed a method to improve the results obtained with ESPRESSO and other similar spectrographs, such as NIRPS. This method, based on a model of the Earth's atmosphere, eliminates atmospheric interference and gives more accurate measurements of stellar velocities and, therefore, greater sensitivity to the presence of planets around stars..

A candidate short-period sub-Earth orbiting Proxima Centauri, J. P. Faria, A. Suárez Mascareño, P. Figueira, A. M. Silva, M. Damasso, O. Demangeon, F. Pepe, N. C. Santos, R. Rebolo, S. Cristiani, V. Adibekyan, Y. Alibert, ***R. Allart****, et al., A&A, 2022; Automatic model-based telluric correction for the ESPRESSO data reduction software,* ***R. Allart*** *et al., A&A 2022.*



The four VLT telescopes in Paranal, Chile, where the ESPRESSO instrument is located.
Credit: ESO/B. Tafreshi

Artistic representation of WASP-39 b and its star.
Credit: M. Weiss/CfA Harvard & Smithsonian

WASP-39 b: AN EXOPLANET ATMOSPHERE AS NEVER SEEN BEFORE

Recent observations from the **James Webb Space Telescope** have provided an **unprecedented portrait of the atmosphere of the exoplanet WASP-39 b**, revealing the **presence of clouds and various chemical compounds** such as sodium, potassium, water, carbon dioxide, carbon monoxide, and sulfur dioxide.

Led by Université de Montréal professor **Björn Benneke**, the research team also included doctoral students **Louis-Philippe Coulombe, Caroline Piaulet-Ghorayeb, Michael Radica, and Pierre-Alexis Roy and** postdoctoral researcher **Jake Taylor**. The team used data from **three of the Webb Telescope's instruments, including the Canadian NIRISS instrument**, to identify these components and signs of active chemistry.

WASP-39 b is a planet similar in mass to Saturn, but much closer to its star. Its atmosphere, which reaches temperatures of 900°C, is mainly composed of hydrogen. The study, which provides valuable information on atmospheric processes and planet-star interactions, attests to the **ability of the James Webb Space Telescope's instruments to carry out in-depth investigations of exoplanetary atmospheres**.

*Early Release Science of the exoplanet WASP-39 b with JWST NIRSpec PRISM, The JWST Transiting Exoplanet Community ERS Team, incl. Z. Rustamkulov, **C. Piaulet, B. Benneke, P.-A. Roy, J. Taylor, T.J. Bell, M. Radica**, et al., Nature, 2023; Early Release Science of the exoplanet WASP-39 b with JWST NIRCam, The JWST Transiting Exoplanet Community ERS Team, incl. E.-M. Ahrer, **B. Benneke, T.J. Bell, C. Piaulet, P.-A. Roy, J. Taylor,** et al., Nature, 2023; Early Release Science of the exoplanet WASP-39 b with JWST NIRSpec G395H, The JWST Transiting Exoplanet Community ERS Team, incl. L. Alderson, **P.-A. Roy, B. Benneke, J. Taylor, T.J. Bell, C. Piaulet**, et al., Nature, 2023; Early Release Science of the exoplanet WASP-39 b with JWST NIRISS, The JWST Transiting Exoplanet Community ERS Team, incl. A. D. Feinstein, **M. Radica, L.-P. Coulombe, B. Benneke, J. Taylor, T.J. Bell, C. Piaulet, P.-A. Roy**, et al., Nature, 2023; Photochemically produced SO2 in the atmosphere of WASP-39 b, The JWST Transiting Exoplanet Community ERS Team, incl. S.-M. Tsai, **B. Benneke, J. Taylor,** et al., Nature, 2023.*

Credit: NASA/C. Gunn

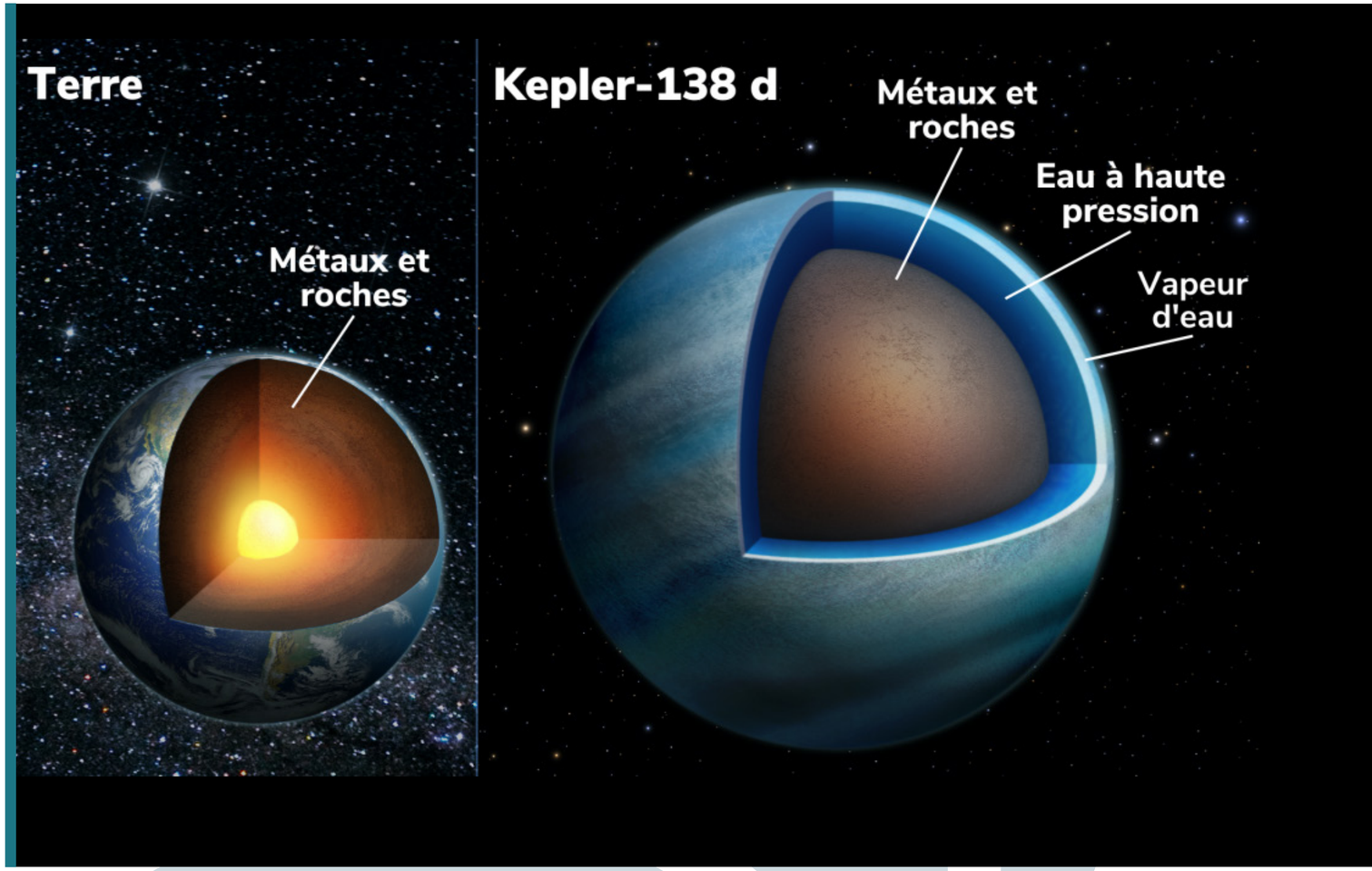
KEPLER-138 c AND d: TWO WATER WORLDS

An international team led by doctoral student **Caroline Piaulet-Ghorayeb** uncovered evidence suggesting that **two exoplanets, Kepler-138 c and Kepler-138 d, are "water worlds"**, i.e. planets whose volume contains a significant fraction of water. These planets orbiting the small star Kepler-138, located 218 light-years from Earth, have compositions that are very different from those of our Solar System. A fourth planet, Kepler-138 e, was subsequently identified in the system.

Using **NASA's Hubble and Spitzer Space Telescopes**, the team determined the rough composition of Kepler-138 c and Kepler-138 d, which are about one and a half times the size of Earth. Although **water was not detected directly, the researchers inferred its presence by comparing the planets' sizes and masses with models**.

The researchers note that the planets are **unlikely to have surface oceans** due to the high temperatures prevailing there, but that **liquid water could be found at high pressure beneath a thick atmosphere laden with water vapour**.

These results, published in Nature Astronomy, provide further evidence for the existence of water worlds, a hypothesis that has long been mooted.



Artistic representation of Kepler-138 d compared to the Earth
Credit: B. Gougeon/UdeM

Evidence for the volatile-rich composition of a 1.5-Earth-radius planet, ***C. Piaulet, B. Benneke****, J. M. Almenara, D. Dragomir, H. A. Knutson,* ***D. Thorngren, M. S. Peterson****, et al., Nature Astronomy, 2023.*

Artistic representation of LP 791-18 d.
Credit: NASA GSFC/C. Smith, KRBwyle.

LP 791-18 d, A VOLCANO-COVERED EXOPLANET

LP 791-18 d is a planet of Earth-like size and mass, likely covered in volcanoes. The planet is located around a small star just 86 light-years away. The discovery was announced in the journal Nature by a team led by iREx astronomers, including Professor **Björn Benneke a**nd graduate students **Merrin Peterson and Caroline Piaulet-Ghorayeb.**

Data from the **Spitzer Space Telescope, the TESS satellite, and ground-based observatories** were used to detect LP 791-18 d and precisely measure its mass.

The team suspects that **its volcanic activity is as intense as that observed on Jupiter's moon Io.** This activity is thought to be due to the high heat generated inside LP 791-18 d by the periodic close passage of its more massive neighbour, LP 791-18 c.

The similarity between LP 791-18 d and the Earth, and the prospect of detectable geological activity and volcanism, make it an important object for better understanding the formation and evolution of rocky worlds.

A temperate Earth-sized planet with tidally-heated interior transiting an M6 star, ***M. S. Peterson, B. Benneke****, K. Collins, C. Piaulet, I. J. M. Crossfield, M. Ali-Dib, J. L. Christiansen,* ***J. Gagné****, J. Faherty, E. Kite, C. Dressing, D. Charbonneau, F. Murgas, M. Cointepas, J. M. Almenara, X. Bonfils, S. Kane, M. W. Werner, V. Gorjian,* ***P.-A. Roy*** *et al., Nature, 2023.*

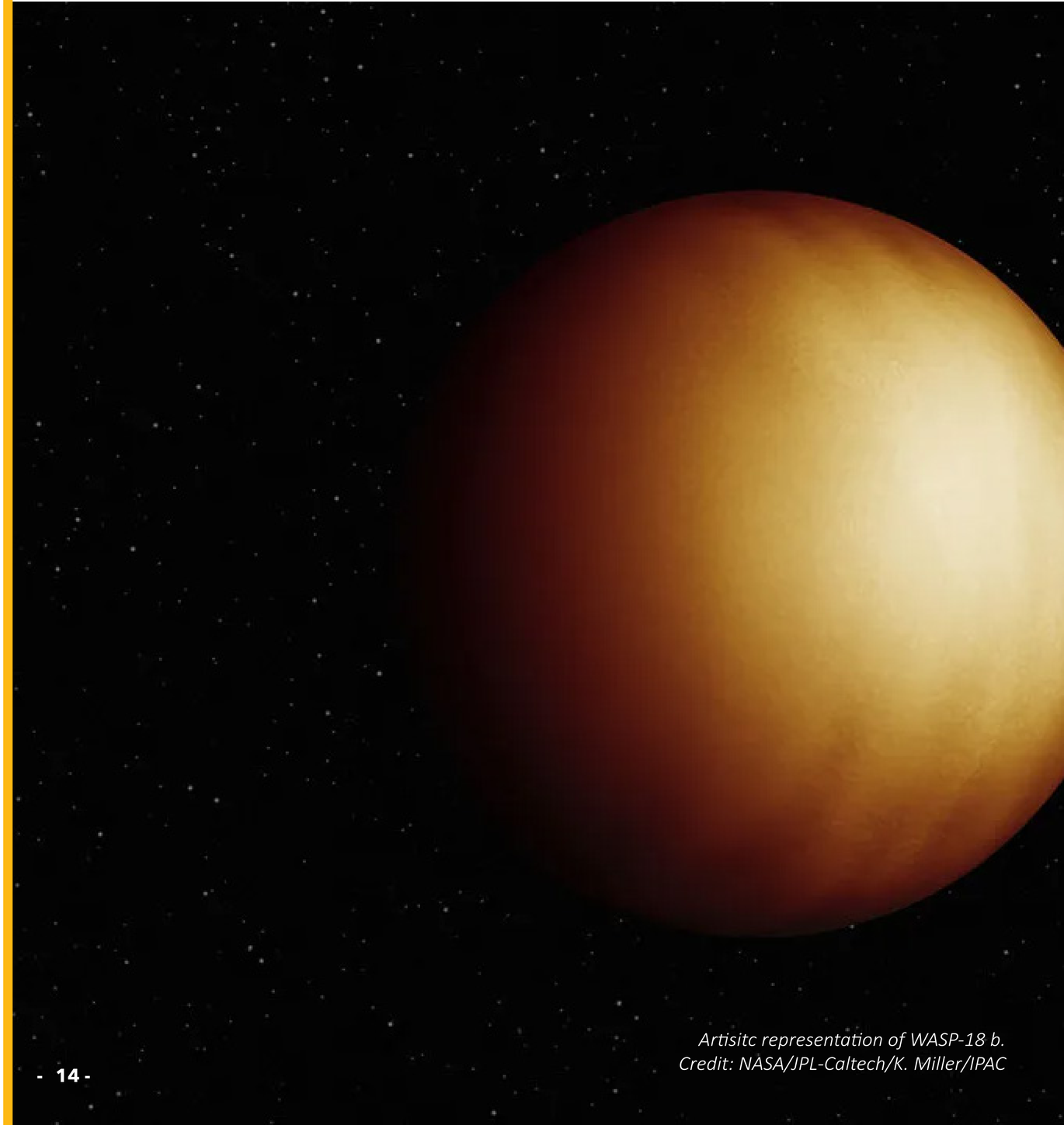
MAPPING THE ULTRA-HOT JUPITER WASP-18 b

The international team of the **JWST Transiting Exoplanet Community Early Release** program, including Ph.D. student **Louis-Philippe Coulombe and Professor Björn Benneke**, used the **Canadian NIRISS instrument on the James Webb Space Telescope to study the ultra-hot gas giant exoplanet WASP-18 b up close**. This exoplanet, ten times more massive than Jupiter, orbits so close to its star that its surface temperature reaches 2,700 degrees Celsius.

