Fall 2018

dimensions

Department of Physics & Astronomy

In this issue:

Northwestern University

Faculty News

Congratulations to **Dr. Takashi Nishikawa** on his election as a Fellow of the American Physical Society. This honor is limited to no more than one half of one percent of the membership each year, and represents recognition from fellow physicists.

Congratulations to Professors **Eric Dahl**, **Andre de Gouvea**, and **Mayda Velasco** on receiving a Fundamental Physics Innovation Award.

Congratulations to Associate Professor **Eric Dahl** on his permanent appointment as Scientist at Fermi National Accelerator Laboratory. The position is held jointly with his appointment at Northwestern University.

Congratulations to Professors **Eric Dahl, Kristian Hahn** and **Nate Stern** on their promotions to Associate Professor with tenure in the Weinberg College of Arts & Sciences.

Professor **Fred Rasio** was the invited *2018 Salpeter Lecturer* at Cornell University.

Professor **Jim Sauls** writes introductory article in *Philosophical Transactions of the Royal Society A*.

Professor **Art Schmidt** did his "Magic of Physics" show on September 15, 2018, for the Annual Wildcat STEM and Sports Day.

Professor **Mel Ulmer** was featured in Sky at Night Magazine.

Welcome to **Christopher Berry**, who recently joined Northwestern from the UK as the new CIERA Board of Visitors Research Professor.

Professor **Adilson E. Motter** has been elected Vice President and Secretary of the Network Science Society for the term 2018-21.

On November 9th and 10th, Professor **Shane Larson** gave a Kavli Fulldome Lecture that was streamed worldwide.

Congratulations to Professor **Mayda Velasco** on the Aps-Moore award. Also, her work with COFI workshops: "Physics beyond standard model using charged leptons," May 2018 and "Challenges in gravitational waves," in October 2018. She also held a COFI Domain Dinner in Old San Juan with Professor **Vicky Kalogera** as lead speaker.

On invitation of Nature Research, Professor **Adilson E. Motter** participated in the Pujiang Innovation Forum 2018, in Shanghai. The focus of this year's science forum was *Understanding Complexity to Foster Innovation*.

Selected Publications

Ronit Freeman, Ming Han, Zaida Alvarez, Jacob A. Lewis, James R. Wester, Nicholas Stephanopoulos, Mark T. McClendon, Cheyenne Lynsky, Jacqueline M. Godbe, Hussain Sangji, **Erik Luijten**, Samuel I. Stupp, *Science*, 04 Oct 2018: eaat6141 http://dx.doi.org/10.1126/science.aat6141

Raffaella Margutti, Dan Milisavljevic, Daniel J. Patnaude, Roger A. Chevalier, John C. Raymond, Robert A. Fesen, Brody Conner, and John Banovetz, *The Astrophysical Journal Letters,* 12 September 2018.

G. Gabrielse et al. "Improved limit on the electric dipole moment of the electron" *Nature,* 17 October 2018.

William P. Halperin, Jeevak M. Parpia, and **James A. Sauls,** *Physics Today*, 01 November 2018: https://physicstoday.scitation.org/doi/10.1063/PT.3.4067

Wen-fai Fong, Raffaella Margutti, et al. The Astrophysical Journal, Volume 862, Number 2 http://iopscience.iop.org/article/10.3847/1538-4357/aacbcc/meta

Shu-Xu Yi, K. S. Cheng, and **Ronald E. Taam** The Astrophysical Journal Letters, Volume 859, Number 2.

Thomas Wytock and **Adilson E. Motter,** Predicting Growth Rate from Gene Expression, to appear in Proc. Natl. Acad. Sci. USA.

Richings, **A. J**. & **Faucher-Giguère, C.-A.** 2018, "Radiative cooling of swept up gas in AGN-driven galactic winds and its implications for molecular outflows," MNRAS, 478, 3100.

