

2019 - 2020

# *dimensions*

*Department of Physics & Astronomy*

***In this issue:***

***Research discoveries within our department***

***Graduate and undergraduate awards***

***New Faculty and Staff join department***

**Northwestern University**

## Faculty News

**Andy Geraci** awarded a \$1M grant from the Keck Foundation [to develop a new type of gravitational wave detector using levitated spheres](#). He is joined on this proposal by **Vicky Kalogera** and **Shane Larson**. This [new detector](#) will complement both LIGO-Virgo and LISA.

**Raffaella Margutti** named the [CIFAR](#) Azrieli Global Scholar. Congratulations, [Professor Margutti!](#)

Congratulations to **Andy Geraci** for his selection as [APS Fellow](#) this year.

**Chris Jacobsen** published a new book on X-ray microscopy with [Cambridge University Press](#).

Members of the Initiative at Northwestern for Quantum Information Research and Engineering (INQUIRE) made presentations to the Faculty and Administration on frontiers in Quantum Information Science (QIS) at the [Lawrence Dumas Domain Dinner](#) on October 21, 2019. Professors Michael Wasielewski, **Jim Sauls**, **Prem Kumar**, Danna Freedman and Mark Hersam [highlighted](#) the challenges in QIS and Northwestern's expertise in Quantum Computing, Quantum Communication, Quantum Sensing and Quantum Materials.

**Adilson Motter** featured in [Cosmos Magazine](#), discussing "Grid unlock: simple fixes, better modelling are keys to reliable energy supply". Also, Adilson is the author of "The Big Bang Theory" finale: Sheldon and Amy's fictional physics parallels real science" featured in [The Conversation](#).

**Jim Sauls** physics research featured in [Office for Research](#) describing his exciting findings that could lead to advanced technologies based on superfluids, cold atomic gases, and superconductors.



Pictured: Anna Grassellino & Jim Sauls

Credit: Northwestern Office of Research

**Claude-André Faucher-Giguère** named a [Highly Cited Researcher](#) in Space Science for 2019.

**Vicky Kalogera** and **Farhad Yusef-Zadeh** are new fellows elected to the American Association for the Advancement of Science ([AAAS](#)). For more information, visit [Northwestern News](#).



Credit: AAAS.org

**Jens Koch** and his group released an extensive python package for calculation of superconducting qubits – [scQubits](#). This code is open access and extensively documented.

**Fred Rasio** received the 2019 [Brouwer Award](#).

The [Supercomputer Award](#) was granted to **Sasha Tchekhovskoy**.

**Mayda Velasco** featured on [Northwestern's Weinberg News](#) discussing her lifelong passion for physics and her drive to understand the mysteries of the beginning of the universe.

**Sasha Tchekhovskoy's** group published detailed simulations to date of [Bardeen-Peterson alignment](#).

**Wen-fai Fong**, Peter Blanchard & collaborators captured the [deepest optical image](#) of first neutron star merger.

Congratulations to **Adilson Motter** and **Takashi Nishikawa** featured for their [Northwestern Now article](#). As Adilson explains in the article, a set of entities which are not quite the same (hence, symmetry breaking) synchronize successfully in contrast to identical entities which do not. The asymmetry in properties leads to a symmetry of behavior, which Adilson and Takashi call "converse symmetry breaking." Their work also appeared in [Nature Physics](#)

## Faculty News cont.

and is also produced on [YouTube](#).

**Jim Sauls** and **Jens Koch** featured in an article from the Office for Research, "[From Qubits to Climate Change: Northwestern Quantum Experts See Powerful Potential](#)".

Congratulations to **John Joseph Carrasco** named [2020 Sloan Research Fellow](#).

Congratulations to **Vicky Kalogera** and **Fred Rasio**: [First Class of AAS Fellows](#)! This is a new and rare distinction accorded only 0.5% of the membership of AAS.

**Raffaella Margutti** received prestigious [Faculty Early Career Development \(CAREER\) Award](#) from the National Science Foundation. She will use the award to [advance her research on the collision of black holes and neutron stars](#).

**Farhad Zadeh** featured in [Northwestern Now](#) about his discovery of the cosmic 'candy cane' spotted in inner Milky Way.

OSA Publishing appointed **Prem Kumar** as the [New Editor-in-Chief](#) of Optica.

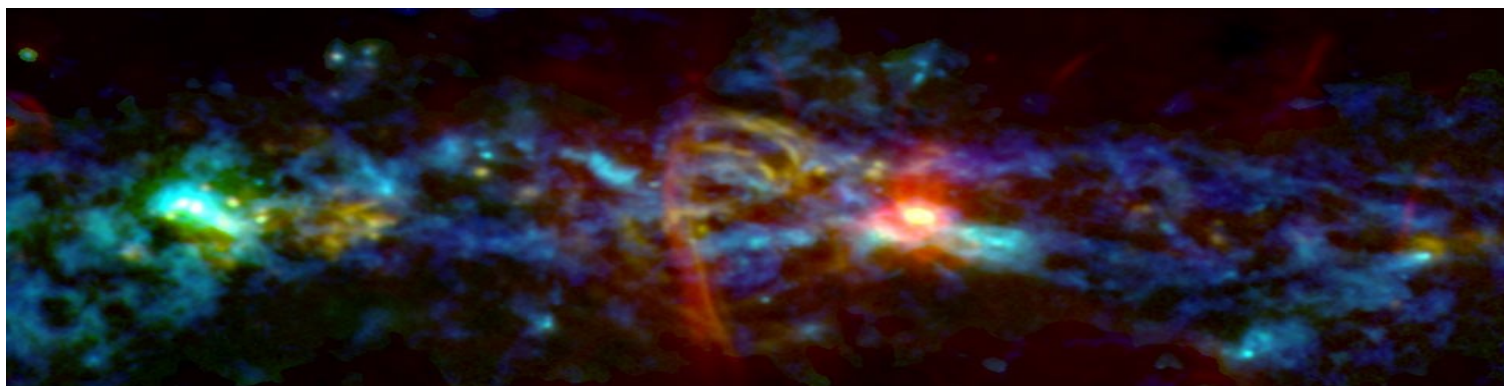
**Nate Stern** is part of a new Northwestern Research Center, the Center for Molecular Quantum Transduction (CMQT), to drive innovation in transformative technology. The Center, slated to begin August 1, 2020, [received \\$12.4 million](#) in funding from the Department of Energy.

**Vicky Kalogera** featured in [Crain's](#) 2020 Notable Women in STEM.

**Wen-fai Fong** and her group observed an extraordinary example of a short gamma-ray burst (SGRB) as reported in [Astrophysical Journal Letters](#). More information on their discovery can be found on our [website](#).

**Claude-André Faucher-Giguère** awarded a [Scialog collaborative award](#) (with Profs. Yue Shen of UIUC and Simone Scaringi of Texas Tech) from the Research Corporation for Science Advancement to develop a novel technique to discover and characterize quiescent supermassive black holes using TESS, a satellite originally designed to observe extrasolar planets.