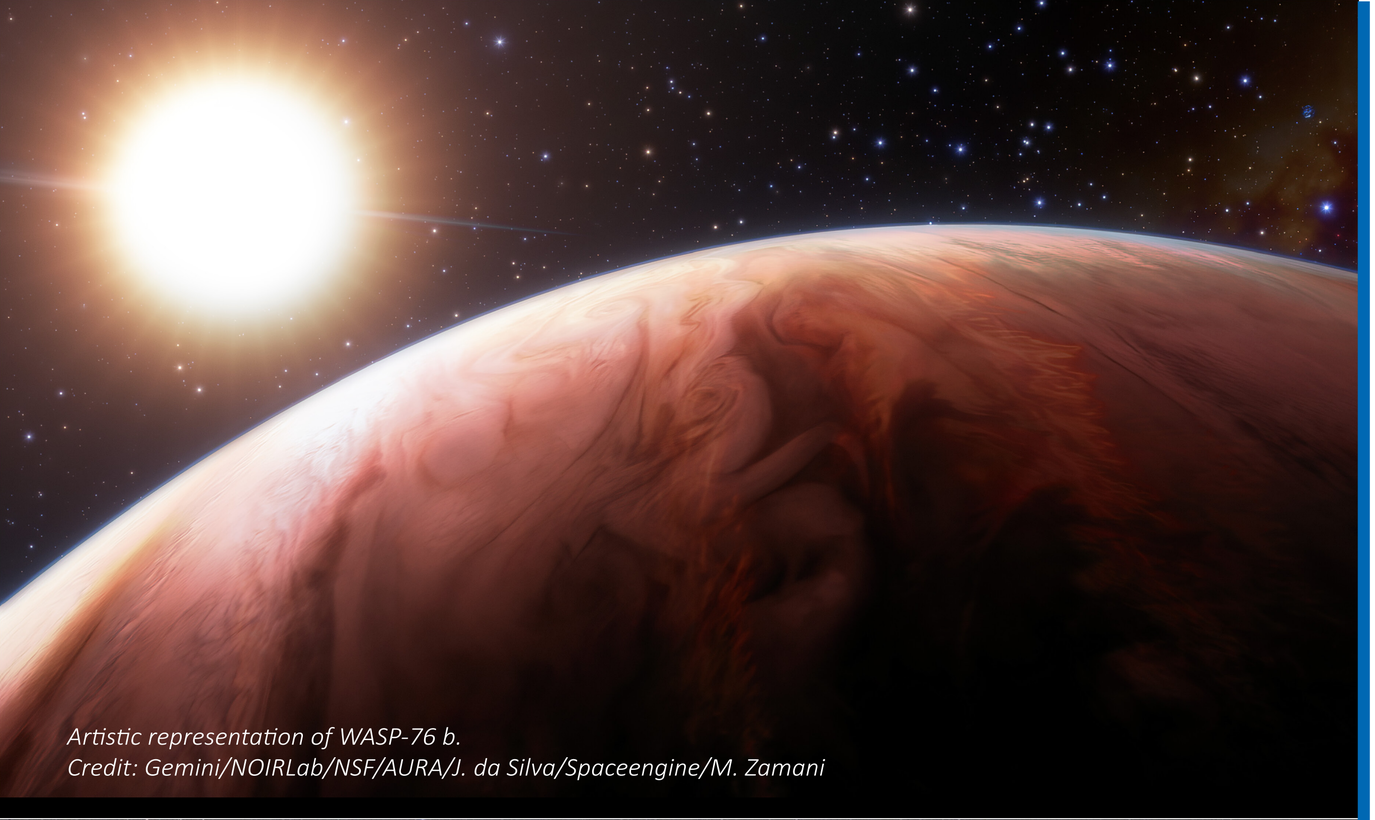
Researchers mapped the planet's atmosphere by observing its secondary eclipse, the moment when it passes behind its star. The planet's temperature map shows **extreme temperature variations**, with gaps of up to 1,000 degrees between the hottest and coldest points. What's more, thanks to the sensitivity of the NIRISS instrument, scientists were able to detect **traces of water vapour in its atmosphere**, which persists despite the extreme temperatures.

This study shows how Webb is pushing the boundaries to deepen our understanding of the atmospheric composition and formation mechanisms of a rich diversity of exoplanets, including exotic worlds like WASP-18 b, which have no analogue in our Solar System.

A broadband thermal emission spectrum of the ultra-hot Jupiter WASP-18 b, The JWST Transiting Exoplanet Community ERS Team, incl. ***L.-P. Coulombe, B. Benneke, M. Radica, T. J. Bell, C. Piaulet, P.-A. Roy, J. Taylor****, et al., Nature, 2023.*



Artisitc representation of WASP-18 b.
Credit: NASA/JPL-Caltech/K. Miller/IPAC



Artistic representation of WASP-76 b.
Credit: Gemini/NOIRLab/NSF/AURA/J. da Silva/Spaceengine/M. Zamani

Photo of the Gemini-North Observatory under the stars.
Credit: Gemini/NOIRLab/NSF/AURA/P. Horálek

A CLOSE-UP VIEW OF WASP-76 b, THE SCORCHING EXOPLANET

Université de Montréal researchers, led by iREx Ph.D. student **Stefan Pelletier**, performed a **detailed study of the ultra-hot giant exoplanet WASP-76 b** using the Gemini-North Observatory in Hawai'i. Their study, published in the journal Nature, **identified 11 chemical elements in its atmosphere, some of which have never been measured in the atmospheres of the giant planets of our Solar System**.

WASP-76 b is a hot exoplanet, with temperatures well in excess of 2,000 degrees Celsius. At such temperatures, several elements that at normal temperatures form rock (such as magnesium and iron), exist as gases in the planet's upper atmosphere and can therefore be detected.

By comparing in detail the abundances of elements in the planet's atmosphere with those of the star, the team **hypothesised that the composition in the upper layers of a planet's atmosphere is highly influenced by temperature**, making it an indicator of the latter.

According to the researchers, measurements of heavy elements such as calcium or magnesium on WASP-76 b will provide a better understanding of the formation of gaseous planets in general.

Vanadium oxide and a sharp onset of cold-trapping on a giant exoplanet, ***S. Pelletier, B. Benneke, M. Ali-Dib****, B. Prinoth, D. Kasper, A. Seifahrt, J. L. Bean, F. Debras, B. Klein,* ***L. Bazinet****, H. J. Hoeijmakers, A. Y. Kesseli,* ***O. Lim*** *et al., Nature, 2023.*

THE FIRST Y+Y BROWN DWARF BINARY UNVEILED

Using the **NIRCam on the James Webb Space Telescope**, astronomers have revealed the **first-ever binary system made up of two very cold brown dwarfs, known as "Y"-type dwarfs**.

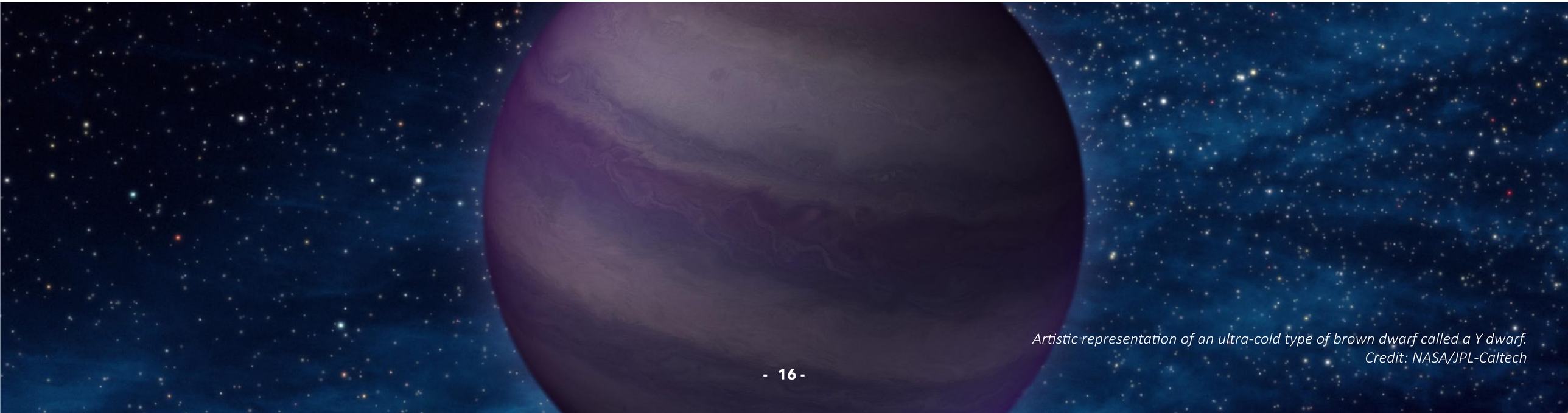
Brown dwarfs are celestial objects with masses intermediate between those of planets and stars. Y dwarfs are the least massive and the coldest: their temperatures, below 230 degrees Celsius, are similar to those of planets.

By observing W0336, a known Y dwarf, a team led by researchers from the University of Michigan and including iREx researchers **Loïc Albert, Frédérique Baron, Clémence Fontanive, and Ph.D. student Thomas Vandal**, discovered the binary system.

W0336 is said to have a mass between 7 and 20 times that of Jupiter, while its companion, which lies around one astronomical unit away, is also a Y dwarf and would be at most 13 times Jupiter's mass.

This discovery sheds new light on these enigmatic objects, notably on their formation mechanism, which is possibly very similar to that of stars.

*JWST/NIRCam Discovery of the First Y+Y Brown Dwarf Binary : WISE J033605.05-014350.4, P. Calissendorff, M. De Furio, M. Meyer, **L. Albert**, C. Aganze, **M. Ali-Dib**, D.C. Bardalez Gagliuffi, **F. Baron**, C.A. Beichman, A.J. Burgasser, M.C. Cushing, J.K. Faherty, **C. Fontanive**, C.R. Gelino, J.E. Gizis, A.Z. Greenbaum, J.D. Kirkpatrick, S.K. Leggett, F. Martinache, D. Mary, M. N'Diaye, B.J.S. Pope, T. Roellig, J. Sahlmann, A. Sivaramakrishnan, **D.P. Thorngren**, M. Ygouf, **T. Vandal**, ApJL, 2023.*



Artistic representation of an ultra-cold type of brown dwarf called a Y dwarf.
Credit: NASA/JPL-Caltech

NEWS FROM THE JAMES WEBB SPACE TELESCOPE

After its long-awaited launch in December 2021 and the start of its scientific operations in the summer of 2022, the **James Webb Space Telescope (JWST)** has rapidly established itself as the revolutionary instrument promised to the international astronomical community.

Canada's JWST Science Support Team, comprising iREx members **René Doyon, Loïc Albert, Étienne Artigau, Neil Cook, and Nathalie Ouellette, renewed its contract with the Canadian Space Agency in 2023** to continue supporting Canadian astronomers for at least the next four years. The team's tasks include the development and maintenance of JWST data reduction algorithms, support to the Canadian community for observing time requests, help in publicising Canadian discoveries, and a wide range of science outreach initiatives.

Many **breathtaking images and surprising results were published in 2022-2023**, several of them being led by or done in collaboration with iREx members (see the articles “WASP-39 b: an exoplanet atmosphere as never seen before”, “Mapping the ultra-hot Jupiter WASP-18 b”, and “The first Y+Y brown dwarf binary unveiled” in this report). Beyond the iREx results, astronomers have used the Webb Telescope to break the record for the most distant galaxy ever observed, probe the planet TRAPPIST-1 c and finding no trace of an atmosphere, detect water in the cryovolcano ejecta from the moon Enceladus, take the best shot of the planet Uranus since the Voyager 2 probe's observations in the 1980s, and much more!

Image of the star-forming region, the Pillars of Creation, taken by the NIRCam and MIRI instruments on the James Webb Space Telescope. Credit: NASA/ESA/CSA/STScI

Cycle 1 of Webb's science observations took place in 2022-2023. A total of **156 hours of observing time** were allocated to science programs led by iREx members **Olivia Lim, Loïc Albert, Lisa Đặng, James Sikora, Stefan Pelletier, Romain Allart, and Björn Benneke**.

In March 2023, the telescope proposals selected for JWST Cycle 2, which began in July 2023, were announced. Many Canadian astronomers have been selected to lead observing programs as Principal Investigators (PIs) during this cycle, covering a wide range of research fields, for a total of 206 observing hours. **Almost half of these hours will be devoted to three programs led by iREx researchers** (including **Jake Taylor, Michael Radica, and Pierre-Alexis Roy**), including **82 hours for a broad program led by Björn Benneke**. This is the largest guaranteed-time program led by a Canadian astronomer in Cycle 2.

The Mont-Mégantic Observatory, seen from a drone.
Credit: E. Chouchane/UdeM

NEWS FROM THE MONT-MÉGANTIC OBSERVATORY

The **Mont-Mégantic Observatory (OMM)** is a **unique research facility** where f**uture astronomers can be trained** in the use of a telescope and its instruments. In addition to being the **largest professional telescope on the east coast of North America**, still contributing to important scientific discoveries, the OMM also works in concert with the ASTROLab du Mont-Mégantic to offer an important **platform to showcase astronomy to the general public**.

A number of **students and interns** from the Université de Montréal and the Université Laval travelled to the OMM in 2022-2023 for **observing missions**, accompanied by our Support Astronomer, **Sylvie Beaulieu**, and our Observing Technicians **Fidèle Robichaud** and **Julien Huot**. The latter left the OMM in 2022, and the whole team wishes him the best of luck in his future adventures! **Ted Rudyk**, who has many years' experience on large telescopes such as the Apache Point Observatory and the Gemini-North Observatory, joined the team as a new Observing Technician in summer 2023. The OMM team has also been joined by a new Outreach Officer, **Heidi White**, who received her Ph.D. from the University of Toronto in 2021 and has over a decade of experience in science education. Heidi also works as an Outreach Officer on the iREx team.

On the OMM instrumentation side, researcher **Thomas Martin** and several Université de Laval students worked on the **SpIOMM** spectroimager in 2023 to update it and fix a few issues with its operation on the telescope. This instrument is particularly useful for studying the emission and absorption lines of extended celestial objects such as nebulae and galaxies.

Telescope operations had to be paused during the summer of 2023 to carry out some important **renovations** that will enhance its operations and dome functioning in the long term.