Stern, J., Faucher-Giguère, C.-A., Hennawi, J. F., **Hafen**, **Z. H**., Johnson, S. D., & Fielding, D. 2018, "Does circumgalactic OVI trace low-pressure gas beyond the accretion shock? Clues from HI and low-ion absorption, line kinematics, and dust extinction," ApJ, 865, 91.

Welcome to Our New Department Faculty

JJ Carrasco

Associate Professor

John Joseph is broadly interested in theoretical physics, from prediction-oriented understanding and formal unification of relativistic quantum field theories, to open phenomenological questions in precision cosmology and gravitational wave astronomy. He has a deep affinity for the value of pushing the line of failure-point predictions. These involve calculations that take modern methods and world-class analytic automation to their breaking point. This strategy invites new ideas, new physical stories, and ultimately the apprehension of novel structure.

Upcoming workshops/programs JJ's organizing involve “QCD meets Gravity IV” at NORDITA this December (www.nordita.org/qcd2018), the Simon’s symposia “Amplitudes meet Cosmology” this May (bit.ly/cosmoamp), and the MIAPP program: “Precision Gravity: From the LHC to LISA” in Munich this upcoming September (www.munich-iapp.de/Precision_Gravity).

Tim Kovachy

Assistant Professor

Tim Kovachy's research group will use atom interferometers, which exploit the quantum mechanical wavelike nature of massive particles, for a variety of fundamental physics tests. His research goals include searching for new particles beyond the standard model by testing the gravitational inverse square with increased precision, making an improved measurement of Newton's gravitational constant, and developing technology for atomic gravitational wave and dark matter detectors.

In his free time, Tim enjoys SCUBA diving, underwater photography, and playing with the two kittens he and his wife recently adopted.

Research Staff and Graduate Student Achievements

Joshua Wiman won the Best Poster Award for the contribution titled "Is Superfluid 3He-A the precursor to magnetically ordered solid 3He?" at the International Symposium on Quantum Fluids and Solids, Tokyo, Japan, August 31, 2018.

Kyle Kremer was first author on a paper published last May in Physical Review Letters on "LISA Sources in Milky Way Globular Clusters". https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.120.191103.

Dr. Mario Spera has joined the Rasio group/CIERA, as a Marie Curie Fellow: an extremely prestigious and competitive postdoctoral fellowship funded by the EU.

Eve Chase and **Scotty Coughlin** were featured in “Humans of LIGO” https://ciera.northwestern.edu/2018/09/20/ciera-researchers-featured-in-humans-of-ligo/

Graduate student **Alexander Gurvich** won an honorable mention for his poster "Vertical Hydrostatic Balance in Galactic Disks from the FIRE Simulations" presented at the conference “The Laws of Star Formation: From the Cosmic Dawn to the Present Universe” this past June in Cambridge, UK.

Graduate Student **Daniel Weiss** received the Quantum Computing Graduate Research Fellowship (QuaCGR), funded by the Army Research Office (ARO).

Undergraduate Nitrogen Ice Cream Event

Our department started a new annual tradition this year, the *Fall Welcome*. This fun event celebrated the announcement of the Nobel Prize in Physics with the making of liquid nitrogen ice cream. We invited current and potential majors to the department to meet all of our faculty, hear Professor **Brian Odom** tell us a little more about the prize, and to enjoy liquid nitrogen ice cream made in-house by Professors **Michelle Driscoll** and **Nate Stern**.

Professors Nate Stern and Michelle Driscoll prepare nitrogen ice cream for our undergraduates.

Professor Michelle Driscoll serves ice cream to an undergraduate student.

CIERA Helps Chicago-Area High School Students Host 2018 GirlCon

On Saturday, June 16th, over 170 middle and high school girls from around the United States gathered to address the future of diversity in STEM during GirlCon 2018, hosted by CIERA and Reach for the Stars.