An international team including **Farhad Zadeh** discovered giant balloon-like structures at the center of the Milky Way. [Read here](#) for the full article.



Cosmic 'candy cane'. Credit: Northwestern Now

### *In memory of*

Jerry (Jerome) Rosen (Emeritus Professor) was primarily interested in the experimental aspects of high-energy particle physics.

*and*

Tony DiVenere, who received his PhD from Physics and Astronomy. Advisor George Wong.

## Selected Publications

**Daniel Case** and **Adilson Motter** [publish breakthrough](#) in pre-programmed microfluidic systems in the journal [Nature](#):

*Braess's Paradox and Programmable Behavior in Microfluidic Networks*

**D. J. Case**, Y. Liu, I. Z. Kiss, J.-R. Angilella & **A. E. Motter**, *Nature* **574**, 647 (2019).

*Cooling Flow Solutions for the Circumgalactic Medium*  
Stern, J., Fielding, D., **Faucher-Giguère, C.-A.**, & Quataert, E. 2019, *MNRAS*, 488, 2542.

*The Origins of the Circumgalactic Medium in the FIRE Simulations*

**Hafen, Z.**, **Faucher-Giguère, C.-A.**, Anglés-Alcázar, D., Stern, J., Keres, D., Hopkins, P. F., Quataert, E., Murray, N., Wetzel, A., Chan, T. K., El-Badry, K., Garrison-Kimmel, S., Hummels, C., & Esmerian, C. 2019, *MNRAS*, 448, 1248.

*Bardeen–Petterson Alignment, Jets, and Magnetic Truncation in GRMHD Simulations of Tilted Thin Accretion Discs.*

**Sasha Tchekhovskoy**, et al.

[Royal Astronomical Society](#)

*ALMA Detection of a Linearly Polarized Reverse Shock in GRB 190114C*

**Wen-fai Fong**, **Raffaella Margutti**, et al.

[The Astrophysical Journal Letters](#)

*Inflation of 430-parsec Bipolar Radio Bubbles in the Galactic Centre by an Energetic Event*

**Farhad Yusef-Zadeh**, et al.

[Nature](#)

*On the Rate of Neutron Star Binary Mergers from Globular Clusters*

**Claire S. Ye**, **Wen-fai Fong**, **Kyle Kremer**, **Carl L. Rodriguez**, **Giacomo Fragione**, **Frederic A. Rasio**

<https://arxiv.org/abs/1910.10740>

*Vortex Phase Diagram of Rotating Superfluid  $^3\text{He-B}$*

**Robert C. Regan**, **J. J. Wiman**, and **J. A. Sauls**

[Phys. Rev. B](#) 101, 024517 – Published 27 January 2020.

*Impurity-Induced Anomalous Thermal Hall Effect in Chiral Superconductors*

Vudtiwat Ngampruetikorn and **J. A. Sauls**

[Phys. Rev. Lett.](#) 124, 157002 – Published 13 April 2020.

*Effect of Inhomogeneous Surface Disorder on the Superheating Field of Superconducting RF Cavities*  
Vudtiwat Ngampruetikorn and **J. A. Sauls**.

[Phys. Rev. Research](#) **1**, 012015(R) (2019) and [NU Office of Research](#).



Photo courtesy of Fermilab

*Eclipses of Continuous Gravitational Waves as a Probe of Stellar Structure*

**Marchant, Pablo et al.**

[Physical Review D](#) 101.2 (2020).

*An Extremely Energetic Supernova From a Very Massive Star in a Dense Medium*

**Peter K. Blanchard**, **Ryan Chornock**, **Raffaella Margutti**, **Adam A. Miller**, **Wen-fai Fong**, **Giacomo Terreran**, **Kerry Paterson**, et al. [Nature](#).

PhD student **Keenan Avers** (lead author), **William Halperin** (lead PI) and **Jim Sauls** (PI), in collaboration with the neutron scattering team led by Morten Eskildsen at Notre Dame, report the discovery of *Broken time-reversal symmetry in the topological superconductor UPt<sub>3</sub>*. Published: March 9, 2020 in [Nature Physics](#).

**Deanne Coppejans** and **Prof. Raffaella Margutti** discover a new class of astrophysical transients reported in [Northwestern Now](#). The paper, with Dr. Coppejans as first author, also appeared in [The Astrophysical Journal Letters](#). CIERA postdoc **Giacomo Terran** also played an important role in the analysis of the Keck data, recognizing that the low metallicity of that galaxy may be an important clue to the way FBOTs are formed. Congratulations, Raffaella, Deanne, and Giacomo!

## Research Staff and Graduate Student Achievements

- Postdoc **Srishti Arora** (Driscoll) won 'Best Poster' at the Gordon Soft Matter Research conference in August 2019. Srishti was one of four winners selected from 137 posters. She got the opportunity to present her research in a short talk, and additionally won a cash prize.
- CIERA Alumna **Laura Fissel (Novak)** began her [Faculty Appointment](#) at Queen's University. Congratulations Laura!
- Astronomy graduate student **Zach Hafen** led a talk and demonstration about virtual galaxies at [STEAM summer camp](#).
- Three members of **Driscoll's lab** were selected as finalists in the Science in Society and the NU Office for Research 2019 Scientific Images Contest, Yuchen Liu (undergrad summer intern), Kelsey-Ann Leslie (undergrad researcher), and **Phalguni Shah** (graduate student).
- Postdoctoral Fellow **Nancy Aggarwal** won the 2019 [GWIC-Braccini Thesis Prize](#) for her thesis "A room temperature optomechanical squeezer."
- Graduate students **Sarah Carin Gavin, Suna Zekioglu & James Dragan** each received the *Outstanding TA Award* for 2019-2020. Each student was recognized at this year's Virtual End of the Year event.

## Fellowship Awards

- **Yuanzhao Zhang**, a PhD student working for **Professor Adilson Motter** in our department, was selected to be one of 22 [Schmidt Science Fellows](#). These fellowships were established three years ago to foster interdisciplinary research and help the best young scientific minds realize their potential. The selected students represent eight nationalities and 17 nominating institutions.
- **Lindsey Byrne** won the [DOE Graduate Fellowship](#).
- **Monica Gallegos Garcia** won the [Ford Foundation Fellowship](#).
- **Aprajita Hajela** won the [NASA Future Investigator Award](#).
- **Michael Zevin** won the esteemed [2020 NASA Hubble Fellowship](#).
- Graduate student **Beverly Lowell** won the [National Science Foundation \(NSF\)](#) graduate fellowship and received the [Illinois Space Grant Consortium \(ISGC\)](#) fellowship for outstanding research in the field of astronomy.
- Graduate student **Danat Issa** won the [Frontera Computational Science Fellowship](#), a distinguished program that provides a year-long opportunity for talented graduate students to compute on the most powerful academic supercomputer in the world and to collaborate with experts at the Texas Advanced Computing Center (TACC).
- CIERA postdoctoral researchers **Kyle Kremer, Patrick Sheehan, and Sarah Wellons** have each won 3-year awards in the National Science Foundation Astronomy and Astrophysics Postdoctoral Fellowship (NSF AAPF) program.