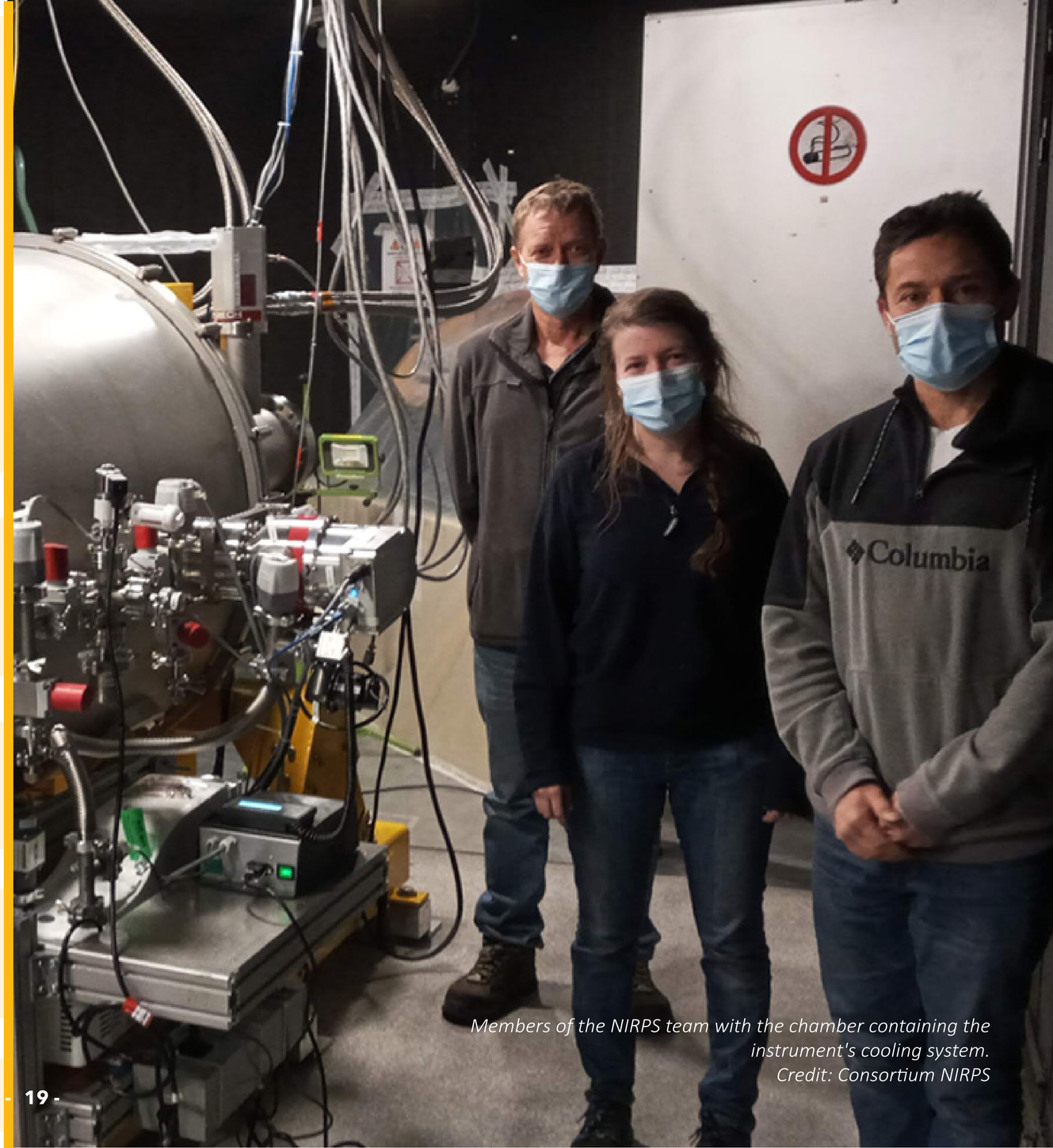
NEWS FROM THE EXPERIMENTAL ASTROPHYSICS LABORATORY

The **Experimental Astrophysics Laboratory (LAE)** is a branch of the Mont-Mégantic Observatory whose mandate is to design astronomical instruments for the OMM telescope, as well as for other world-class telescopes on the ground and in space. Several LAE projects reached important milestones in 2022-2023, thanks in part to the significant contribution of the iREx team.

The **NIRPS** (Near-Infrared Planet Searcher) instrument entered a major development phase during the past year. Since April 1, 2023, after several months of testing at the La Silla Observatory in Chile in which several iREx members took part, **NIRPS has been ready for science and offered to the entire astronomical community**. Astronomers from all over the world can now apply for time to use the instrument. In addition, the scientific team, led by Canada and Switzerland and made up of the teams who built the instrument, have also begun to benefit from the Guaranteed Time Observations obtained in exchange for building the instrument. Over the next five years, **740 nights of observing time are guaranteed to the NIRPS scientific team**.

The **camera and detector of the SPIP instrument,** a copy of the LAE's SPIRou (SpectroPolarimètre InfraRouge) instrument, were **tested in a cryogenic chamber at the Université de Montréal** in autumn 2022. They were then sent to France to the Observatoire Midi-Pyrénées laboratory at the Université Toulouse III Paul Sabatier to be assembled with the other components to form SPIP. The instrument is due to be installed at the Observatoire Midi-Pyrénées in 2024.

HiCIBaS (High Contrast Imaging Balloon System) is a telescope installed on a balloon probe. Its main objective is to demonstrate the usefulness of high-contrast imaging equipment on board a stratospheric balloon. The project is led by the Université Laval, in collaboration with the Canadian Space Agency (CSA) and the LAE. The HicIBaS mission finally flew in August 2023, aboard a CSA balloon.



Members of the NIRPS team with the chamber containing the instrument's cooling system.
Credit: Consortium NIRPS

TEAM

The iREx team is made up of undergraduate and graduate students, postdoctoral and senior researchers, professors, and staff. Our members are located at the **Université de Montréal, McGill University, Bishop's University, the Université Laval, and the Montreal Planetarium**.

Together, we form the largest exoplanet research centre in Canada, and one of the most competitive in the world.

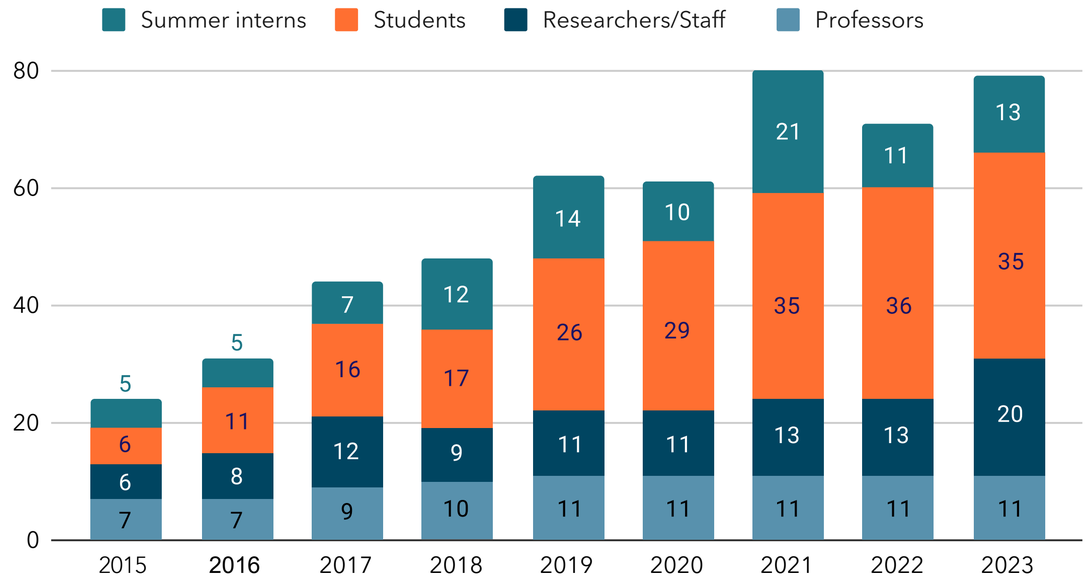
OUR TEAM'S GROWTH

At its inception in 2014, the iREx had barely a dozen members. Since then, the iREx team has experienced **impressive growth** thanks to the active recruitment of new students and researchers.

Several new students and a few new postdoctoral researchers joined our team in 2022-2023. Our cohort of summer interns was slightly larger than last year's, and we were delighted to welcome these **13 students from across Canada in person to our campuses**. We also had **a record number of postdoctoral researchers**, thanks in part to the fact that several of them were able to attract external funding to extend their stays with us.

At its peak in the summer of 2023, iREx had **79 members**. The total number of iREx members fluctuates each year as team members come and go, but our research network continues to grow and today includes dozens of people who have spent time with us as students or researchers.

Number of members



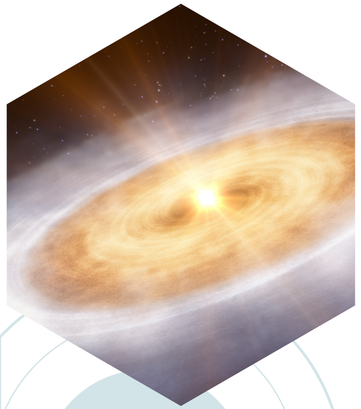


Photo credits:
Planet: ESO/M. Kornmesser/S. Guisard
Galaxy: ESO/L. Calçada

CHANGES IN OUR TEAM

The iREx team brings together researchers of international renown who stand out for their contributions to various aspects of exoplanet science and science communication. Over the period of 2022-2023, several new members joined our team.

Arrival of Vignesh Krishnamurthy

Vignesh Krishnamurthy is interested in the formation and evolution of the atmospheres of small and young exoplanets. After completing a Ph.D. at the Tokyo University of Technology in Japan in 2021, he continued his career at the National Astronomical Observatory of Japan (NAOJ, Mitaka) in Tokyo until September 2022. He then joined **McGill University in November 2022** as a postdoctoral fellow, where he continues to probe the atmospheres of exoplanets using the newly installed NIRPS spectrograph on the ESO 3.6 m telescope in Chile.

Arrival of Giang Nguyen

Giang Nguyen completed his Ph.D. at York University in Toronto. Since **October 2022**, he has been a **postdoctoral fellow at McGill University** in Nicolas Cowan's team. After studying the Martian polar caps to understand their role in the planet's climate, he turned his attention to water trapping on a large number of planetoids. He is now developing atmospheric models for lava exoplanets hot enough to vaporise rocks and generate a mineral atmosphere.

Departure of Amy Steele

Amy Steele, a postdoctoral researcher at McGill University between 2021 and 2023, left Montreal in **May 2023** to take up the position of **Director of Astronomy and Research at the Yerkes Observatory** in Wisconsin, USA. During her time at iREx, she continued her work on discs around stars of all ages. Her extensive experience with telescopes around the world and her research expertise, as well as her commitment to making the field of astrophysics more inclusive and accessible, will no doubt be valuable assets to her new organisation.

Departure of Anne Boucher

After submitting her doctoral thesis in the **spring of 2022** at the Université de Montréal, **Anne Boucher** worked as a **postdoctoral researcher at McGill University** in Nicolas Cowan's group. Considered an expert in high-resolution transit spectroscopy, she worked on a study of the emission from the unlit side of ultra-hot Jupiters with SPIRou during her stint at McGill. She left iREx in **May 2023** to join the team of scientists at Environment and Climate Change Canada, where she will work on the various weather models produced by the federal agency.

Promotion of Antoine Darveau-Bernier from Ph.D. student to postdoctoral researcher

Antoine Darveau-Bernier completed his Ph.D. in **early 2023**, at the Université de Montréal. He was then offered a **postdoctoral position**, again at the **Université de Montréal**. As a specialist in transit spectroscopy, he now works mainly on analysing data from the NIRISS instrument on the James Webb Space Telescope, which is used in particular to study the atmospheres of exoplanets. He also uses the SPIRou instrument on the Canada-France-Hawai'i Telescope to study the atmospheres of hot Jupiter-type exoplanets.

Arrival of Heidi White

Heidi White recently joined our team at the **Université de Montréal** as an **Outreach Officer for our Institute and the Mont-Mégantic Observatory**. Originally from Chicago in the USA, she earned a Ph.D. in astrophysics from the Dunlap Institute at the University of Toronto in 2021. She has also worked on a number of science communication initiatives committed to reaching underserved populations in Canada and around the world. She is a co-founder and instructor of the Pan-African School for Emerging Astronomers (PASEA) and a member of the Astrodigenous team. Her role is to create and maintain various activities and programs that enable us to share our passion for astrophysics and exoplanets with different audiences.

Photo credits:
Wolf-Rayet Star: NASA, ESA, CSA, STScI, Webb ERO Production Team
Planet: NASA, ESA, CSA, Joseph Olmsted (STScI)

Arrival of Marie-Ève Lapierre

We welcomed **Marie-Ève Lapierre** to the team in **July 2023**, as an **Administrative Technician**. With a Bachelor's degree in Biological Sciences from the Université de Montréal and a DESS in Administration from UQAM, Marie-Ève has experience in team management, technical manipulations in the laboratory, event organisation, and administrative tasks – skills that will serve her well in her new role with us!

Roseane de Lima Gomes' Internship

Roseane de Lima Gomes is a **fellow of the Brazilian National Council for Scientific and Technological Development** (CNPq, Conselho Nacional de Desenvolvimento Científico e Tecnológico) completing an internship at the **Université de Montréal**. Before joining our team in **May 2023**, she completed a Ph.D. at the Federal University of Rio Grande do Norte in Brazil in 2022. At iREx, Roseane is pursuing her work on stellar variability. In particular, she is focusing on the hosts of exoplanet candidates identified by NASA's TESS satellite. She also contributes to various complementary tasks and programs of the NIRPS instrument on the characterisation of exoplanets and their host stars.

Yuri Messias' Internship

Since 2020, **Yuri Messias** has been pursuing a Ph.D. at the Federal University of Rio Grande do Norte in Brazil. He is interested in the synchronisation between the rotation periods of stars and the orbital periods of their planets and the impact of this phenomenon on the habitability of planets. Since **February 2023**, he has been doing an internship at the **Université de Montréal**, using data from NIRPS, a spectrograph installed on the 3.6-metre telescope at La Silla in Chile, to find planets around active stars and stars with circumstellar discs.

Photo credits:
Red planet: NASA, ESA, CSA, Joseph Olmsted (STScI)
Grey planet: NASA, ESA, CSA, Joseph Olmsted (STScI), Leah Hustak (STScI)

Credit: NASA, ESA, CSA, STScI, Klaus Pontoppidan (STScI)

Congratulations to our new Masters and Doctors!

Congratulations to **Leslie Moranta and Alexandrine L'Heureux**, who were promoted from their Master's programs to their doctoral programs this year with the same supervisor and at the same institution (Jonathan Gagné at UdeM/Planétarium de Montréal for the former, and René Doyon at UdeM for the latter). Congratulations also to **Michael Matesic**, who completed his Master's at Bishop's with Jason Rowe and is now working on his doctorate at UdeM with Jason Rowe and Laurence Perreault-Levasseur as supervisors.