GirlCon was held at Northwestern's Norris Center and was ideated, organized, and executed by a team of 15 high-school girls from across the US, lead by Deerfield High School rising junior Kyla Guru and Libertyville High School rising senior Molly Graton. More than 50 recognized experts in the fields of Science, Technology, Engineering and Mathematics served as speakers, breakout session leaders, and lunch panelists.

Dearborn Observatory
Fall/Winter Hours
(October-March)

8:00-9:00 PM: One hour session by reservation only. Your group will be able to use the telescope for the full hour.

9:00-10:00 PM: Walk-ins are welcome, but space in the dome is limited.

There is no charge for these Friday night tours; however, we do require a refundable deposit for groups of 10 or more. Additionally, the Observatory is available for private viewing events on other evenings. Reservations may be requested online at http://www.physics.northwestern.edu/about/dearborn-observatory/.
For more information, please contact
Yas Shemirani at 847-491-7650.

The Department of Physics and Astronomy is proud to host the 2019 regional Conference of Undergraduate Women in Physics

AMERICAN PHYSICAL SOCIETY

CONFERENCE for UNDERGRADUATE WOMEN in PHYSICS at NORTHWESTERN UNIVERSITY

january 18 - 20 2019

APS NU CUWiP is a **three-day regional conference** for undergraduate physics majors from Minnesota, Wisconsin, Iowa, Illinois, and Puerto Rico.

Experience a professional conference, learn about careers and graduate school, interact with peers and professionals of all ages, and more.

Department Outreach

The weekend of September 21-23, the Physics & Astronomy department welcomed seven middle school girls with their chaperones from the **Bad River Ojibwe** reservation in northern Wisconsin for a STEM weekend that included professor talks, time at the Adler, an exchange of native star stories and science (led off by the Center for Native American & Indigenous Research Director, Professor Patty Loew at the welcoming gathering attended by more than a dozen grad students and professors), and even an overnight stay in Dearborn, where the girls could see the changing views in the telescope.

Their stay was entirely funded by the Office of Institutional Diversity and Inclusion with a grant to **Ava Polzin**, who enlisted Physics & Astronomy faculty (**Professors Pulak Dutta, Art Schmidt, Eric Dahl, Aaron Geller, Wen-fai Fong, Claude-André Faucher-Giguère, Zosia Krusberg**, and **Raf Margutti**) and post-baccalaureate/grad students (**Eve Chase, Aprajita Hajela, Renée Manzagol,** and **Katie Barnhart**) to plan logistics, prepare and present activities, talks, and lab tours that left the guests marveling at all of the learning and goodwill packed into the weekend.

The outreach was so successful and gratifying for all that planning for next year's guests (**Lakota** girls from the Pine Ridge Reservation in South Dakota) is already underway for the spring.