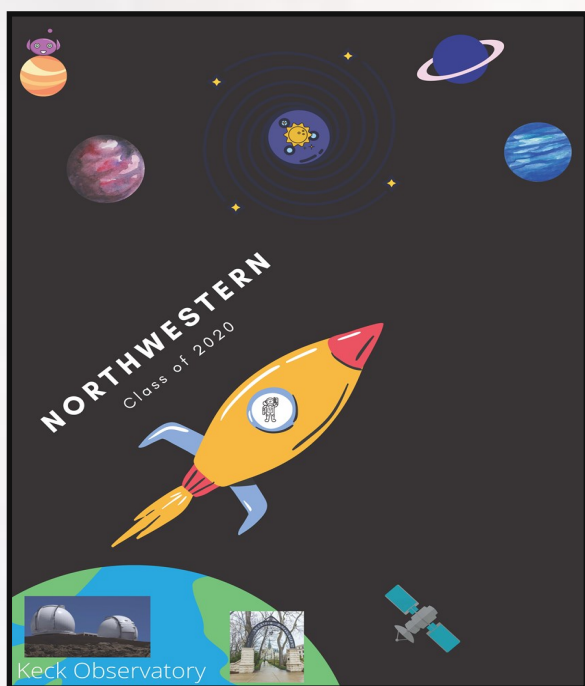
Source: Schmidt Science Fellows

## Undergraduate News

### Undergraduate Andrew Bowen Receives AAS Chambliss Award

Northwestern University undergraduate **Andrew Bowen** was awarded a 2020 Chambliss Astronomy Achievement Student Award for his poster presentation at the 235th American Astronomical Society meeting. Bowen, majoring in Physics & Astronomy, was one of the 15 undergraduate student medalists from over 350 entrants. Bowen presented his work studying the ability of the upcoming Rubin Observatory (previous known as LSST) to detect eclipsing binary stars in star clusters. Bowen particularly focused on what cadence of observations will enable the Rubin Observatory to detect the most binaries.

Source: [CIERA](#)



Best Decorative Cap Design by undergraduate Angelo Bastas.

### Best Decorative Graduation Cap Winner

This year's 2020 graduation event was held virtually as a chance for all students and faculty to celebrate one's achievements. This year we added the "Best Decorative Graduation Cap Contest" for students to design their graduation cap anyway that they wanted to! During the 2020 graduation event, undergraduate **Angelo Bastas** was chosen for his creative design (see image, left). The department plans to continue this contest for future graduation events.

### Summer at CERN

Recent undergraduate **Julie Malewicz** spent the summer at CERN where she worked in the Beams and Accelerator Physics department. She divided her time between working on simulations of beam dynamics and enjoying the beautiful local scenery.

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## Congratulations to our Undergraduate Awardees

- Departmental Honors in Physics and Astronomy: **Fiona Brady and Kristopher Mortensen**
- Outstanding Junior in Physics & Astronomy: **Daniel Grass**
- Outstanding Sophomore in Physics & Astronomy: **Ravi Chepuri**
- Outstanding Undergraduate in Graduate Coursework: **Andrew Kindseth**
- Outstanding Thesis Research in Physics and Astronomy: **Fiona Brady and Kristopher Mortensen**
- Phi Beta Kappa elections: **Fiona Brady and Kristopher Mortensen**

# Welcome to Our New Department Faculty

## Gayle Ratliff



Gayle Ratliff is a physicist and educator. Her expertise is in the detection of very high energy cosmic radiation, having conducted research with the Very Energetic Radiation Imaging Telescope Array System (VERITAS) in southern Arizona for a number of years. As one of a very small number of African American women in the history of the US to have earned a Ph.D. in Physics (<http://aawip.com>), she is committed to inclusive teaching and using STEM education to open doors for underrepresented groups. Born and raised on the south side of Chicago, she attended Chicago Public Schools and after earning her B.S. in Physics, she lived and worked as a dancer in New York City. She trained and toured with the Dance Theater of Harlem before returning to grad school, and she continues to work on a number of dance projects around city. She teaches classical ballet and still choreographs and performs contemporary dance works.

## Istvan Kovacs



István Kovács's research group is working on bridging the gap between structure and function in complex systems. His group is developing novel methodologies to predict emerging structural and functional patterns in complex systems, while fighting data incompleteness and biases. His goals include constructing scalable quantum networks, inferring novel therapeutic drug combinations, and unveiling the genetic rules that govern brain wiring, in close collaboration with experimental groups and theorists in the US, Canada, Europe and Japan.

In his free time, István enjoys playing board games, ping pong, bouldering, hiking, singing and baking.

## Ryan Chornock



Ryan spent most of his childhood in the northern Virginia suburbs of Washington, D.C., where a few chance encounters with educational games and some popular science books on his grandparents' shelves sparked his interest in astrophysics at an early age. Ryan began his professional education by heading off to college at Caltech to receive his B.S. in Physics. After finishing college, he moved on to UC Berkeley for his M.A. and Ph.D. in Astrophysics. In 2009, Ryan moved on to the Harvard-Smithsonian Center for Astrophysics, where he spent the five years as a postdoc before arriving at Ohio University. Ryan works on many different topics in astrophysics, mostly united by an interest in phenomena that are transient or time-variable. Ryan also likes to spend time in forests and mountains when he is not in his office.

***Congratulations to Class of 2020 Physics and  
Astronomy Majors & Minors!***

**Angelo Bastas**

**Fiona Brady**

**Dylaan Cornish**

**Aaron Funes**

**Samuel Kim Jr.**

**Lawrence Luo**

**Kristopher Mortensen**

**Anne Parker**

**Joshua Pritz**

**Isaac Rivera**

**Josiah Jefte Veloz**

**Mahir Akhil Wagh**

**Riley Campbell Wind**

**Gibran Patra Wirjawan**

***2020 Rapid Fire Research***

*Congratulations to the winners of this year's Rapid Fire Research. We thank everyone who  
participated in this event!*

**First Place**

Peter Gilhwan Lim: "Preserving magneto-optical properties in ALD-passivated CrI<sub>3</sub> "

**Second Place**

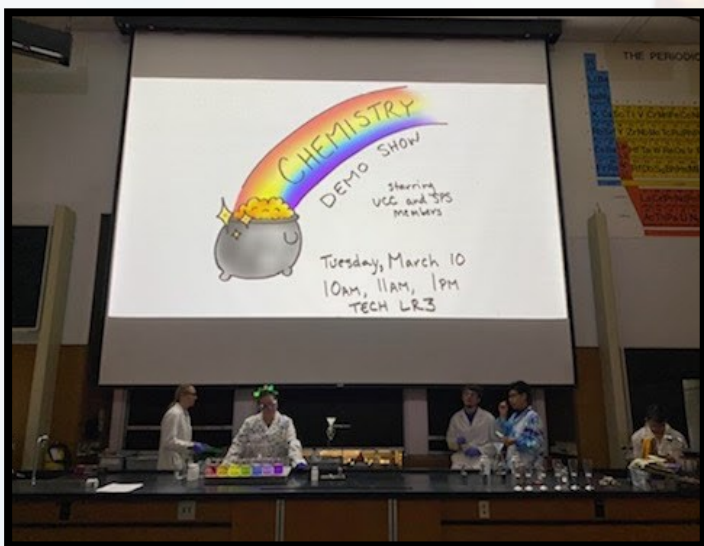
Dylan Temples: "Hydrogen Doping in LXe-TPCs for Dark Matter Searches"



## Department Outreach

### STEM Day Outreach

Art Schmidt held a physics demonstration, "Magic of Physics" on November 17, 2019, in front of about 100 scouts before the Northwestern football game. He levitated three balloons and a ping pong ball on a single stream of air from a hair dryer and he used mirrors to project a lit lightbulb onto an empty socket. Also, he multiplied a single candle into several images for successive birthdays and blew the candle out with a vortex generator made from a large garbage can.