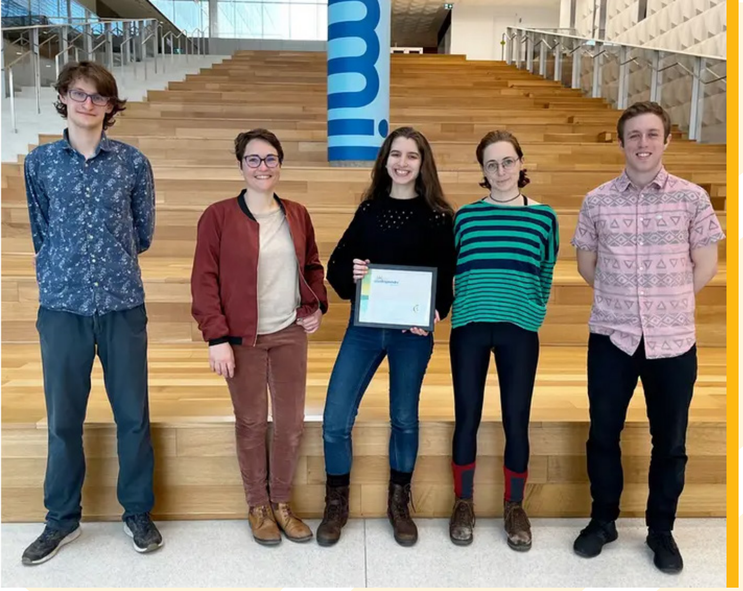
Congratulations to **Margaret Bruna, Ariane Deslières, André Beaudoin, Marylou Fournier-Tondreau, Noah Goldman, and Cheryl Wang**, who completed their Masters under the supervision of Nicolas Cowan (McGill) for the first, René Doyon (UdeM) for the next two, David Lafrenière (UdeM) for the fourth, and Eve Lee (McGill) for the last two.

Finally, we congratulate three of our members who completed their doctorates in 2022-2023: **Anne Boucher** (supervised by David Lafrenière at UdeM), **Antoine Darveau-Bernier** (supervised by René Doyon at UdeM), and **Rafael Fuentes** (supervised by Andrew Cumming at McGill)..

Welcome to our new graduate students!

Welcome to our new Master's students: **Érika Le Bourdais** (Patrick Dufour, UdeM), **Kim Morel** (David Lafrenière, UdeM), **Kevin Marimbu** (Eve Lee, McGill), **Luc Bazinet** (Björn Benneke, UdeM), and **Maya Tatarelli** (Eve Lee, McGill)..

AWARDS AND GRANTS



Winners of the regional division of the Défi OSEntreprendre Montréal, InitiaSciences

The InitiaSciences team, which includes iREx's **Caroline Piaulet-Ghorayeb, Thomas Vandal, and André Beaudoin**, won the **regional division of the Défi OSEntreprendre Montréal** in the "*Universitaire en équipe*" category for their project ***Initier les jeunes à la recherche scientifique***. Founded in June 2021 by a group of graduate students, InitiaSciences is a non-profit organisation that aims to demystify scientific research for secondary school and college students in Quebec. The iREx is a proud partner of this initiative, which enables these young people to gain authentic research experience spread over a school year, mentored by young researchers.

Fellow of the College of the Royal Society of Canada, Nicolas Cowan

McGill University professor and iREx member **Nicolas Cowan** was elected to the **Royal Society of Canada's (RSC) College of New Researchers and Creators in Art and Science in September 2022**. This prestigious honour was awarded this year to 54 mid-career Canadians who have distinguished themselves through their research or creative work. Associate Professor and Canada Research Chair in Planetary Climate, Nicolas studies the climate of exoplanets using telescopes on the ground and in space. He is interested in the habitability of planets, and is particularly motivated by the search for habitable worlds.

Hubert Reeves Scholarship, Érika Le Bourdais and Leslie Moranta

Érika Le Bourdais and Leslie Moranta, who began their Master's studies in 2022, won the **Hubert Reeves Scholarship awarded by the Université de Montréal's Department of Physics**. The scholarship, awarded by a jury made up of three professors from the department and Olivier Hernandez, Director of the Montreal Planetarium, recognises the remarkable motivation shown by these two young researchers to pursue graduate studies in astrophysics.

L'Oréal-UNESCO Fellowship for Women in Science and NSERC Banting Postdoctoral Fellowship, Lisa Đặng

Lisa Đặng, a postdoctoral researcher at Université de Montréal, was awarded a $20,000 **L'Oréal-UNESCO For Women in Science Fellowship** to support her postdoctoral research project. Lisa, a graduate of McGill University, is an expert in the study of exoplanets. She is particularly interested in lava planets, which she is studying with the James Webb Space Telescope. She joins an international community of 3,900 female researchers. L'Oréal and UNESCO also provide her with new avenues to pursue her work to make science more accessible through various educational initiatives. Lisa has also been awarded a prestigious **NSERC Banting Fellowship** for her postdoctoral fellowship, which she chose to hold at UdeM with iREx.

Photos: Nicolas Cowan, Credit: A. Tran/McGill University
Érika Le Bourdais and Leslie Moranta, Credit: Y. Turcotte
Lisa Dang, Credit: A. Gupta

Vain Bappu 2022 Gold Medal, Eve Lee

McGill University Assistant Professor **Eve J. Lee** has been awarded the **Indian Astronomical Society's Professor M. K. Vainu Bappu 2022 Gold Medal** for her contributions to astronomy and astrophysics. The prize, awarded every two years to scientists under the age of 35, honours Eve's outstanding achievements in these fields. A prolific young researcher, Eve focuses in particular on star and planet formation, with an emphasis on the diversity of exoplanets formed in protoplanetary discs.

Radio-Canada's 2022 Scientist of the Year, René Doyon

Radio-Canada awarded its **2022 Scientist of the Year** prize to astrophysicist **René Doyon**, Director of our Institute, for his key role in Canada's contribution to the James Webb Space Telescope. An expert in the study of exoplanets and astronomical instrumentation, René provided leadership and guidance in the development of the telescope's guidance system, FGS, and NIRISS, one of the four scientific instruments. After 20 years of hard work, the telescope delivered its first images in July 2022, and the important results it is delivering are opening the door to a new era in infrared astronomy. René had already been named Scientist of the Year in 2008, alongside his colleagues David Lafrenière and Christian Marois, for his contribution to the first image of a planetary system. He is the only individual to have received this honour more than once.

Prize for the Best Poster at the SAPHARI, Érika Le Bourdais

Érika Le Bourdais, a Master's student at iREx, was awarded **second prize for her poster entitled "WD1145+017 and the dance of exoplanetary debris"**. The poster competition was held during the **Symposium Annuel de Physique pour un Avenir en Recherche et en Industrie** (SAPHARI), an annual opportunity for students at the Université de Montréal to explore various career prospects. Érika presented her work on the study of exoplanetary debris around white dwarf stars. This work enables her to better understand the evolution of stars and their planetary systems.

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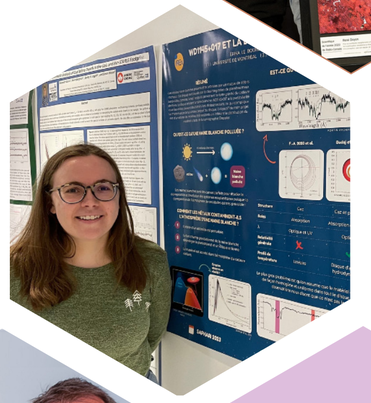
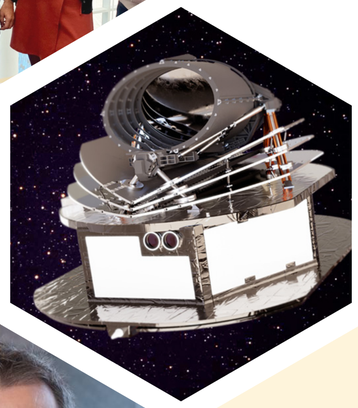


NASA Medal for Exceptional Public Service, René Doyon

René Doyon, Director of our Institute, was honoured by **NASA** with the prestigious **Medal of Honor for Exceptional Public Service in May 2023** for his **leading role in the James Webb Space Telescope mission**. The medal is NASA's highest honour, and recognises his outstanding leadership and significant impact on the space agency's mission. René, also a professor in the Department of Physics at the Université de Montréal and Director of the Mont-Mégantic Observatory, is responsible for the Canadian contribution to Webb, and is the Principal Investigator of the NIRISS instrument. He travelled to NASA's Goddard Space Flight Center in Maryland to receive his award.

Photos: René Doyon, Scientist of the Year, Credit: M. Ouellet-Diotte
Érika Le Bourdais , Credit: M.-E. Naud
René Doyon and NASA representative, Credit: T. Luskey/NASA



Photos: Érika Le Bourdais with colleagues, Credit: N. Ouellette
Ariel Telescope, Credit: Canadian Space Agency
René Doyon, Credit: A. Philibert/UdeM

Fonds de recherche du Québec's *Prix d'excellence* for Researchers, Étienne Artigauu

Étienne Artigau, a researcher at the Université de Montréal's iREx, has been awarded the **second Prix d'excellence des professionnels de recherche des Fonds de recherche du Québec - Nature et technologies in 2023**. Étienne is a very active member of our Institute, generously putting his skills in the study of brown dwarfs, exoplanets, and astronomical instrumentation at the service of our projects and members. Project scientist for the NIRPS and SPIRou instruments, he also contributes to data analysis for the James Webb Space Telescope.

UdeM Engagement Grant and Lumbroso Ambassador Grant, Érika Le Bourdais

Érika Le Bourdais, a master's student at the Université de Montréal, is the winner of the **2023 Lumbroso Grant**. This grant, offered annually thanks to a generous donation from Mr. Sylvain Lumbroso, a long-time ally of our Institute, recognises her leadership and commitment as an **iREx ambassador**. Her exceptional involvement in the Department of Physics at the Université de Montréal, both in terms of scope and impact, also earned her an **Engagement Scholarship from the Fonds d'amélioration à la vie étudiante de l'UdeM**. This award recognises her as an outstanding role model for the UdeM student community.

Canadian Principal Investigator for the Ariel mission, Nicolas Cowan

The Canadian Space Agency (CSA) has officially joined the European Space Agency's Ariel mission, a space telescope scheduled for launch in 2029. iREx member **Nicolas Cowan**, a Professor at McGill University, has been named **Canadian Principal Investigator for the mission, and joins the scientific team that will carry it out**. Using advanced spectroscopic techniques, Ariel will analyse the atmospheres of nearly a thousand exoplanets, shedding new light on their formation, atmospheric phenomena, and habitability. In addition to the expertise of Nicolas and his Canadian colleagues, the Canadian contribution will also include sophisticated electronic drivers provided by the CSA..

Tier 1 Canada Research Chair, René Doyon

René Doyon, Director of our Institute and of the Mont-Mégantic Observatory, has been named **Canada Research Chair in Experimental Astrophysics and Exoplanet Sciences**. This **Tier 1** Chair, endowed with $200,000 per year for 7 years, recognises the importance of René's achievements in these two fields, as well as his talents in recruiting and supervising students and researchers. This Chair is one of 157 to be created or renewed in 2022-2023, including seven at the Université de Montréal, to support leading researchers and strengthen research excellence in Canada

Outreach

PUBLICS EVENTS

Public and School Talks

iREx members are seasoned scientists who are actively involved in the communication of science. They love discussing their research topics, exoplanets, and astronomy in general with a wide range of audiences. They are regularly asked to give **talks** across Quebec and Canada at **libraries, amateur astronomy clubs, science centres, bars, seniors' centres**, and more. They also give **presentations, workshops, kiosks, and activities for students from pre-school to university**.

For a complete list of our public and school lectures, see the appendix at the end of this report.

Science Literacy Week 2022

For a third year, iREx took part in **Science Literacy Week**, offering the activity “Invitez une astrophysicienne à visiter votre bibliothèque” (Invite an astrophysicist to visit your library) in **September 2022**. Our astrophysicist **Marie-Eve Naud** visited two secondary schools, the Académie de Roberval and the Pensionnat Saint-Nom-de-Marie, and gave a virtual presentation for the Cégep Saint-Jean-sur-Richelieu library. Over **a hundred secondary school and college students** learned more about astrophysics, exoplanets, and the search for extraterrestrial life.

La nuit des chercheuses et chercheurs 2022, Espace pour la vie

A third edition of ***La nuit des chercheuses et des chercheurs*** was organised by **Space for Life on November 11, 2022 at the Montreal Botanical Garden**. The event, which also takes place in 300 European cities, invites the general public to come and celebrate research. iREx members **Romain Allart, Frédérique Baron, Charles Cadieux, Clémence Fontanive, Érika Le Bourdais, Alexandrine L'Heureux, Kim Morel, Caroline Piaulet, and Thomas Navarro** were all invited to meet the public and talk about their real-life astrophysics research projects. They also brought along the UdeM Department of Physics’ impressive Camillien-Houde refractor telescope for their demonstration booth.


Credit: G. Decarie-Landry

Soiree d'initiation à la recherche en astrophysique 2023

On **February 8, 2023**, a new virtual edition of the ***Soirée d'initiation à la recherche en astrophysique*** was held at the Université de Montréal, organised by iREx in collaboration with the UdeM Department of Physics and the Centre for Research in Astrophysics of Québec. The event attracted some **180 young people** from CEGEPs across the province. Several of our members helped make this edition a memorable one, including astrophysicists **Marie-Eve Naud, Frédérique Baron, and Nathalie Ouellette**, and iREx students **Érika Le Bourdais, Kim Morel, and Pierrot Lamontagne**. The students truly enjoyed meeting a variety of scientists and finding answers to all their questions about making an informed selection of a university program.

La Grande conference de l'iREx 2023, Thomas Fauchez

On **March 15, 2023**, our Institute presented its Grande conférence, this year titled ***"Atmosphères d'exo-Terres"*** and given by **Dr. Thomas J. Fauchez**, a researcher at NASA's Goddard Space Flight Center. During the talk, he presented methods for detecting and studying Earth-like exoplanets. His research into the atmospheres of these planets is particularly aimed at assessing their habitability.

The event, in hybrid mode, attracted a varied audience of nearly **150 people** on the MIL campus of the Université de Montréal and online on the Institute's Facebook and YouTube channels.

Each year, the Grande conférence de l'iREx allow a **world-class researcher to visit Montreal to interact with iREx members and present his or her research and story to the general public**. Past speakers include David Charbonneau (Harvard), Vicky Meadows (University of Washington), Sarah Hörst (Johns Hopkins University), and Clara Sousa-Silva (Harvard/CfA).