Welcome to Our New Graduate Students Fall 2018

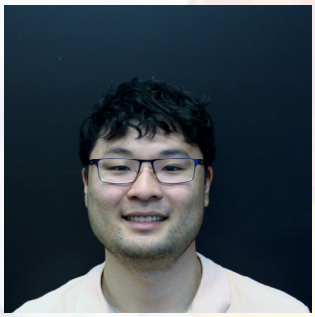
Eduardo Alejandro

Michael Bueno

Lindsey Byrne

Matt Carney

Lindsay DeMarchi



William Eom

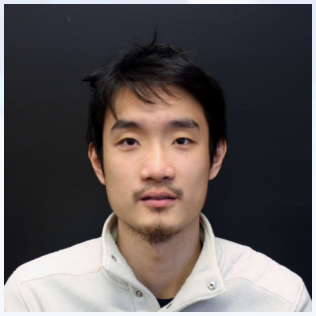
Joshua Fuhrman

Monica Gallegos

Carin Gavin

Scott Grudichak

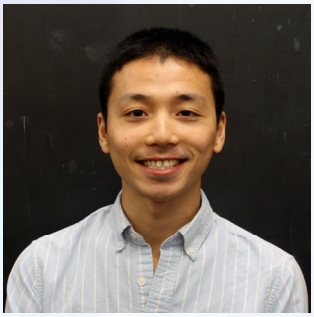
Bingjie Hao



Junguang He

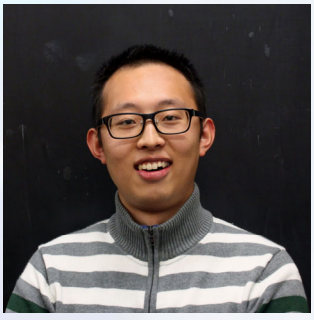
Danat Issa

Cole Kampa



Dennis Lee

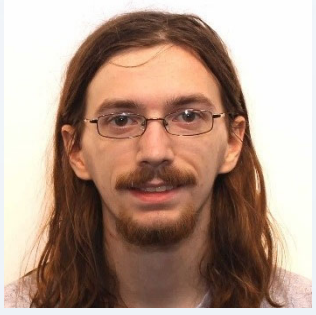
Jinyang Li



Siyuan Liu

Beverly Lowell

Joey McCourt

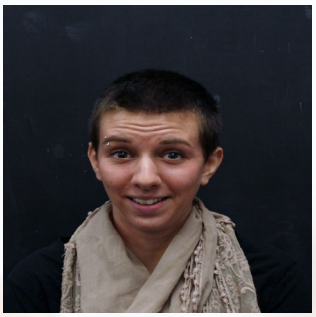


Jacob McLaughlin

Welcome to Our New Graduate Students Fall 2018 (continued)


Anya Nugent


Kaushik Rao

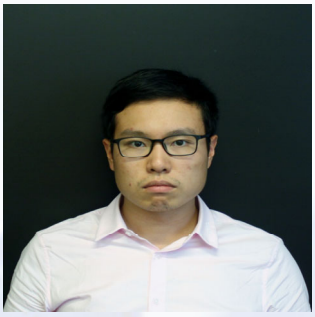

Monica Rizzo


Kyle Rocha


Kevin Ryan

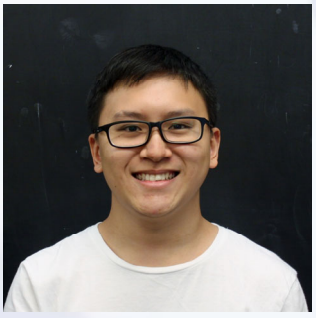

Genevieve Schroeder

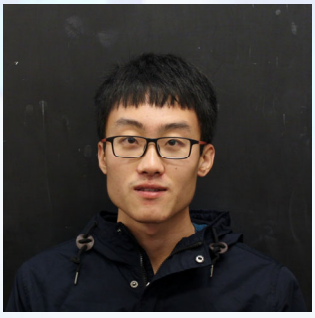

John Scott


Ye Shen


Candice Stauffer


Benedict Sukra

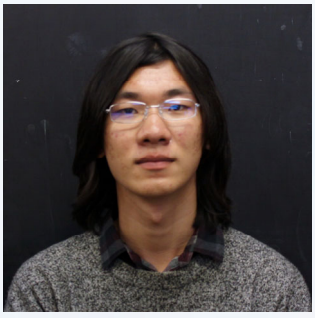

Chee Yu Tan


Yuxin Wang

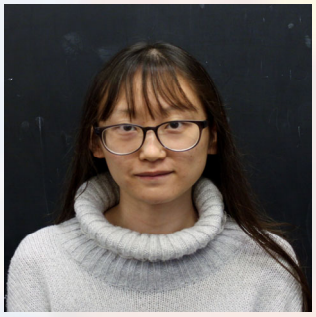

Newlin Weatherford

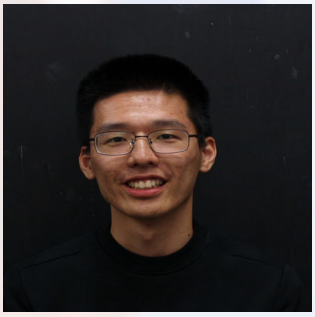
Jean Weill


Wenxin Xie


Zanpeng Yin


Suna Zekioglu


Huan Zhang


Runze Zhang

Noteworthy Events

Experts Gather to Discuss the Circumgalactic Medium

Organized by Professor **Claude-André Faucher-Giguère** and Postdoctoral Fellow **Jonathan Stern**, CIERA hosted a workshop for 50 experts on the circumgalactic medium July 30 – August 3, 2018.