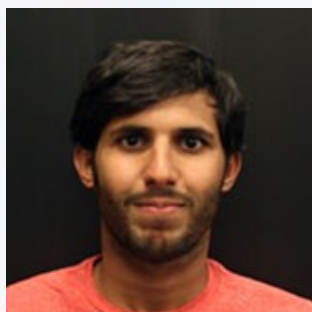
### Students from Chicago's Off the Street Club Visit Dearborn Observatory

CIERA staff, Board of Visitors, and graduate students organized a visit to Dearborn Observatory on the Northwestern University campus for children in the [Off the Street Club](#) to gaze at the stars and learn about astronomy. Graduate students Michael Katz and Aprajita Hajela from [CIERA's Reach for the Stars program](#) taught the 16 students about astronomy along with a bit of data science.



Photo courtesy of CIERA.

## Welcome to Our New Graduate Students Fall 2019



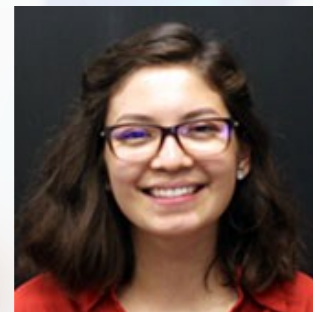
**Abdulwahab Al Luhaibi**



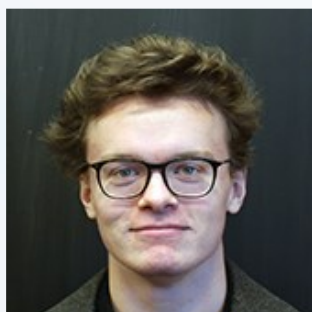
**Aaron Brandon**



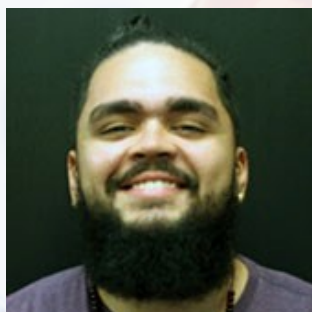
**Nia Burrell**



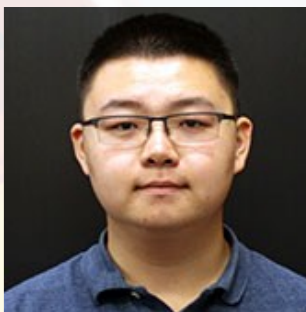
**Chloe Calderon**



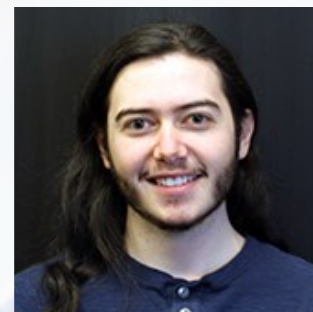
**Thomas Cane**



**Gabriel Casabona**



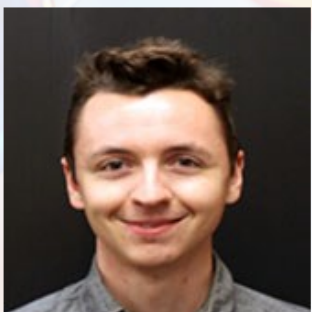
**Ran Chen**



**Kenneth DeRose**



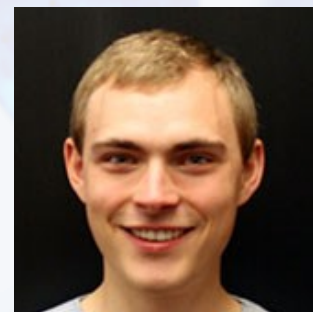
**Jiaxing Du**



**Ethan Garvey**



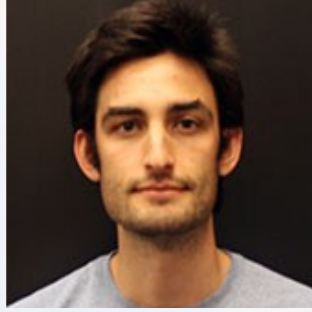
**Jonah Glick**



**Jorin Graham**



**Kezhu Guo**



**Wynn Jacobson-Galan**



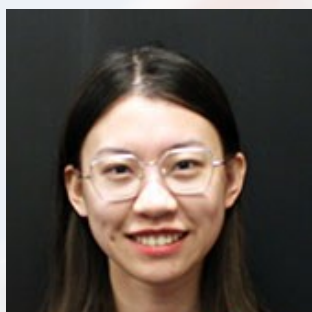
**Mohammad Jalilvand**



**Taeyoon Kim**



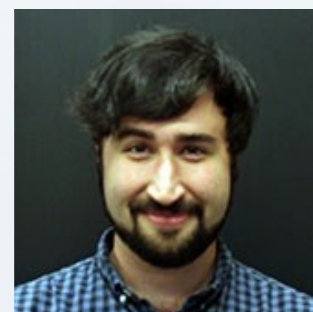
**Fulya Kiroglu**



**Yanlin Li**

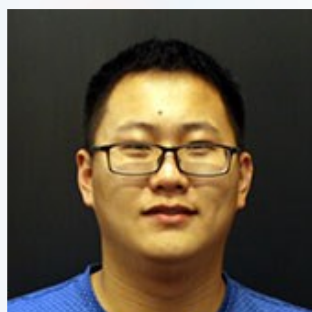


**Zhi-zhong Li**

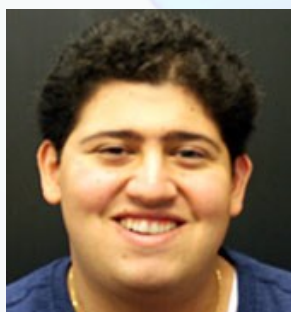


**David Matthews**

## Welcome to Our New Graduate Students Fall 2019 (cont.)



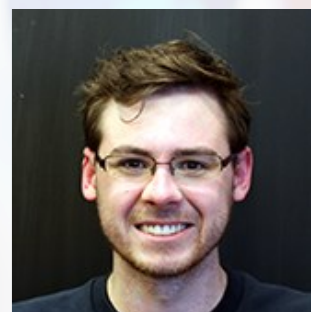
**Yulun Miao**



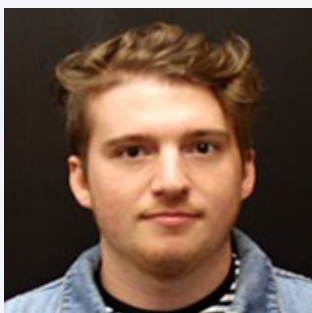
**Joseph Michail**



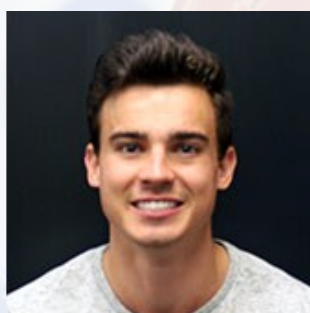
**Nicholas Miller**



**John Mitchell**



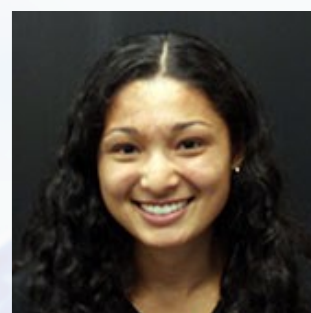
**Nicholas Kaaz Omahen**



**Nicolas Pavao**



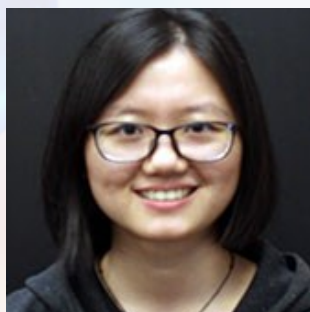
**Minli Qiu**



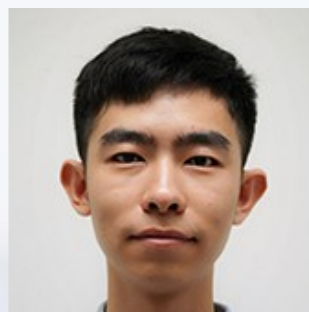
**Jillian Rastinejad**



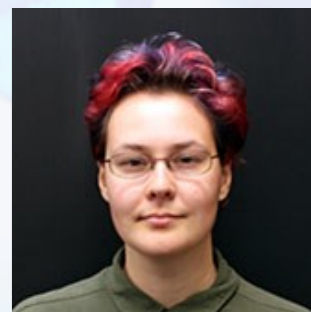
**Aslan Seifi**



**Yanxuan Shao**



**Zhiheng Sheng**



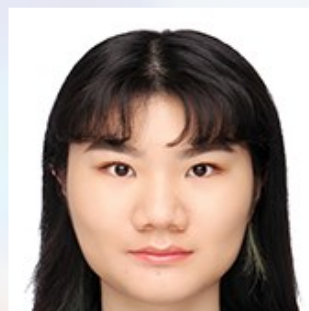
**Carissa Skye**



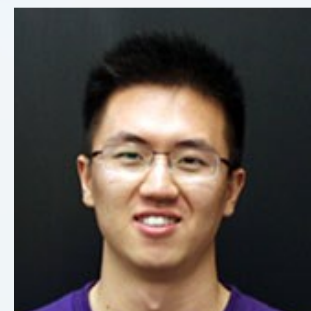
**Zehao Song**



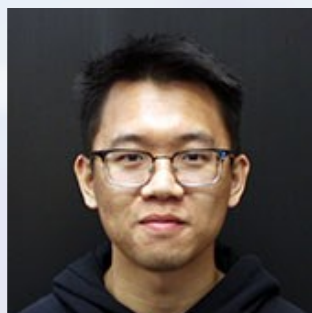
**Kierstin Sorensen**



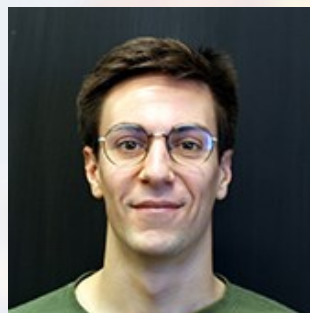
**Haoyue Wang**



**Zhiyuan Wang**



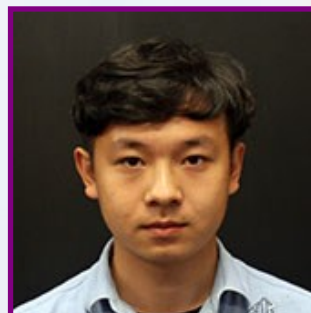