Credit: M.-E. Naud

AstroFest 2023

On **June 3, 2023**, iREx took part – with two activities rather than one – in the annual **AstroFest held at Space for Life's Montreal Planetarium**. At the ***"Where will you be on April 8, 2024?"*** booth, run jointly by our Institute, Discover the Universe, and the Centre for Research in Astrophysics of Quebec, young and old were able to learn more about solar eclipses and prepare for the big one on April 8, 2024. One floor down, the ***"Discover the Universe with the James Webb Space Telescope"*** workshop gave young and old alike the chance to draw or describe what they'd like to observe with this powerful telescope: a star nursery, a lava planet, a distant galaxy – there was no shortage of choices! Several iREx members helped lead these activities: **Frédérique Baron, Rebecca Hamel, Naman Jain, Érika Le Bourdais, Marie-Eve Naud, Nathalie Ouellette, Maddy Walkington, and Heidi White**. In the evening, **Nathalie Ouellette and René Doyon** gave a talk for the general public. In all, over 3,500 people took part in this great celebration of astronomy!

24 Hours of Science 2023

On **May 16 and 17, 2023**, as part of ***Science pour tous'* 24 Hours of Science**, astrophysicists **Frédérique Baron and Marie-Eve Naud**, from our Institute and the Centre for Research in Astrophysics of Quebec, presented ***"La Petite école de l'espace... dans ta classe".*** They visited **13 classrooms at the Montreal Parc-Extension borough's École Camille-Laurin** to meet **170 youngsters in kindergarten aged 4 and 5**. The little ones were able to learn the names of our planet, our star and our natural satellite, and had lots of fun with our Sun, Earth, and Moon plush toys brought along by the visitors!

Eurêka! Festival 2023

At the **Eurêka! Festival**, held from **May 26 to 28, 2023 at Jean-Drapeau Park**, iREx members **Érika Le Bourdais, Frédérique Baron, Nathalie Ouellette, Marie-Eve Naud**, and our science communications intern **Rebecca Hamel** hosted the ***"Where will you be on April 8, 2024?"*** booth, presented by the Centre for Research in Astrophysics of Quebec. Visitors were able to prepare for the great solar eclipse on April 8 by observing the Sun with eclipse glasses and a solar telescope. Young and old were also invited to draw a picture of what they would like to observe with the James Webb Space Telescope.

Mont-Mégantic Popular Astronomy Festival 2023

The **Astronomy Festival** is a unique opportunity for astronomy enthusiasts to enjoy Mont-Mégantic's magnificent starry skies and the **ASTROLab**'s captivating program. It's the only time of year when the general public can access the OMM dome and look through the telescope's eyepiece!

The 2023 edition took place on **July 6, 7, and 8**, on the theme of "**Eclipses**". The ASTROLab team set the scene for the total solar eclipse of April 8, 2024, whose centre of totality will pass exactly over the OMM, with a special presentation. Festival speakers were **Frédérique Baron**, instrumentation project manager with the OMM and iREx, Marianne Ruest, Master's student at the Université Laval, and **Nathalie Ouellette**, Deputy Director of the OMM and iREx. Frédérique recounted the adventure of commissioning the exoplanet-hunting instrument NIRPS in Chile, and Nathalie presented a summary of the most exciting results from the Webb telescope's first year of scientific operations.

Credit: M. Dusseault

Panel celebrating the 15th anniversary of HR 8799

The Mont-Mégantic Observatory and iREx organised the ***Canadian Astronomical Instrumentation Workshop*** at the Université de Montréal's MIL campus on August 31 and September 1, 2023. During this two-day workshop, astronomers from across Canada gathered to present their current astronomical instrumentation projects and discuss strategies for funding and developing future instruments and infrastructure.

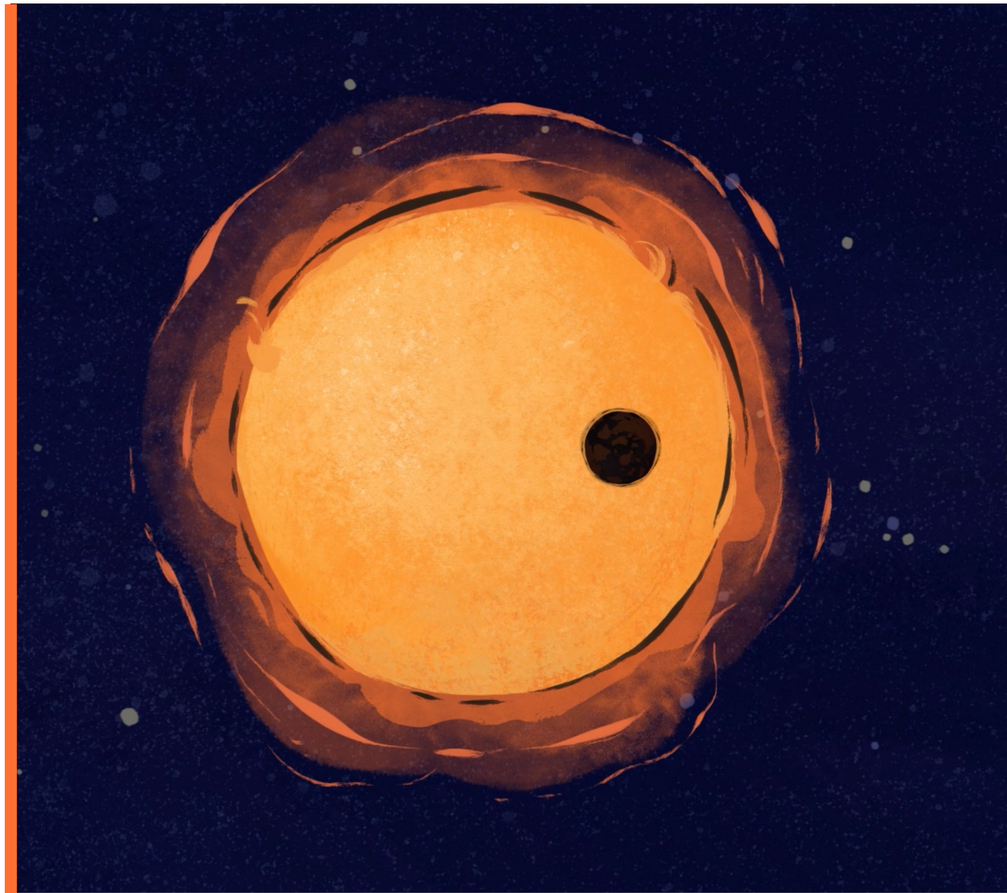
On the evening of **August 31, a panel discussion for the general public was organised to celebrate the 15th anniversary of the discovery of the HR 8799 exoplanetary system** in November 2008. This system of four exoplanets was the first to be directly imaged, and remains to this day a major milestone in the field of exoplanets, as well as the eventual creation of the iREx. The architects of this discovery, **René Doyon and David Lafrenière** from iREx, along with NRC-Herzberg researcher Christian Marois, took part in a discussion moderated by **Nathalie Ouellette** for the occasion, and then answered numerous questions from the audience.

PROGRAMS AND CONTENT CREATION

ExoBite 7

In winter 2020, the iREx team received a **DIALOGUE – Volet Chercheur grant**, awarded by the Fonds de recherche du Québec. Thanks to this grant, iREx launched the **ExoBites series**: **a series of short videos in French with English subtitles featuring our researchers talking about exoplanets and astronomy.**

During the summer and fall of 2022, a new ExoBite was created thanks to the work of our Sureau science communication intern **Érika Le Bourdais** and our Deputy Director, **Nathalie Ouellette**. The video, titled **"A cosmic wink"**, explains the **transit method** for detecting exoplanets. In addition to Érika and Nathalie, students **Charles Cadieux and Olivia Lim** appear in the video to explain how missions such as TESS and the Webb Telescope observe transits to study exoplanets. This seventh ExoBite was published in January 2023 and is the most popular yet! It has already accumulated **over 41,000 views** on the iREx's social networks. This video, along with the entire series of ExoBite videos, has also been **integrated into the "Exoplanets in the Classroom" resources** developed for Quebec school staff and their classrooms.



Exoplanets in the Classroom

In the **spring of 2023**, our Institute, in collaboration with Discover the Universe and other partners, completed the creation phase of the ***Exoplanets in the Classroom*** project, thanks to a **NovaScience grant from the Ministère de l'Économie, de l'Innovation et de l'Énergie**. This project offers a wealth of **free educational resources**, now available at www.exoplanetesalecole.ca**,** for people working in primary, secondary, and CEGEP schools, as well as for anyone with a passion for astronomy, in Canada and around the world.

These resources, designed by our **team of expert educational scientists** in collaboration with **hundreds of members of school staff from diverse backgrounds**, are varied and captivating. They include **presentations, activities, biographies of astronomers, videos, tutorials for virtual tools, encyclopaedias, FAQs, posters**, and more, all focusing on **exoplanets and the search for life elsewhere in the Universe** – subjects that fascinate young people. They have been very well received when presented in various contexts: **booths, interactive activities, classroom animations, libraries, career days**, as well as at Quebec, Canadian and international education, astrophysics and science communication **conferences**.

All these resources are currently being translated. Starting next year, anglophones around the world will be able to discover them at www.exoplanetsintheclassroom.ca**.**

Exoplanets and Us

The ***"Exoplanets and Us"*** series features six astronomers from our Institute: **Thomas Vandal, Frédérique Baron, Marie-Eve Naud, Nicolas Cowan, Marylou Fournier-Tondreau, and Jonathan Gagné**. In the videos, they answer questions often asked by young and old alike. Developed as part of the ***Exoplanets in the Classroom*** project, this collection of short videos was produced by our summer 2022 science communications intern, **Érika Le Bourdais**, in collaboration with our EPO Coordinator, **Marie-Eve Naud**. Released in **March 2023**, these vignettes allow viewers to discover each astronomer's **favourite exoplanet, a moment in the history of exoplanet research** they consider important, and their perspective on the big question: **Is there life elsewhere than on Earth?** Watch the videos here: https://bit.ly/exoplaneteetnous.

Preparation for the 2024 Eclipse

In 2022-2023, the preparations that began last year for the **total solar eclipse in southern Quebec on April 8, 2024** accelerated considerably. In addition to actively collaborating with all members of the Éclipse Québec committee, notably on the **creation of the www.eclipsequebec.ca website**, our team stepped up its work with the Université de Montréal this year. Among other things, we purchased **over 70,000 pairs of eclipse glasses** for our community and the general public.

In addition, some **sixty Eclipse Ambassadors** were trained. These young university students from all levels and from a variety of programs took part in a 4-hour training course with our astrophysicists **Marie-Eve Naud and Heidi White** to learn the basics of solar eclipses, and to hone their scientific communication skills so they can act as leaders in their chosen communities before and during the eclipse.

Our EPO team is also working on several activities and initiatives for fall 2023 and winter 2024.

Beyond the Stars Program

Beyond the Stars is a program created in 2021 by **Heidi White** to bridge the educational divide between Indigenous and settler communities in Canada. It provides hands-on astronomy learning opportunities for Indigenous youth in remote areas.

The program, rooted in modern educational principles, **immerses participants in local cultures and heritages**, using **traditional storytelling** to awaken their curiosity about the night sky and the Universe. During the 2022-2023 school year, Beyond the Stars ran a **pilot program** that engaged nearly **50 secondary school students and young adults from Nunavut and Ontario**. The program saw a high level of engagement and enthusiasm from participants, particularly during the hands-on activities and roundtable discussions on cultural astronomy.

In August 2023, Beyond the Stars ran a successful **two-week in-person workshop** in Durham, Ontario, through a partnership with Elephant Thoughts. Approximately **20 young adults from Indigenous and underserved communities** were involved in **astrophotography sessions and observation of the Sun and night sky**. The program also incorporated artistic elements, including the reproduction of astronomical images using handicrafts.

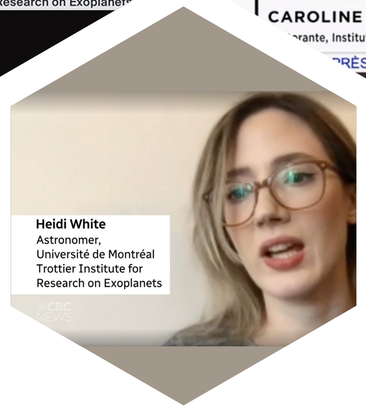
The lessons learned from this pilot year pave the way for a more structured and focused approach for the 2023-2024 program. In 2024, Beyond the Stars aims to further develop the partnership with Elephant Thoughts, as well as establish new links with the James Bay Eeyou School and the Kahnawà:ke Survival School, to enhance the program's reach and impact.

iREx IN THE NEWS

Members of the iREx are always **in demand by the media** to comment on their discoveries, large-scale missions such as the James Webb Space Telescope, or scientific news. Several research projects carried out by our students, including the **ocean planet TOI-1452 b studied by Charles Cadieux, the water worlds Kepler-138 c and d studied by Caroline Piaulet**, and the volcanic planet LP 791-18 d studied by Merrin Peterson and Caroline Piaulet, made a huge media splash around the world.

In 2022-2023, iREx members participated in **32 television interviews, 39 radio interviews and 75 print and online interviews**, for a total of **146 media interviews**.

For a more complete list of our media interventions, please see the appendix to this report.



SOCIAL MEDIA

The iREx is present on several **social networks** and strives to connect with different audiences through modern and innovative means, whether it is to **introduce the world of exoplanets to children and their families**, to **talk about the discoveries of our team scientists**, or to **recruit new members**. As of **August 31, 2023**, the iREx had:

5360 subscribers	1347 subscribers	463 070 visits	2254 subscribers	2400 subscribers	380 subscribers
@iRExoplanetes	@iExoplanets	www.exoplanets.ca	irex@astro.umontreal.ca	@exoplanetes	/exoplanetes

Inreach

CAFÉS iREx

iREx Cafés are weekly get-togethers that enable iREx members to **discuss news** in the field of exoplanets, **present their latest results, or chat with each other and with special iREx guests**. It is also a unique opportunity to learn more about various topics related to **education and science communication, equity, diversity and inclusion, or career development**.

Between May and August, our many interns join us every week. For the occasion, the Cafés include training on various sub-topics related to exoplanet science or research techniques and tools.

Since 2022, our Cafés have adopted a **hybrid format**, enabling the majority of our members to join us in person, while allowing those off-campus not to miss anything.

Our iREx Cafés take several formats depending on our needs: **presentations** with visual aids, **discussions**, or **question and answer sessions**. We also often welcome **internationally-renowned visitors**. These gatherings enable our members, and especially our students, to interact with experienced researchers in a more informal setting.

SUMMER INTERNSHIPS

We have welcomed **summer interns** since the iREx was founded. The effervescence and dynamism of the Institute, as well as our prestigious **Trottier Excellence Grants** competition, attract undergraduate students from across the country to work with our researchers.

Following last year's success, iREx offered the **Sureau Grant in science communication** a the second year, enabling an undergraduate student to work with our outreach team on several of our knowledge translation projects. The second recipient of this scholarship was **Rebecca Hamel** from Saint Mary's University.