The circumgalactic medium (CGM) is host to many physical processes critical to galaxy formation. Beyond important issues concerning the mass, energy, and chemical content of the CGM, the scientific community is vigorously debating several open questions about this part of our Universe. The expert theoreticians and observers invited to this limited-size workshop at Northwestern discussed these matters in-depth, and also had the opportunity to enjoy visiting Chicago and our Evanston campus in the summertime. Visit the Circumgalactic Medium Workshop website.

Planning the Future of Muon-to-Electron Conversion Experiments

Professors **Michael Schmitt** and **Mayda Velasco** hosted over 70 people who gathered at Northwestern University to discuss the future of the Mu2e experiment. The current Mu2e experiment is designed to look for the extremely rare process of muon-to-electron conversion in the field of an atomic nucleus. It should reach a single-event sensitivity of 3 x 10^-17, which is far below all past experiments. A positive observation of this process would be a major discovery.

If it is not observed, then particle physicists aim for improving the sensitivity by one or two orders of magnitude, and the Northwestern workshop explored the main technical barriers to that improvement. Visitors were very impressed by the Northwestern University campus and enjoyed an excellent dinner at Chef's Station located in downtown Evanston. Details of the workshop can be found at the workshop web site.

Department Events and News

UNESCO ESTABLISHES CHAIR PROFESSORSHIP AT NORTHWESTERN

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has announced they will establish a Chair on Fundamental and Interdisciplinary Physics at Northwestern University. The position is established in support and recognition of the Colegio De Fisica Fundamental E Interdisciplinaria De Las Americas (COFI), located in San Juan, Puerto Rico. Professor **Mayda Velasco** serves as General Director of COFI and will hold the *UNESCO Chair Professorship* at Northwestern University.

MODEST-18 HOSTED BY CIERA IN SANTORINI, GREECE

MODEST-18, the 18th workshop on Modeling and Observing DEnse STellar systems, took place on the island of Santorini, Greece, June 25 – 29. Scientific sessions were held at the Petros Nomikos Conference Centre located in the capital city of Firá. CIERA's **Fred Rasio** and UCLA's Andrea Ghez led the scientific organizing committee, and **Vicky Kalogera**, a native of Greece, led the local organizing committee. CIERA researchers and graduate students **Katie Breivik**, **Kyle Kremer**, **Newlin Weatherford**, **Claire Ye**, and **Mike Zevin**, along with CIERA alums Sourav Chatterjee and Carl Rodriguez, all presented research.

NORTHWESTERN ROCKET RETURNS TO EARTH AFTER 15 MINUTE JOURNEY THROUGH SPACE

On July 22, a 10-year, NASA-funded project culminated with the launch of the "Micro-X" rocket from White Sands Missile Range in southern New Mexico. The research team was led by physicist **Enectali Figueroa-Feliciano**, an Associate Professor of Physics and Astronomy in the Weinberg College of Arts and Sciences and an associate member of Northwestern's Center for Interdisciplinary Exploration and Research in Astrophysics (CIERA).

The Micro-X rocket was meant to observe the supernova remnant Cassiopeia A, a star in the Cassiopeia constellation that exploded approximately 11,000 light-years away from Earth. Due to problems with the mission's pointing system, those images were not possible on this flight, but researchers did demonstrate the detectors, along with their superconducting electronics readout, working for the first time in space.