**Xinjue Wei**



**Max Wisne**



**Ruiting Xie**

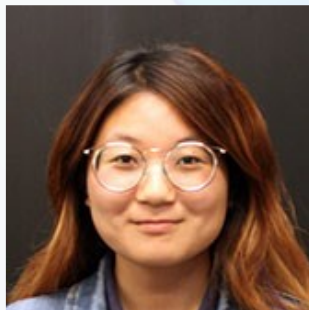


**Yuchan Yang**

## Welcome to Our New Graduate Students Fall 2019 (cont.)



**Weitian Yu**



**Fangjun Zhu**

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### Department Events and News

#### Open House Chicago Dearborn Observatory

On October 19 and 20, 2019, Open House Chicago hosted two events at the Dearborn Observatory. A total of 1,412 people attended Dearborn, surpassing our expectation of 1,000. The Dearborn Observatory was constructed in 1889 through a collaboration between Northwestern University and the Chicago Astronomical Society, and once held the record for the world's largest telescope at 18.5 inches. Visitors were able to walk through the dome that houses the telescope, and many were able to observe the Sun through a spotting scope or a solar telescope.

#### CIERA Celebrates Apollo 11

On July 12 and 26, 2019, CIERA hosted special evening events at the Dearborn Observatory to [celebrate the 50th anniversary of the Apollo 11 Moon landing](#). Organized by astronomy graduate student Eve Chase, each event attracted about 75 members of the public. Topics included the anatomy of lunar and solar eclipses, Apollo 11 history, understanding distances to scale, future prospects in space exploration, other planets' moons, Earth's ocean tides, and the famous "dark side of the Moon."



Dearborn Observatory, 2020

#### SAGUARO: Using Arizona Telescopes to Observe the Most Dramatic Collisions in Space

Throughout the world, new developments are being made in the field of gravitational wave astrophysics, with groups of scientists utilizing new technologies to reveal the Universe's secrets. One such collaboration is Searches After Gravitational-waves Using Arizona Observatories (SAGUARO), where team members respond to phone alerts at 3:00 a.m. and happily consider it the "new normal" for life as an astronomer.

The leadership team behind the [SAGUARO project](#), which received funding from the National Science Foundation, is made up of researchers from Northwestern, CIERA postdoc Kerry Paterson and Professor Wen-fai Fong, and from the University of Arizona, postdoc Michael Lundquist and Professor David Sand. The team uses the gravitational waves produced by mergers of two black holes, two neutron stars, or a neutron star and a black hole, to "chase the light" and uncover more about these sources than gravitational waves alone could show.