In the summer of 2023, we welcomed **13 summer interns, including four Trottier Fellows, one Sureau Fellow, and one Marie-Curie Fellow** from the UdeM Department of Physics. Comfortably settled in at UdeM's MIL campus, at McGill, and at Bishop's, the trainees were able to interact with other iREx members throughout the summer. They met at the **Welcome Day** in May, and at weekly iREx Cafés, as well as several times during the summer for various professional and social events. They also had the chance to participate in many of our **educational and scientific outreach activities**, such as our booths at the Montreal Planetarium's AstroFest and the Eurêka! Festival, the Mont-Mégantic Popular Astronomy Festival and other

presentations. Some of them also spent time at the **Mont-Mégantic Observatory**, where they were trained to use the telescope and its instruments, and to collect astronomical data.

Their internship culminated in a **Final Presentation Day in August**, where they all had the chance to showcase their summer's work.

INITIASCIENCES PROGRAM

InitiaSciences is an innovative Quebec program offering **secondary school and CEGEP students from groups under-represented in science their first research experience**. Coached by **young university mentors**, the program is made possible by the volunteer commitment of a team of researchers led by **Caroline Piaulet-Ghorayeb**, iREx Ph.D. student and President of InitiaSciences.

Between September 2022 and June 2023, a first cohort of young people completed their internship. Among the five mentors who supervised these students, two are iREx members: **Caroline Piaulet-Ghorayeb** supervised Danika Belzile from Dawson College, Mehramat Kaur from École secondaire Caelier-De LaSalle and Kamrul Musfirat from Vanier College. Master's student **André Beaudoin** supervised Carla Letang, Islem Gattoufi and Huri-Nur Yergin, three students from Cégep Marie-Victorin.

The InitiaSciences team includes several other iREx graduate students: **Kim Morel, Érika Le Bourdais, Thomas Vandal, Laurie Dauplaise, Ariane Deslières**, as well as our EPO Coordinator **Marie-Eve Naud**, who acts as an advisor. The iREx, a proud partner of InitiaSciences, supports this initiative financially and through various in-kind contributions.

Credit: Polyphoto

EDI COMMITTEE

The mission of the iREx **Equity, Diversity and Inclusion** (EDI) Committee is to foster the professional integration within our Institute of people from groups traditionally under-represented in astrophysics, in order to help increase the scientific prosperity of an inclusive Institute that takes pride in its diversity.

Our objectives are to:

- **increase recruitment efforts for people from under-represented groups**, at all levels of study and employment,
- promote the **integration and retention** of these individuals within iREx,
- **promote diversity in science** through iREx, and
- foster members' **professional development** so that they can pursue the career of their choice.

In 2022-2023, the committee was able to count on postdoctoral fellows **Romain Allart and Clémence Fontanive,** students **Leslie Moranta and Caroline Piaulet-Ghorayeb**, as well as employees **Frédérique Baron and Marie-Eve Naud**. Our warmest thanks go to **David Lafrenière**, professor, and **Étienne Artigau**, researcher, who ended their participation on this committee this year.

In 2022-2023, the Committee's major project was the **drafting of an action plan**, which is already well underway. Members of our Institute also continue to learn more about EDI issues through **training courses, presentations, and discussions**, which have a considerable impact on all our scientific and educational activities.

To break the isolation of our members, including those new to Montreal, our committee **encouraged the creation of a Social Committee**, which came into being at the end of summer 2022. Several team-building activities were supported by this committee and ours, including **lunches** before weekly meetings and an **icebreaker event** in May 2023.

All iREx members received training on **imposter syndrome and management of frustration and time in research** from our colleague Carolina Cruz-Vinaccia of McGill University. They also received several **training sessions on career development**, including creating a personal website as a scientist, dealing with the media and writing press releases, and using artificial intelligence in research. Finally, one of our members took the ***Sentinelle* training offered by *Suicide Action Montréal*** and summarised it for committee members, so that they are better able to react when faced with a person in distress.

Our **self-identification form** was presented to our members for the second year running, to get a clearer picture of our Institute's membership. A total of 43 people completed the form, a number comparable to last year. The information gathered shows that **a majority of our members are, once again, not from under-represented groups**, and that we need to pursue our recruitment and retention efforts in this direction. That said, the **proportion of our members with the gender identity "cisgender woman" has risen from 25% to 40% since last year**. Following feedback from our members after this year's form, **a question on the highest level of education achieved by parents or grandparents will be added** to the next edition, in order to recognise family history as a factor influencing access to research.

Finally, the Committee continues to work in **collaboration with other committees with similar missions**, including those of the physics departments at UdeM and McGill University, and that of the Centre for Research in Astrophysics of Quebec, to achieve change on a larger scale.

Appendices

PUBLIC EVENTS

School and Library Talks

1. *Exploring the Cosmos with the James Webb Space Telescope*, **Nathalie Ouellette**, Exploring by the Seat of your Pants, September 12 2022.
2. *Explorer le cosmos avec le télescope spatial James Webb*, **Nathalie Ouellette**, Exploring by the Seat of your Pants, September 12 2022.
3. *Skype an Astronomer*, **Nathalie Ouellette**, Skype a Scientist, September 13 2022.
4. *Skype an Astronomer*, **Nathalie Ouellette**, Skype a Scientist, September 16 2022.
5. *Discussion avec une astrophysicienne*, **Marie-Eve Naud**, Pensionnat du Saint-Nom-de-Marie, September 19 2022.
6. *Career Interview*, **Lisa Dang**, Westmount Park Elementary School, September 20 2022.
7. *Discussion avec une astrophysicienne*, **Marie-Eve Naud**, Cégep Saint-Jean-sur-Richelieu, September 21 2022.
8. *Discussion avec une astrophysicienne*, **Marie-Eve Naud**, Académie de Roberval, September 22 2022.
9. *Ma vie de chercheur en astronomie*, **Thomas Vandal**, Cégep de la Gaspésie et des Îles, October 2022.
10. *Unveiling the Universe with the Webb Telescope*, **Nathalie Ouellette**, Universidad de Buenos Aires, October 6 2022.
11. *Intro to Exoplanets*, **Heidi White**, Pan-African School for Emerging Astronomers, October 12 2022.
12. *Une astronome dans votre classe*, **Marie-Eve Naud**, École Les Jeunes Découvreurs, October 14 2022.
13. *Skype an Astronomer*, **Nathalie Ouellette,** Skype a Scientist, October 18 2022.
14. *Discovering the Universe with the James Webb Space Telescope*, **Frédérique Baron**, Vanier College, October 19 2022.
15. *Chasseuse d'exoplanètes*, **Frédérique Baron**, Exploring by the Seat of your Pants, October 27 2022.
16. *Une astronome dans votre classe*, **Marie-Eve Naud**, École primaire les Sittelles, October 27 2022.
17. *Exoplanets, new worlds to discover*, **Marie-Eve Naud**, John McCrae Secondary School, October 28 2022.
18. *Analyse spectroscopique d'étoiles naines blanches*, **Alexandrine L'heureux**, Cégep de Saint-Laurent, October 28 2022.
19. *Une journée dans ma vie de chercheuse en astronomie*, **Érika Le Bourdais**, Université de Montréal, November 2022.
20. *Analyse spectroscopique d'étoiles naines blanches*, **Alexandrine L'heureux**, École secondaire Augustin-Norbert-Morin, November 8 2022.
21. *Discussion avec une astrophysicienne*, **Marie-Eve Naud**, École spécialisée des Remparts, November 9 2022.
22. *Nommez votre exoplanète!*, **Marie-Eve Naud**, Club d'astronomie du Collège Mont Notre-Dame, November 16 2022.
23. *Nommez votre exoplanète!*, **Marie-Eve Naud**, Activité aérospatiale de l'Escadron 518 Rosemont, November 19 2022.
24. *Science Communication*, **Nathalie Ouellette**, Science Communication Executive Certificate Program (Seneca College), November 29 2022.
25. *Panel de discussion: La désinformation en science*, **Nathalie Ouellette**, Université de Montréal, December 7 2022.
26. *Le télescope spatial James Webb: premiers résultats*, **René Doyon**, Polytechnique de Montréal, January 2023.
27. *Discussion avec une astrophysicienne*, **Marie-Eve Naud**, Université de Montréal, pour le collégial du Collège Stanislas, January 20 2023.
28. *Une astronome en maternelle*, **Marie-Eve Naud**, École Gadbois, January 23 2023.
29. *Une astronome dans votre classe*, **Marie-Eve Naud**, École Saint-André, January 25-26 2023.
30. *Discussion avec une astrophysicienne*, **Marie-Eve Naud**, Bayside Middle School, February 3 2023.
31. *Dévoiler le cosmos avec le télescope spatial James Webb*, **Nathalie Ouellette**, Club scientifique de Collège Jean-de-Brébeuf, February 2023.

32. *Une astronome dans votre classe*, **Marie-Eve Naud**, École Les Bocages, February 17 2023.
33. *Ce qu'il y a dans l'espace*, **Marie-Eve Naud**, Club de Filles de l'École Barthélemy-Vimont, February 21 2023.
34. *Planètes et exoplanètes*, **Frédérique Baron**, CanYES, February 2023.
35. *Les premiers résultats du télescope spatial James Webb*, **René Doyon**, Réseau des bibliothèques publiques de Thetford, February 22 2023.
36. *Dévoiler le cosmos avec le télescope spatial James Webb*, **Nathalie Ouellette**, École secondaire de la Haute-Ville (Granby, QC), February 22 2023.
37. *Beyond the Stars*, **Heidi White**, Kugluktuk High School, from March 8 to April 19 2023 (online workshops).
38. *Seeing Beyond the Visible: First Results from the James Webb Space Telescope*, **Nathalie Ouellette**, Royal Military College Physics Seminar, March 9 2023.
39. *La recherche en astrophysique*, **Leslie Moranta**, Cégep de Lanaudière à Terrebonne, March 17 2023.
40. *Seeing Beyond the Visible: First Results from the James Webb Space Telescope*, **Nathalie Ouellette**, University of Windsor Physics Seminar, March 21 2023.
41. *Skype an Astronomer*, **Nathalie** Ouellette, Skype a Scientist, March 22 2023.
42. *First Exciting Results from the Webb Telescope*, **Nathalie Ouellette**, Collège Bois-de-Boulogne, March 23 2023.
43. *Une astronome dans votre classe*, **Marie-Eve Naud**, École Notre-Dame-de-la-Sagesse, March 24 2023.
44. *Une astronome dans votre classe*, **Marie-Eve Naud**, École primaire les Sittelles, March 28 2023.
45. *Beyond the Stars*, **Heidi White**, Qarmartalik School, April 3-19 2023 (online workshops).
46. *Une astronome dans votre classe*, **Marie-Eve Naud**, École Pierre-Boucher, April 12 2023.
47. *Ce qu'il y a dans le système solaire et au-delà*, **Marie-Eve Naud**, École Barthélemy-Vimont, April 13 2023.
48. *Une astronome dans votre classe*, **Marie-Eve Naud**, École Lévis-Sauvé, April 14 2023.
49. *Conférence de clôture*, **Marie-Eve Naud**, SCIENCE POP | Compétition de communication scientifique interne du Centre de recherche interdisciplinaire en réadaptation du Montréal métropolitain, April 18 2023.
50. *Extraterrestrial Life*, **Lisa Dang**, Carnegie Mellon University, April 21 2023.
51. *A Deeper Dive into the James Webb Space Telescope*, **Nathalie** Ouellette, New York Master Teachers' Program, April 22 2023.
52. *Dévoiler le cosmos avec le télescope spatial James Webb*, **Nathalie Ouellette**, Collège français, April 25 2023.
53. *Discussion avec une astronome*, **Marie-Eve Naud**, Résidence ORA, April 25 2023.
54. *Sommes-nous seuls dans l'Univers*, **René Doyon**, APRÈS l'UQAM, April 26 2023.
55. *Le télescope Webb*, **Loïc Albert et Étienne Artigau**, Les pauses découvertes de la Faculté des arts et des sciences – Université de Montréal, April 27 2023.
56. *Discussion avec une astronome*, **Marie-Eve Naud**, Centre des aînés de Villeray, May 5 2023.
57. *Les premiers résultats du télescope spatial James Webb*, **René Doyon**, Centre de recherches mathématiques (during the 24 hours of science), May 5 2023.
58. *Curious Topics in Science*, **Lisa Dang**, McGill University, May 10 2023.
59. *La Petite école de l'espace... dans ta classe!*, **Frédérique Baron et Marie-Eve Naud**, École Camille-Laurin, May 16-17 2023.
60. *Une astronome dans votre classe*, **Marie-Eve Naud**, École Plein Soleil, May 18 2023.
61. *Discussion avec une astronome*, **Marie-Eve Naud**, Manifesting Space Cities, May 29 2023.
62. *Les exoplanètes : à la recherche de nouveaux mondes*, **Érika Le Bourdais**, Cap campus – Université de Montréal, June 2023.
63. *Une astronome dans votre classe*, **Marie-Eve Naud**, École primaire Cardinal-Léger, June 7 2023.
64. *Une astronome dans votre classe,* **Marie-Eve Naud**, École Barthélemy-Vimont, June 12 2023.
65. *Unveiling the Cosmos: the James Webb Space Telescope*, **Nathalie Ouellette**, CASCA Teachers' Workshop, June 12 2023.
66. *Multiwavelength Astronomy*, **Heidi White**, CASCA Teachers' Workshop, June 12 2023.
67. *Et toi, qu'en penses-tu : Sommes-nous seuls dans l'Univers?*, **Marie-Eve Naud**, École secondaire Louis-Jobin, June 16 2023.
68. *Les exoplanètes et le télescope Webb : conférence discussion avec une astronome!*, **Marie-Eve Naud**, Bibliothèque Jacqueline-De Repentigny, June 20 2023.
69. *Les exoplanètes*, **Marie-Eve Naud**, Camp de jour d'astronomie du CEPSUM, July 6 2023.
70. *Le télescope spatial James Webb*, **Nathalie Ouellette**, Camp de jour d'astronomie du CEPSUM, July 11 2023.

71. *Les exoplanètes*, **Marie-Eve Naud**, Camp de jour d'astronomie du CEPSUM, July 20 2023.
72. *Les exoplanètes et l'agence de voyages interstellaire*, **Nathalie Ouellette**, École des langues de l'UdeM, July 24 2023.
73. *Le télescope spatial James Webb*, **Nathalie Ouellette**, Camp de jour d'astronomie du CEPSUM, July 25 2023.
74. *Rencontre un.e astronome*, **Romain Allart**, Camp de jour d'astronomie du CEPSUM, July 25 2023.
75. *Beyond the Stars*, **Heidi White**, Elephant Thoughts, August 8 and 15 2023.
76. *Une astronome à ta bibliothèque*, **Marie-Eve Naud**, Bibliothèque de Beaconsfield, August 31 2023.
77. *Chasseurs d'exoplanètes*, **Thomas Vandal**, Cœur des sciences (UQAM), 10 secondary school presentations (online), Fall 2022 and Winter 2023.
78. *WR 124 : explosion imminente?*, **Pierre-Alexis Roy et Thomas Vandal**, Cœur des sciences (UQAM), 10 secondary school presentations (online), Fall 2022 and Winter 2023.