RESEARCH EXPERIENCES FOR UNDERGRADUATES POSTER PRESENTATION

CIERA's Research Experiences for Undergraduates (REU) program provides students with the chance to pursue an astrophysics-based interdisciplinary research project in collaboration with Northwestern faculty. This year, 8 students were selected and funded by the NSF. Additional funding from the LSSTC, Illinois Space Grant, and faculty grants enabled a total of 15 exceptional students to spend their summer working with CIERA researchers and learning technical skills that will serve them in their future academic and professional lives.

On August 23, 2018, these students presented at the REU program's final poster session at Northwestern. Every year, the poster session serves as an opportunity for REU students to share their hard work with peers and faculty from many different departments, as well as providing them with a chance to practice public speaking before traveling to give presentations to the public at the Adler Planetarium—which they did this year on August 24th. Some of the REU students will also participate in the 233rd Meeting of the American Astronomical Society, taking place in January 2019.

CIERA CONTRIBUTES TO WORLD SCIENCE FESTIVAL

The World Science Festival is an educational non-profit which was founded 11 years ago by physicist Brian Greene. Its mission is to cultivate a general public informed by science, inspired by its wonder, convinced of its value, and prepared to engage with its implications for the future. This year's World Science Festival in New York City featured an expert panel discussing black holes, including CIERA director **Vicky Kalogera**. Also featured was a video illustrating the collision of two neutron stars (GW170817), created by CIERA's Aaron Geller.

CIERA DIRECTOR VICKY KALOGERA PRESENTS ANNUAL PUBLIC LECTURE

Founded ten years ago, the Center for Interdisciplinary Exploration and Research in Astrophysics (CIERA) is celebrating a decade of astrophysics discovery and research, and the community joins in this commemoration through the annual public lecture series. The annual public lecture serves as a special event that connects Northwestern researchers, astronomers, students, and the public for an evening exploring a timely and exciting astronomy topic.

The lecture took place on October 11, 2018, in Cahn Auditorium and was attended by nearly 600 people. Professor **Vicky Kalogera's** talk–a glimpse into the years of fascinating work conducted by CIERA–highlighted key discoveries and what they mean for the future of astronomy. Professor Kalogera discussed the lives of stars, how their influence on the Cosmos has changed in the recent decade, and the ways in which CIERA helped push forward toward new boundaries of understanding. The talk vividly explored the story of the life and death of stars, the ways in which we study their remains utilizing light and gravity, and how this translates into unfolding the evolution of the galaxy and the Universe itself.

Open House Chicago
Dearborn Observatory

On October 13 and 14, 2018, Open House Chicago hosted two events at the Dearborn Observatory.

This year, 1,494 people attended Dearborn, surpassing our expectation of 1,000.

Faculty Spotlight: Jonathan J. Carrasco

Professor Carrasco is broadly interested in theoretical physics, from prediction-oriented understanding of quantum field theories, to open phenomenological questions in precision cosmology and gravitational wave astronomy. He has a deep affinity for the value of pushing the line of failure-point predictions. These involve calculations that take modern methods and world-class technologies to their breaking-point. To make progress this strategy invites new ideas, new physical stories, and ultimately the apprehension of novel structure.

The goal is deep physical insight, with a joy in developing and leveraging -- for mutual benefit -- domain expertise in scattering amplitudes, relativity, particle physics, string theory, and cosmology.

Ph.D., *University of California, Los Angeles*, 2010

Honors and Awards

- ERC Starting Grant 2014, Principle Investigator, *preQFT: Strategic Predictions for Quantum Field Theories* (2015-).
- John F. Templeton Grant, Co-leader with Renata Kallosh, *Quantum Gravity Frontiers* (2012-2015).
- Julian S. Schwinger Named Diploma, Erice International School of Subnuclear Physics (2011).
- Best Theoretical Physics Prize, Erice International School of Subnuclear Physics (2011).
- Stanford Institute for Theoretical Physics, Postdoctoral Research Scholar Fellowship (2010-2013).
- Guy Weyl Physics Alumni Graduate Fellowship (2007-2010).
- John S. Bell Named Diploma, Erice International School of Subnuclear Physics (2008).
- Best [open] Question Prize [1], Erice International School of Subnuclear Physics (2008).