## ***Department Events and News (cont.)***

### Observational Astronomers Gather for 'Hot-wiring the Transient Universe VI'

An international group of over 90 experts and early-career researchers gathered August 19 – 22, 2019, for [Hot-wiring the Transient Universe VI](#). Hosted by scientific organizing committee chair Professor Raffaella Margutti, the meeting aimed to explore opportunities and challenges of massively parallel time domain surveys coupled with rapid coordinated multi-wavelength follow-up observations.

Through over 50 talk presentations, 3 panel discussions, a dozen posters, and two “hack sessions”, the group spent nearly a week digging into the latest science in observational astronomy.

The meeting also included a fascinating public lecture, called Streaming the Universe, presented by Andrew J. Connolly, Professor of Astronomy at the University of Washington and Director of the DIRAC (Data Intensive Research in Astrophysics and Cosmology) Institute.

The participants had a chance to enjoy the Evanston/Chicago area in the summertime, with a banquet dinner and an architecture boat tour.

### IDEAS & CIERA Host NSF Research Traineeship National Meeting

Nearly 300 graduate students, faculty, and professionals (evaluators and staff) from more than 90 programs and 60 institutions attended the 2019 National Science Foundation Research Traineeship Annual Meeting hosted by IDEAS and [CIERA](#) at Northwestern University from September 25 through 27, 2019.

The NSF Research Traineeship (NRT) program is dedicated to effective training of STEM graduate students in high priority interdisciplinary research areas. The goals of the meeting were to share innovative practices and to have candid discussions about what works to improve NRT programs that aid in the career preparation of trainees. The 3-day meeting consisted of poster sessions, panel discussions, and lightning talks.

### Priya Natarajan Presents 12th Annual CIERA Public Lecture

CIERA's [11th annual public lecture](#) was presented by award-winning author and Yale professor Dr. Priyamvada Natarajan at Cahn Auditorium on October 24, 2019. Natarajan gave her talk, Cartography of the Cosmos: Mapping the Unseen, to an audience of about 250 people.

Natarajan discussed how mapping over time encodes radical new scientific ideas. She walked through the history of the acceptance of new astronomical ideas, and talked about the status of several current transformative (and deeply contested) ideas. She explained that the arc of their acceptance reveals not only our own shifting conceptions of the cosmos, but also shows how science works.

### Bud Robinson Selected for 2019-20 Ver Steeg Staff Award

Graduate Assistant, Bud Robinson, was selected as recipient of the 2019-20 Ver Steeg Staff Award. This award is given annually and recognizes one outstanding non-faculty staff and one graduate faculty member University-wide for excellence in working with TGS students. Congratulations Bud for your outstanding work with graduate students!

### Yas Shemirani places as runner up in "You Can Make a Difference"

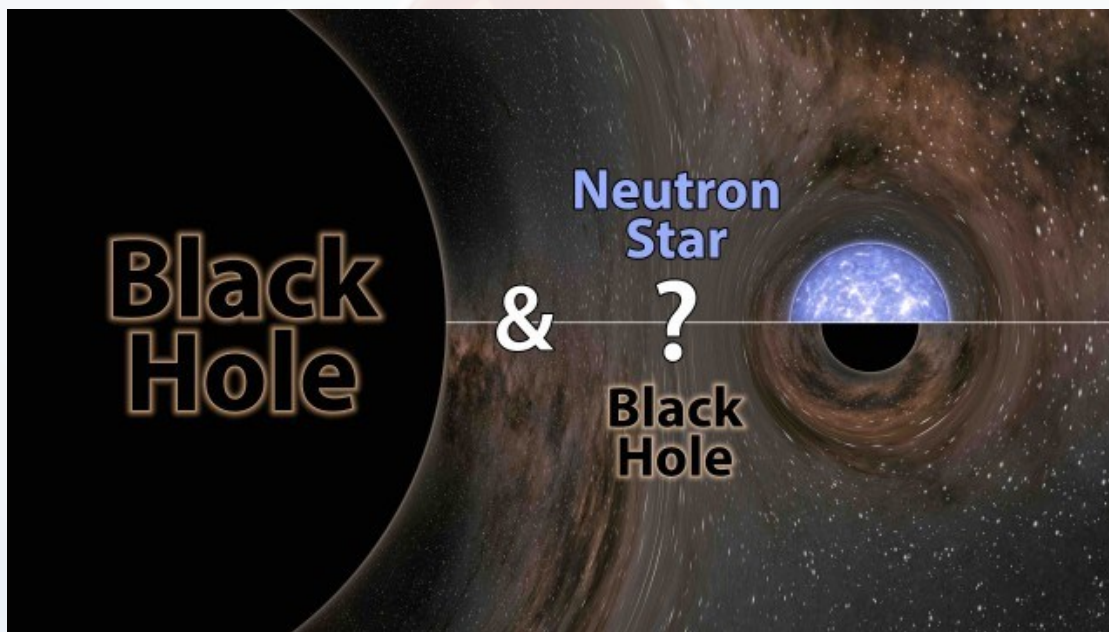
Department staff member, Yas Shemirani was selected by the Affordable Instructional Initiative at Northwestern in appreciation for her excellent work in providing course information to undergraduates. Congratulations, Yas!

## Department Events and News (cont.)

### LIGO-Virgo finds mystery astronomical object in 'mass gap'

In August of 2019, the [LIGO-Virgo gravitational-wave network](#) witnessed the merger of a black hole with 23 times the mass of the sun and a mystery object 2.6 solar masses, which generated a splash of gravitational waves detected back on Earth by LIGO and Virgo. Scientists do not know if the mystery object was a neutron star or black hole, but either way it set a record as being either the heaviest known neutron star or the lightest known black hole. A paper about its detection was published today (June 23, 2020) by [The Astrophysical Journal Letters](#). Physics & Astronomy Professor and CIERA Director Vicky Kalogera led the paper team, who all contributed directly to the scientific results: Postdoctoral Fellow Mario Spera, Graduate students Michael Zevin and Chase Kimball, and Research Assistant Professor Christopher Berry.

Related Sources: New York Times, [A Black Hole's Lunch Provides a Treat for Astronomers](#).



Source: Northwestern Now

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### CIERA Open House

CIERA kicked off the new year by welcoming over 100 people to an open house of their [new office location](#) to learn more about the center. CIERA is now located at 1800 Sherman Ave. in Evanston, Illinois. There were stations throughout the office for visitors to have a chance to talk to CIERA researchers. Topics included the newly completed remote observing room, high performance computing, visualizations and instrumentation, and LIGO, as well as for programs such as IDEAS, Gravity Spy, and Reach for the Stars.

### First Discoveries by the Young Supernova Experiment

The Northwestern-based YSE team is excited to announce the start of the [Young Supernova Experiment](#), a new transient discovery survey using the Pan-STARRS1 and Pan-STARRS2 telescopes. This survey uses the large, 7-square degree field of view of the Pan-STARRS telescopes in Hawaii to identify new stellar explosions, stellar disruptions by supermassive black holes, and other cosmic transients.