Public Talks

1. *Unveiling the Cosmos with the James Webb Space Telescope*, **Nathalie Ouellette**, Queen's Observatory Open House, September 24 2022.
2. *Le telescope James Webb: voir l'Univers differemment*, **René Doyon et Nathalie Ouellette**, Les conferences de la montagne de l'UdeM, September 28 2022.
3. *Planets near and far*, **Eve Lee**, Thomas Navarro et Jared Splinter, McGill Public AstroNight, September 28 2022.
4. *Le télescope James Webb et l'astrophysique au Québec*, **Nathalie Ouellette**, Montreal International Center of Expertise in Artificial Intelligence (CEIMIA), September 29 2022.
5. *Un nouveau regard sur le cosmos*, **Nathalie Ouellette**, Coeur des sciences (UQAM), September 29 2022.
6. *L'instrument NIRPS*, **Frédérique Baron**, Discover the Universe, September 30 2022.
7. *From Data to Images & Science with the James Webb Space Telescope*, **Nathalie Ouellette**, NASA SpaceApps Challenge, September 30 2022.
8. *Les résultats du télescope spatial James Webb*, **René Doyon**, Conférence annuelle de la Fédération des astronomes amateurs du Québec, October 1 2022.
9. *Dévoiler l'Univers avec le télescope spatial James Webb*, **Nathalie Ouellette**, La Grande Unification du département de physique de l'UdeM, October 6 2022.
10. *À la recherche de nouveaux mondes*, **Frédérique Baron**, Parc Ahuntsic, October 6 2022.
11. *Evening Under the Stars*, **Eve Lee**, George Mason Observatory, October 18 2022.
12. *Unveiling the Universe with the James Webb Space Telescope*, **Nathalie Ouellette**, St-Louis Astronomical Society, October 21 2022.
13. *The James Webb Space Telescope: First Results*, **René Doyon**, Canadian Aeronautic Space Institute Conference, November 2022.
14. *Unveiling the Universe with the James Webb Space Telescope*, **Nathalie Ouellette**, St-James Society, November 8 2022.
15. *Une conférence sous les étoiles,* **Nathalie Ouellette**, Journée G-CHANGE de l'ETS, November 10 2022.
16. *Unveiling the Secrets of the Universe with the James Webb Space Telescope*, **Nathalie Ouellette**, PhysiX: Girls Matter (University of Waterloo), November 26 2022.
17. *Unveiling the Universe with the James Webb Space Telescope*, **Nathalie Ouellette**, AstroMcGill Public Lecture, November 30 2022.
18. *Seeing Beyond the Visible with the James Webb Space Telescope*, **Nathalie Ouellette**, CS2AI, December 1 2022.
19. *À travers la lunette du télescope James Webb,* **Nathalie Ouellette**, Causerie BAnQ, December 1 2022.
20. *Seeing the Universe in a New Light with JWST*, **Heidi White**, Canadian Association of Girls in Science, January 14 2023.
21. *Seeing Beyond the Visible with the James Webb Space Telescope*, **Nathalie Ouellette**, CS2AI Family Event, January 22 2023.
22. *James Webb Space Telescope Panel*, **Nathalie Ouellette**, Canadian Space Conference, January 28 2023.
23. *What can we learn from the JWST data?* Panel, **Lisa Dang et Olivia Lim**, Canadian Space Conference, January 28 2023.
24. *The James Webb Space Telescope: First Results*, **René Doyon**, Canadian Space Conference, January 29 2023.
25. *Unveiling the Universe with the James Webb Space Telescope*, **Nathalie Ouellette**, Third Age

Learning Burlington, February 9 2023.

26. *Unveiling the Universe with the James Webb Space Telescope*, **Nathalie Ouellette**, International Conference on Mathematics and Natural Sciences, February 10 2023.
27. *Le fonctionnement du télescope Webb*, **Loïc Albert**, Club d'astronomie Mont-Tremblant, February 14 2023.
28. *À la recherche de nouveaux mondes*, **Frédérique Baron**, Club d'astronomie de Sherbrooke, March 10 2023.
29. *Les premiers résultats du télescope spatial James Webb*, **Nathalie Ouellette**, Société d'astronomie du Planétarium de Montréal, March 10 2023.
30. *Unveiling the Cosmos with the James Webb Space Telescope*, **Nathalie Ouellette**, Lifelong Learners Niagara, March 14 2023.
31. *Le chasseur de planètes NIRPS*, **Frédérique Baron**, Club d'astronomie Bois de Belle-Rivière-Mirabel, March 28 2023.
32. *The James Webb Space Telescope: a New Eye in the Sky*, **René Doyon**, McGill University, April 2023.
33. *The James Webb Space Telescope and Ask an Astrophysicist*, **Nathalie Ouellette**, New York Master Teachers' Program, April 22 2023.
34. *À la recherche de nouveaux mondes : l'étude des exoplanètes*, **Alexandrine L'heureux**, Club d'astronomie les Boréalides, April 28 2023.
35. *Why are we made of stardust?*, **Stefan Pelletier,** Astronomy on Tap, May 2 2023.
36. *Les exoplanètes*, Caroline Piaulet, Twitch Live at the 24 hours of science, May 5 2023.
37. *Les premiers résultats du télescope spatial James Webb*, **René Doyon**, Acfas, May 8 2023.
38. *L'exploration de mondes potentiellement habités avec le télescope spatial James Webb*, **René Doyon**, Acfas, May 8 2023.
39. *La recherche des planètes terrestres du voisinage immédiat du Soleil*, **Étienne Artigau**, Acfas, May 8 2023.
40. *TOI-1452 b : une exoplanète possiblement recouverte d'un océan*, **Charles Cadieux**, Soirée-bénéfice de la Corporation d'astronomie de Val-Bélair, May 27 2023.
41. *Panel sur la communication scientifique*, **Nathalie Ouellette**, ComSciCon-QC, June 3 2023.
42. *Le télescope spatial James Webb en histoires*, **René Doyon**, Montreal Planetarium's AstroFest, June 3 2023.
43. *Le télescope spatial James Webb en images*, **Nathalie Ouellette**, Montreal Planetarium's AstroFest, June 3 2023.
44. *Y a-t-il de la vie sur Vénus?*, **Thomas Navarro**, Astronomy on Tap, June 6 2023.
45. *La variété des mondes habitables*, **Étienne Artigau**, Astronomy on Tap, June 6 2023.
46. *Alien Worlds through the Eyes of the James Webb Space Telescope*, **Nathalie Ouellette**, TELUS Spark After Dark, June 9 2023.
47. *Les premiers résultats du télescope spatial James Webb*, **Nathalie Ouellette**, Club d'astronomie de Lévis, June 21 2023.
48. *Unveiling the Universe with the James Webb Space Telescope*, **Nathalie Ouellette**, Women in Physics Canada Conference, July 6 2023.
49. *Le chasseur d'exoplanètes NIRPS*, **Frédérique Baron**, Festival d'astronomie populaire du Mont-Mégantic, July 6 2023.
50. *Le télescope spatial James Webb: rétrospective d'une année fantastique!*, **Nathalie Ouellette**, Festival d'astronomie populaire du Mont-Mégantic, July 8 2023.

Public Events

1. *La nuit des chercheuses et des chercheurs*, **Romain Allart**, Frédérique Baron, Clémence Fontanive et Kim Morel, Space for Life, November 11 2022.
2. *Soirée d'initiation à la recherche en astrophysique 2023,* **Marie-Eve Naud**, Frédérique Baron, Nathalie Ouellette, Érika Le Bourdais, Kim Morel et Pierrot Lamontagne, Université de Montréal, February 8 2023.
3. *Atmosphères d'exo-Terres, Thomas Fauchez (NASA) and the iREx team*, La grande conférence de l'iREx (Université de Montréal), March 15 2023.
4. *Astronomie en fût / Astronomy on Tap MTL* (2 events), Montreal astronomers including members of iREx, May 2 and June 6 2023.
5. *Où seras-tu le 8 avril 2024?*, **Érika Le Bourdais**, **Frédérique Baron, Nathalie Ouellette, Marie-Eve Naud and Rebecca Hamel**, Eurêka! Festival, May 26-27-28 2023.
6. *AstroFest 2023*, **Frédérique Baron, Rebecca Hamel, Érika Le Bourdais, Naman Jain, Marie-Eve Naud, Nathalie Ouellette, Maddy Walkington and Heidi White**, Montreal Planetarium, May 7 2022.
7. *Célébrons 15 ans d'imagerie d'exoplanètes*, **René Doyon, David Lafrenière, Nathalie Ouellette**

and the iREx/OMM Team, Université de Montréal, August 31 2023.

MEDIA INTERVIEWS

Television Interviews

1. *La mission DART*, **Nathalie Ouellette**, LCN, September 26 2022.
2. *La mission DART*, **Nathalie Ouellette**, TVA Nouvelles, September 27 2022.
3. *La formation rapide de la Lune*, **Frédérique Baron**, Le téléjournal 18h (Radio-Canada), October 5 2022.
4. *InstaLive avant la Journée G-CHANGE*, **Nathalie Ouellette**, G-CHANGE de l'École de technologie supérieure, October 26 2022.
5. *NASA offers new clues for potentially inhabiting Mars*, **Heidi White**, Global National, October 27 2022.
6. *AAS Journal Author Series: Charles Cadieux…*, **Charles Cadieux**, American Astronomical Society YouTube Channel, November 1 2022.
7. *La mission Artemis*, **Nathalie Ouellette**, LCN, November 16 2022.
8. *Mission Artémis*, **Frédérique Baron**, 24•60, November 16 2022.
9. *Deux étudiants témoignent de leur expérience unique à l'Institut de recherche sur les exoplanètes*, **Lisa Dang and Thomas Vandal**, Université de Montréal Instagram, November 21 2022.
10. *Une découverte de deux exoplanètes composées principalement d'eau*, **Caroline Piaulet**, Salut Bonjour (TVA), December 16 2022.
11. *What is TRAPPIST-1 and what did JWST observe so far?*, **Olivia Lim**, SETI Institute YouTube, December 17 2022.
12. *Une grosse année… pour l'astrophysique*, **Nathalie Ouellette**, Rad (Radio-Canada), December 19 2022.
13. *Watery Exoplanets*, **Caroline Piaulet**, SETI Institute YouTube, January 19 2023.
14. *Le Scientifique de l'année 2022*, **René Doyon**, Découverte (Radio-Canada), January 29 2023.
15. *Des astuces pour bien observer l'alignement de cinq planètes*, **Nathalie Ouellette**, TVA Nouvelles, April 2 2023.
16. *La mission Artémis*, **Nathalie Ouellette**, TVA Nouvelles, April 3 2023.
17. *La mission Artémis*, **Nathalie Ouellette**, 24•60 (Radio-Canada), April 3 2023.
18. *The Artemis II Mission*, **Nathalie Ouellette**, CBC Vancouver, April 3 2023.
19. *Le tachyon, une particule "bienfaisante", mais imaginaire*, **Nathalie Ouellette**, La facture (Radio-Canada), April 4 2023.
20. *Canadian astronomers discover new Earth-like planet potentially covered in volcanoes*, **Björn Benneke**, CTV News, May 19 2023.
21. *Canadian researcher on discovery of exoplanet*, **Björn Benneke**, CP24, May 19 2023.
22. *Montreal astronomers discover Earth-sized planet potentially covered with volcanoes*, **Björn Benneke**, CTV News, May 22 2023.
23. *Why does the sun look red? Wildfire smog's effect explained*, **Heidi White**, CBC, June 6 2023.
24. *Pourquoi le Soleil rouge dans le ciel?*, **Nathalie Ouellette**, TVA Nouvelles, June 7 2023.
25. *New exoplanet discovery sparks hope of hidden 'Tatooines'*, **Christopher Mann**, CBC News, June 12 2023.
26. *Le télescope James Webb dévoile la planète Saturne,* **René Doyon**, 24•60, July 7 2023.
27. *The James Webb Telescope Celebrates First Anniversary*, **Nathalie Ouellette**, Global News, July 12 2023.
28. *The Cosmos Week*, **Nathalie Ouellette**, TVO (5 parts), July 24 2023.
29. *Dans l'inconnu : la machine à remonter le temps*, **Lisa Dang and Mahesh Herath**, Netflix, July 25 2023.
30. *La mission Luna-25*, **Nathalie Ouellette**, TVA Nouvelles, August 11 2023.
31. *Interview avec Nathalie Ouellette, chercheuse canadienne sur les exoplanètes dans le projet JWST*, **Nathalie Ouellette**, TQ5 Media, Augstu 12 2023.
32. *Alunissage réussi de Chadrayaan-3*, **Nathalie Ouellette**, Le téléjournal de 18h (Radio-Canada), August 23 2023.

Radio Interviews

1. *Water exoplanet*, **Charles Cadieux**, As It Happens (CBC Radio), September 6 2022.
2. *Discussion avec Marie-Eve Naud*, **Marie-Eve Naud**, Voir large (Radio VM), September 15 2022.
3. *Accès Innovation #6 – Comment découvrir une exoplanète recouverte d'eau?*, **Charles Cadieux**, Balado Accès innovation, September 20 2022.
4. *La mission DART*, **Nathalie Ouellette,** Radio-Canada (series of 8 interviews), September 26 2022.