### New remote observatory compresses distances to connect Evanston and Hawaii

Northwestern astronomers have begun scanning the heavens from Evanston using a newly completed remote [observatory](#) to link to the W.M. Keck Observatory in Hawaii. Located on the 13,600-foot summit of Mauna Kea, the twin 10-meter-wide telescopes provide a state-of-the-art celestial window for University researchers to collect

## Department Events and News (cont.)

astronomical data without needing to travel thousands of miles to do it.

### CIERA to Host National REU Leaders

The National Science Foundation has awarded a new 3-year grant to Research Assistant Professor Aaron Geller, who has directed CIERA's [Research Experiences for Undergraduates \(REU\)](#) Site Program since its inception six years ago.

In close collaboration with The American Physical Society (APS), the National Physics REU Leadership Group Workshop and Community-Building project will bring together leaders from across the country who run REU Sites. Through the new grant, REU Site leaders will have opportunities to learn from one another to strengthen their programs.

### Kamal Seth becomes Professor Emeritus

Professor Kamal Seth became Professor Emeritus for his professional contributions and of the years of dedicated service he provided to Northwestern University. Congratulations Kam!

## Northwestern's Society of Physics Students (SPS)

**President:** Orion Forowycz

**Treasurer:** Ravi Chepuri

**Secretary:** Maura Lally

**Departmental Relations Chair:** Josh Pritz



### **Special Thanks to our Donors**

*The Department of Physics and Astronomy would like to sincerely thank all of our donors who contribute greatly to our mission. Our Department currently has 46 graduate faculty and 12 faculty at other ranks (instructional and research faculty). Our graduate program generally has about 140 graduate students and 40 full-time Postdoctoral Research Fellows associated with it, along with a varying number of Visiting Scholars and other distinguished guests. In most years, we have about 50 undergraduate majors in our department, many of them working in our research programs.*

## Welcome to Our New Department Staff



**Catherine Cotter**

*Director of Operations*

Catherine joined us in December as the new Director of Operations. Previously, she was the Business Administrator in Engineering Sciences & Applied Mathematics (McCormick) for 2 ½ years. During her time there, she received an NU Service Excellence Award in both 2018 and 2019. She also is a CRA (Certified Research Administrator), passing the exam this past Spring. She is active in ANUW (Association of Northwestern University Women) and is on the steering sub-committee for Communications and Outreach with NURAP (Northwestern University Research Administrators Professionals).



**Vasiliki (Vaso) Ventresca**

*Accounting Specialist*

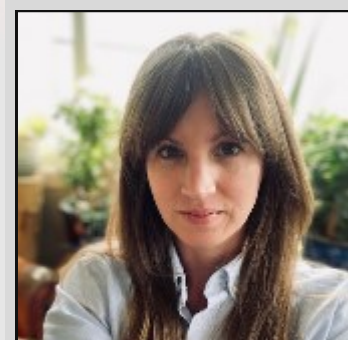
Vaso joined us in March as the new Accounting Specialist. Vaso graduated from the University of Chicago with BA in Economics and pursued a career on the business side of the music industry both locally in Chicago and nationally. After a long and incredibly unique career that combined her love of music and business background, she joined the Department of Physics and Astronomy at Northwestern. Vaso's father is an astrophysicist at the University of Chicago, so she had knowledge of the science and found this to be the perfect opportunity for her to again combine an interest, in this case, planetary science with her business background. Vaso has travelled to 5 of the 7 continents and looks forward to more adventures and showing her daughter everything her father showed her.



**Peri Drury**

*Undergraduate Program Assistant*

Peri joined us in March as the new Undergraduate Program Assistant. Before joining us, Peri worked as the program coordinator for the Egan Office for Urban Education and Community Partnerships at DePaul University for 2 years while pursuing her Master's in Public Policy with a focus on higher education at DePaul. Peri is passionate about the power of education and the ability for it to build and bridge communities, as well as transform lives. In her personal life Peri enjoys splitting her time between activism, restorative justice, and her hobbies which include cooking, wood burning, hiking, kayaking, singing, and playing the piano. She is excited to join the department and looks forward to meeting everyone in person when in-person meetings can happen once again.



**Erin Sazy**

*Financial Assistant*

Erin recently joined us as a Financial Assistant. Erin graduated from DePaul University with a Master's in Sociology. Prior to coming to Northwestern, Erin worked in film and television production. In her spare time, she enjoys hiking with her dogs, yoga and reading.



## Faculty Spotlight: Claude-André Faucher-Giguère

Prof. Claude-André Faucher-Giguère is a theoretical astrophysicist with broad interests in galaxy formation and cosmology. His specialty is in modeling the diverse, multi-scale processes that drive galaxy formation, including star formation, galaxy-black hole co-evolution, galactic dynamics, and connections with the intergalactic medium and cosmology. This research is driven by the prospect that understanding galaxy formation will provide key insights into several of the most important questions in modern astrophysics, including the origin of structure in the Universe, the formation of stars and black holes, and the nature of dark matter and dark energy.

To do this, the Faucher-Giguère group uses a combination of analytic modeling, numerical simulations, and comparisons with observations. Prof. Faucher-Giguère is a founder and core developer of the FIRE (Feedback In Realistic Environments) cosmological simulation project, as part of which he develops new approaches to improve the predictive power of galaxy formation simulations. Prof. Faucher-Giguère also holds a courtesy appointment at Argonne National Laboratory, where he collaborates with the Cosmological Physics and Advanced Computing group to develop the next generation of extremely large volume cosmological simulations.

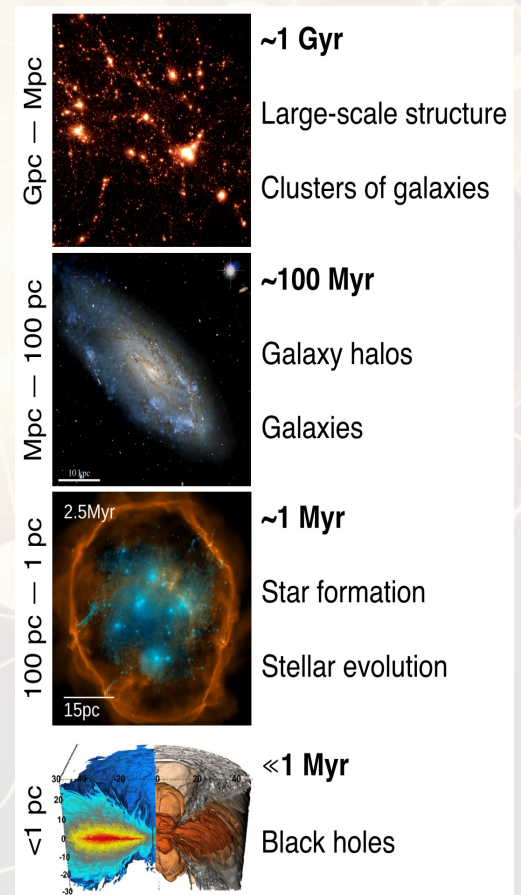
Prof. Faucher-Giguère was recently named a Highly Cited Researcher in Space Science, a distinction which recognizes researchers who have produced multiple highly-cited papers that rank in the top 1% by citations.



Ph.D., Harvard University,  
2010

### Honors and Awards

- Clarivate Highly Cited Researcher, 2019
- Scialog Fellow, 2019
- Cottrell Scholar Award, 2018
- NSF CAREER Award, 2017
- NASA Einstein Fellow, 2013-2014
- Miller Research Fellow, 2010-2013
- Eric R. Keto Prize in Theoretical Astrophysics, 2010



Renderings of simulations on different astrophysical scales developed by Prof. Faucher-Giguère's group, ranging from the large scale-structure of the Universe to galaxies to stars and black holes.

# Congratulations to our Graduating Students



**Daniel Case (Motter)**

*PhD*

*Harnessing Nonlinearity and Asymmetry for Built-in Control in Mechanical and Fluid Systems*

**Andrea Isgro (Petriello)**

*PhD*

*The N-Jettiness Subtraction Scheme at Subleading Power*



**Adam Dempsey (Lithwick)**

*PhD*

*Topics On Planet-Disk Interaction and Solar Convection*

**Miaotianzi Jin (Dahl)**

*PhD*

*Measurements and Analysis of the Sensitivity of Superheated C3F8 Bubble Chambers to Interactions from WIMP Dark Matter*



**Cody Dirks (Meyer)**

*PhD*

*Probing the Transition from the Diffuse to the Molecular ISM*

**Michael Katz (Larson)**

*PhD*

*Computational Advancements for Analyzing Binary Systems with LISA*



**Zachary Hafén (Faucher-Giguère)**

*PhD*

*From Observations to Origins and Fates: Disentangling Gas Flows Around Galaxies*

**Kyle Kremer (Rasio)**

*PhD*

*The Role of Black Holes in Globular Cluster Dynamics with Applications to Gravitational-Wave and High-Energy Astrophysics*



**Joon Suk Huh (Youn)**

*MS*

*The Statistical Mechanics of Cities*



## Congratulations to our Recent Graduating Students



**Erik Lenferink (Stern)**

*PhD*

*Broken Symmetries in Low Dimensional Materials*

**Zanpeng Yin (Carrasco)**

*MS*



**Taewan Noh (Chandrasekhar)**

*PhD*

*Nonlocal Correlations in a Proximity-Coupled Normal Metal*

**Zhewei Yin (Low)**

*PhD*

*The Infrared Structure of Nonlinear Sigma Model Amplitudes*



**Edouard Nottet (Gabrielse)**

*PhD*

*Improved Antihydrogen Production at the ATRAP Experiment*

**Runze Zhang (Dahl)**

*MS*

*Stress Testing Silicon Photomultipliers for Application in Scintillation Bubble Chambers*



**Robert Regan (Sauls)**

*PhD*

*Quantized Vortices in Superfluid Helium-3*

**Huan Zhang**

*MS*

*Amplifying Circuit for a SiPM Detector for a Resonant Molecular-Absorption-Based Dark Matter Search*



**Patrick Stollenwerk (Odom)**

*PhD*

*Rovibrational Control of a Diatomic Molecule*

**Andrew Zimmerman (Halperin)**

*PhD*

*Engineering Order with Disorder: NMR Studies of Superfluid  $^3\text{He}$  in Silica Aerogel*



## *Alumni Focus*

**Wei Wei Yin** (PhD '95) works as VP of Sales/Marketing in Calibre UK, a video processing technology design and manufacturer based in UK, and also Senior Director of Coretronic Corp in Taiwan.

**Jennifer Hobbs** (PhD '15) started a new position as the Director of Machine Learning at [IntelinAir](#). The company uses computer vision and machine learning to provide farmers with important information and insights around crop emergence, pest and disease pressure, irrigation and nutrient management, equipment optimization, and other areas. They are actively engaged in the research community and will be organizing a workshop at CVPR in 2020.

Previously, she was a Senior AI Scientist and Manager at StatsPerform, working on fine-grained multi-agent spatiotemporal search and pattern recognition in sport. Some of her work there was featured on a [podcast](#) on This Week in Machine Learning.

Recently, she was featured in [Symmetry Magazine](#) describing her transition from Physics to Data Science (although in truth she's more of an applied researcher than a data scientist). She tries to remain involved in the Northwestern community and have enjoyed being on a number of panels here.

**Hao Wu** (PhD '16) works in the financial industry since graduating with his PhD. His first job was at Goldman Sachs, and now he is working for the financial firm Citadel.

**Ahmet Uysal** (PhD '12) won the [DOE Early Career Award](#).

**Kai-Kai Wong** (PhD '63) retired from the University of Kansas in 2005, but continues in active research, including work on 5D homogeneous space-time, and the recent explicit solution to the Maxwell magnetic monopole: *Physics Essays* 31, 4:493-495 (2018).

**Laszlo Fraser** (PhD '14) is a Research Fellow in the Center of Excellence in Exciton Science at Monash University. He received the Young Nanoscience Ambassador Award from the Australian Nanotechnology Network this year.

**John Wiley** (MSc '59) spent most of his career with Texas Instruments as a technologist working on silicon integrated circuits.

**Yen-Jung (Jeff) Chen** (PhD '18) works at Intel in California as a Product Development Engineer.

**Casey Law** (PhD '07) recently moved from the Department of Astronomy at UC Berkeley to a position as Staff Scientist at Caltech in the Department of Astronomy and Owens Valley Radio Observatory.

**Ben Farr** (PhD '14) was a McCormick fellow for 3 years in the Enrico Fermi Institute at the University of Chicago. Recently, he began as an assistant professor at the University of Oregon in 2017.

## ***Alumni Focus Continued***

**Liqun Guo** (PhD '96) lives and works in the Chicago area. Liqun works within the information technology field in design and engineering of corporate network and security infrastructure. He is currently at Hyatt Corporation as a Sr. Network Engineer.

**Kris Raghunathan** (PhD '78) worked in Systems and Applied Sciences Corporation for about three years. He then switched to INTELSAT as a principal engineer working on ground systems. After 1995, he transferred to Space Systems/Loral and worked on Japanese meteorological satellites. He went back to INTELSAT and became director of the department in which he worked. Kris returned to Space Systems/Loral as Chief Engineer, and finally retired from all work in 2012. He is now living in New Jersey and writing a book on electrodynamics.

## Contact Us

The department newsletter is a means of reaching out to the alumni to keep them abreast of current research and developments in the Department of Physics and Astronomy. It is also a forum for alumni to keep the department informed of their accomplishments; the department welcomes submissions from alumni of newsworthy items for publication in the newsletter. Please feel free to email your news to **Yas Shemirani** at [yassaman.shemirani@northwestern.edu](mailto:yassaman.shemirani@northwestern.edu).



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Please take the time to join our [LinkedIn](#) page for our alumni.

Follow us on [Facebook!](#)



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*2020*

*For more information about our department, please visit [www.physics.northwestern.edu](http://www.physics.northwestern.edu)*