5. *La mission DART*, **Nathalie Ouellette**, Radio X, September 26 2022.
6. *Pushing an asteroid away from planet Earth*, **Lisa Dang**, Mornings with Simi (CKNW), September 27 2022.
7. *The James Webb Space Telescope,* **Nathalie Ouellette**, Queen's Fast Radio Burst Podcast, September 28 2022.
8. *James Webb et Hubble peuvent-ils prendre des photos d'astres plus près d'eux?*, **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), October 4 2022.
9. *On a percuté un astéroïde, et après?*, **Nathalie Ouellette**, Balado Le Devoir, October 14 2022.
10. *Est-il possible que l'on puisse voir les mêmes galaxies plusieurs fois?*, **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), November 15 2022.
11. *Entrevue avec Olivia Lim, doctorante à l'Institut de recherche sur les exoplanètes de l'Université de Montréal*, **Olivia Lim**, Marceau le midi (BLVD 102.1), November 18 2022.
12. *Exoplanets and the James Webb Space Telescope*, **Nathalie Ouellette**, The Daily Edition (Sirius XM), November 25 2022.
13. *Deux exoplanètes composées de grandes quantités d'eau*, **Caroline Piaulet**, Les années lumière (Radio-Canada), December 18 2022.
14. *Comment fait-on pour mesurer la température sur les autres planètes?,* **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), December 20 2022.
15. *Est-ce vrai que la Voie lactée entre en collision avec Andromède?*, **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), January 17 2023.
16. *La mission JUICE*, **Nathalie Ouellette**, QUB Radio, January 24 2023.
17. *Le Canada devient partenaire dans le Square Kilometre Array*, **Nathalie Ouellette**, CBC Radio Syndication (6 interviews), January 25 2023.
18. *René Doyon, scientifique de l'année de Radio-Canada 2022*, **René Doyon, David Lafrenière, Olivia Lim and Nathalie Ouellette**, Les années lumière (Radio-Canada ICI Première), January 29 2023.
19. *Sommes-nous seuls dans l'Univers selon Nathalie Ouellette*, **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), February 14 2023.
20. *L'étude gyrochronologique des nouvelles associations de jeunes étoiles*, **Leslie Moranta**, Moteur de recherche (Radio-Canada), February 24 2023.
21. *Pourquoi les planètes sont-elles rondes et les galaxies en forme de disque?*, **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), March 14 2023.
22. *The Artemis II Mission*, **Nathalie Ouellette**, CBC Radio Toronto, April 3 2023.
23. *The Artemis II Mission*, **Nathalie Ouellette**, CBC Radio Syndication (5 interviews), April 3 2023.
24. *The Artemis 2 Mission*, **Nathalie Ouellette**, 630 CHED Edmonton/QR 770 Calgary, April 4 2023.
25. *La mission Artémis 2*, **Nathalie Ouellette**, 650 CKOM, April 4 2023.
26. *Les premières galaxies étudiées par le télescope Webb*, **Nathalie Ouellette**, QUB Radio, April 5 2023.
27. *Quel est le rôle du Canada dans la conquête de l'espace*, **Nathalie Ouellette**, Les faits d'abord (Radio-Canada ICI Première), April 8 2023.
28. *Y a-t-il encore de nouvelles étoiles qui apparaissent dans le ciel?*, **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), April 11 2023.
29. *La mission JUICE de l'ESA*, **Nathalie Ouellette**, Radio-Canada Syndication (5 interviews), April 14 2023.
30. *Aurora over Newfoundland*, **Nathalie Ouellette**, Corner Brook Morning Show (CBC Newfoundland and Labrador), April 27 2023.
31. *Science avec Nathalie Nguyen-Quoc Ouellette: Les secrets du télescope James Webb*, **Nathalie Ouellette**, 15-18 (Radio-Canada ICI Première), May 31 2023.
32. *Est-ce que ça existe, des étoiles qui chantent?*, **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), June 6 2023.
33. *Comment expliquer que certaines planètes sont sans soleil et sans port d'attache?*, **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), July 11 2023.
34. *A year of discovery from the James Webb Space Telescope*, **Lisa Dang**, On Point (WBUR), July 19 2023.
35. *Un astéroïde détecté 48 heures après son passage*, **Nathalie Ouellette**, 98.5 FM, July 23 2023.
36. *L'astrophysique à la portée de tous avec Nathalie Ouellette*, **Nathalie Ouellette**, Papa PhD Podcast, July 21 2023.
37. *How we search for planets that could host life*, **Heidi White**, The Decibel Podcast (The Globe and Mail), August 8 2023.
38. *La toute première image d'un système exoplanétaire en 2008*, **René Doyon et David Lafrenière**, Les années lumière (Radio-Canada), August 27 2023.

39. *Notre Univers aurait-il en fait 26 milliards d'années?*, **Nathalie Ouellette**, Moteur de recherche (Radio-Canada ICI Première), August 29 2023.

Press and Online Interviews

1. *Des chercheurs de l'Université de Montréal découvrent une probable exoplanète océanique*, **Charles Cadieux**, La Presse, September 4 2022.
2. *Quebec researchers discover potential water world exoplanet*, **Charles Cadieux**, Montreal Gazette, September 5 2022.
3. *Scientists might have discovered an Earth-like planet. Let one of them tell you about it.*, **Charles Cadieux**, USA Today, September 12 2022.
4. *Un monde océan à portée de James-Webb*, **René Doyon and Charles Cadieux,** Le Point, September 12 2022.
5. *Why is NASA purposefully crashing into this asteroid?*, **Heidi White**, The Toronto Star, September 22 2022.
6. *Ovnis, drones ou autres? : dédiée à la recherche de la vie ailleurs dans l'Univers*, **Olivia Lim**, Journal de Montréal, November 12 2022.
7. *Nathalie Ouellette named Deputy Director of Mont-Mégantic Observatory*, **Nathalie Ouellette**, SkyNews Magazine, November 20 2022.
8. *Trois astrophysiciennes qui font rayonner la science à travers l'iREx*, **Marie-Eve Naud, Frédérique Baron and Nathalie Ouellette**, UdeM Nouvelles, November 21 2022.
9. *L'iREx et son importante contribution à l'astronomie*, **René Doyon**, **Björn Benneke and Charles Cadieux**, UdeM Nouvelles, November 21 2022.
10. *L'astrophysique vers de nouveaux horizons : 26 M$ pour l'Université McGill et l'Université de Montréal*, **René Doyon,** UdeM Nouvelles, November 21 2022.
11. *26 millions pour la recherche en astrophysique*, **René Doyon**, La Presse, November 21 2022.
12. *Des planètes lointaines aident à comprendre le système solaire*, **Lisa Dang**, Universités Canada, November 22 2022.
13. *An exoplanet atmosphere as never seen before*, **Björn Benneke and Michael Radica**, UdeM Nouvelles, November 22 2022.
14. *'It's like a dream factory': A look at what's in store for Canadian space exploration*, **Nathalie Ouellette**, The Canadian Press, December 11 2022.
15. *JWST gets first glimpse of 7-planet system with potentially habitable worlds*, **Olivia Lim and Björn Benneke**, Nature, December 14 2022.
16. *Study Reveals Potential Water Worlds in Kepler-138 System*, **Björn Benneke,** American Museum of Natural History, December 15 2022.
17. *"Water Worlds" – Astronomers Discover That Two Exoplanets Are Unlike Any Planets in Our Solar System*, **Caroline Piaulet and Björn Benneke**, SciTechDaily, December 15 2022.
18. *Découverte de deux exoplanètes composées majoritairement d'eau*, **Caroline Piaulet, Sciences et Avenir**, December 15 2022.
19. *Astronomers find cool evidence of two exoplanets made almost entirely of hot water*, **Caroline Piaulet and Björn Benneke**, Inverse, December 15 2022.
20. *Two Exoplanets Appear To Be Mostly Water, Some Of It Possibly Liquid*, **Caroline Piaulet and Björn Benneke**, IFLScience, December 15 2022.
21. *Deux « mondes d'eau » observés à 218 années-lumière de la Terre*, **Caroline Piaulet**, Radio-Canada, December 15 2022.
22. *Twin planets orbiting a distant star may be half water*, **Caroline Piaulet**, New Scientist, December 15 2022.
23. *Astronomers discover strange twin alien planets might be water worlds*, **Caroline Piaulet and Björn Benneke**, Space, December 15 2022.
24. *Scientists find new 'waterworlds' that look nothing like any planet in our solar system*, **Björn Benneke**, Yahoo! News, December 15 2022.
25. *Water worlds: Best evidence yet of new type of exoplanet*, **Caroline Piaulet and Björn Benneke**, New Atlas, December 15 2022.
26. *Des « mondes d'eau » découverts dans l'espace par des chercheurs de l'UdeM*, **Caroline Piaulet and Björn Benneke**, Journal de Montréal, December 15 2022.
27. *Deux planètes océaniques découvertes*, **Björn Benneke**, La Presse, December 16 2022.
28. *Call James Cameron: Two Distant Planets Could Be Filled With Water*, **Caroline Piaulet and Björn Benneke**, Gizmodo, December 16 2022.
29. *NASA finds evidence that two water worlds orbiting a red dwarf star*, **Caroline Piaulet and Björn Benneke**, Tech Explorist, December 16 2022.
30. *Scientists detect two water worlds 218 light years away,* **Caroline Piaulet and Björn Benneke**, Down To Earth, December 16 2022.

31. *Astronomers discover twin exoplanets that could be 'water worlds'*, **Caroline Piaulet and Björn Benneke**, Interesting Engineering, December 16 2022.
32. *Researchers identify twin exoplanets that may be the first water worlds*, **Caroline Piaulet and Björn Benneke**, TechSpot, December 16 2022.
33. *'Unlike any planets found in our solar system:' These two planets are probably made of water, study finds*, **Caroline Piaulet and Björn Benneke**, CNN, December 17 2022.
34. *Steamy science: Astronomers find 2 likely 'water world' exoplanets*, **Caroline Piaulet and Björn Benneke**, New York Post, December 18 2022.
35. *Hubble and Spitzer Team up to Find a Pair of Waterworld Exoplanets*, **Caroline Piaulet and Björn Benneke**, Universe Today, December 19 2022.
36. *Scientists discover riveting evidence of 'water worlds' in deep space*, **Caroline Piaulet and Björn Benneke**, Mashable, December 19 2022.
37. *NASA Telescopes Identify 2 Alien Worlds Composed Mostly of Water,* **Caroline Piaulet and Björn Benneke**, CNET, December 20 2022.
38. *Caroline Piaulet, Ph.D. Student at Université de Montréal: "Here's how we discover water worlds"*, **Caroline Piaulet**, Kosmo Magazine, February 1 2023.
39. *Rencontre avec Nathalie Ouellette, coordinatrice du télescope James Webb au Canada*, **Nathalie Ouellette**, Le Journal des Voisins (Ahuntsic), February 10 2023.
40. *All eyes on Quebec's 45 year old observatory*, **Nathalie Ouellette**, SkyNews Magazine, February 19 2023.
41. *Une découverte du télescope James Webb remet en question les modèles de cosmologie actuels*, **Nathalie Ouellette**, Le Devoir, February 22 2023.
42. NIRISS: l'instrument canadien qui cherche de la vie extraterrestre, **Loïc Albert, Björn Benneke, René Doyon, Olivia Lim and Nathalie Ouellette**, Québec Science, March 9 2023.
43. *NASA monitoring asteroid that may crash into Earth in 2046*, **Heidi White**, The Toronto Star, March 11 2023.
44. *Les anneaux du système solaire se révèlent*, **Nathalie Ouellette**, Québec Science, March 17 2023.
45. *Comprendre les exoplanètes*, **Caroline Piaulet**, Le Devoir, April 1 2023.
46. *Lyrid Meteor Shower 2023: How to watch in Canada*, **Heidi White**, The Toronto Star, April 21 2023.
47. *The old eight-planet shuffle*, **Christopher Mann**, St. Albert Gazette, April 27 2023.
48. *The Webb Telescope Could Help Astronomers Finally Solve One of Space's Most Irritating Questions*, **Olivia Lim**, Inverse, May 4 2023.
49. *Comment reconnaître la vie sur d'autres planètes*, **René Doyon and Étienne Artigau**, Le Devoir, May 8 2023.
50. *À la recherche des nouvelles « Terres » les plus proches*, **Étienne Artigau**, La Tribune, May 9 2023.
51. *Woah...the colours...,* **Christopher Mann**, St. Albert Gazette, May 10 2023.
52. *Volcano planet tantalizes as potential haven for atmosphere and life*, **Björn Benneke**, The Globe and Mail, May 17 2023.
53. *Un nouveau monde volcanique de la taille de la Terre*, **Björn Benneke**, Radio-Canada, May 17 2023.
54. *Earth-size exoplanet may be covered in volcanoes*, **Björn Benneke**, CNN, May 17 2023.
55. *Volcanoes may carpet surface of newfound Earth-size exoplanet*, **Björn Benneke**, Space, May 17 2023.
56. *New exoplanet: Earth-sized world, dubbed LP 791-18 d, is covered in volcanoes*, **Björn Benneke**, Earth.com, May 17 2023.
57. *Canadian astronomers discover new, volcano-covered exoplanet that may support life*, **Björn Benneke**, The Toronto Star, May 17 2023.
58. *Earth-sized exoplanet is likely covered with volcanoes, researchers say*, **Björn Benneke**, CBS News, May 18 2023.
59. *Day meets night on Earth-sized exoplanet rocked by volcanism*, **Björn Benneke**, Aljazeera, May 18 2023.
60. *Astronomers Find an Earth-Sized World That May Be Carpeted in Volcanoes*, **Björn Benneke**, Universe Today, May 18 2023.
61. *NASA's TESS, Spitzer Help Find Earth-Sized Exoplanet Carpeted With Active Volcanoes Just 90 Light-Years Away!*, **Björn Benneke**, The Weather Channel, May 18 2023.
62. *TESS aurait découvert une exoplanète couverte de volcans, une super Io*, **Björn Benneke and Caroline Piaulet**, Futura, May 19 2023.
63. *Distant volcano-covered world is the size of Earth*, **Björn Benneke and Caroline Piaulet**, EarthSky, May 21 2023.

64. *Exoplanet Found Outside Our Solar System Could Be Covered in Volcanoes*, **Björn Benneke**, Newsweek, May 22 2023.
65. *Vancouver astronomer gains access to prestigious James Webb Space Telescope for research*, **Nathalie Ouellette**, CTV News, May 23 2023.
66. *Scientists Discover Brutal Planet That Sounds Like Darth Vader's Mustafar*, **Björn Benneke**, Futurism, May 23 2023.
67. *Earth-sized volcano planet may have a livable environment*, **Björn Benneke**, Washington Examiner, May 23 2023.
68. *René Doyon reçoit une prestigieuse médaille de la NASA*, **René Doyon**, UdeM Nouvelles, May 26 2023.
69. *Ultra-hot exoplanet has an atmosphere of vaporized rock*, **Stefan Pelletier**, Space, June 14 2023.
70. *A Planet So Hot Its Atmosphere Contains the Raw Material for Rocks*, **Stefan Pelletier**, Universe Today, June 15 2023.
71. *Astronomers Find Evidence That a Giant Exoplanet Ate Its Neighbor*, **Stefan Pelletier**, Inverse, June 15 2023.
72. *James Webb is a GO for Cycle 2 Observations!*, **Björn Benneke**, Universe Today, July 4 2023.
73. *Fireball Forensics: Astronomers Scrutinize a Strange Scorching-Hot Exoplanet*, **Stefan Pelletier and Björn Benneke**, SciTechDaily, July 7 2023.
74. *Incorporating Indigenous Astronomy Knowledges with Astrodigenous,* **Heidi White**, Astrobites, July 14 2023.
75. *Experts: Canadian astronomers set to join Ariel space mission*, **Nicolas Cowan and Jared Splinter**, McGill Newsroom Institutional Communications, July 25 2023.

Credit: NASA, ESA, CSA, Brant Robertson (UC Santa Cruz), Ben Johnson (CfA), Sandro Tacchella (Cambridge), Marcia Rieke (University of Arizona), Daniel Eisenstein (CfA)

PUBLICATIONS

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