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 38 graduate faculty and 12 faculty at other ranks (instructional and research faculty). Our graduate program generally has about 99 graduate students and 35 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 60 undergraduate majors in our department, many of them working in our research programs.

Congratulations to our Recent Graduating Students

Varada Bal (Chandrasekhar)
PhD

Transport Measurements on (111) Oriented (La0:3Sr0:7) (Al0:65Ta0:35)/SrTiO3 Heterostructures

Sumit Brahmachi (Marko)
PhD

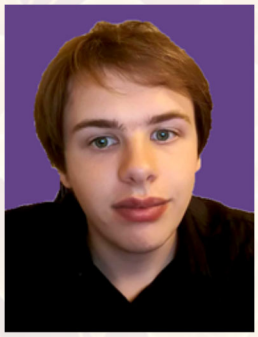
DNA Topology and Mechanics

Yen Jung Chen (Stern)
PhD

Manipulation of Valley-Sensitive Light-Matter Interactions in Two-Dimensional Semiconductors

Bo Fu (Ratner)
PhD

Chemical Physics at the Molecule-Metal Interface



John Gresl (Dahl)
MS

Acoustic Analysis of a Scintillating Xenon bubble chamber for Detecting Dark Matter

Stanislava Sevova (Hahn)
PhD

A Search for Dark Matter Produced in Association with Top Quark Pairs in the Dilepton Final State at sqrt{s}=13 TeV with the CMS Detector

Siyuan Shi (Kumar)
PhD

Entanglement Generation in Green Fluorescent Proteins

Niharika Sravan (Kalogera)
PhD

A Comprehensive Investigation of Type IIb Supernova Progenitors: Combining Theory, Observations and Statistics

Vesselin Velev (Kumar)
PhD

Towards Quantum Applications for Nonlinear Interactions in Chip-Based Waveguides and Resonators

Alumni Focus

James A. Muir (*PhD* 1966) James Muir first began working at University of Puerto Rico, in Rio Piedras, Puerto Rico with Mariel Meents (Muir). In 1992, Mariel Muir became Dean of Science at Texas State University in San Marcos, TX, while James Muir spent his time wiring up all the dormitory rooms for Ethernet. James retired from Texas State University in 2012.

Sung-Hyon "Sonny" Rhim *(PhD,* 2007*)* Dr. Rhim (Freeman Group) has been working at the University of Ulsan (Department of Physics), as an assistant professor since 2017.

Chunglee Kim (*PhD*, 2006) Dr. Kim, (Kalogera Group), joined the EWHA Woman's University, Seoul in March of 2018.

Hyoung Soon Choi (*PhD*, 2007) Dr. Choi (Halperin Group) joined the Korean Advanced Institute of Science of Technology (KAIST) as a professor.

Joy Nichols (*BA, 1968; MS, 1970*) received her BA in math and MS in Physics and Astronomy from Northwestern University. She received her Ph.D. from the University of Amsterdam. She has worked for 40 years on NASA space missions and currently is responsible for the data processing of Chandra data. She has also worked on IUE, HST, and Spitzer. Her research primarily concerns the winds of hot stars.

Bruce Weinke (*PhD,* 1970) received a BS in physics and mathematics from Northern Michigan University, MS in nuclear physics from Marquette University, and PhD in particle physics from Northwestern University. He is the Director of the Computational Testbed For Industry (CTI), a DOE User Facility providing cooperative opportunities for American Industry in high performance supercomputing, software development, and training, and is a Program Manager in the Nuclear Weapons Technology/Simulation And Computing Office at the Los Alamos National Laboratory (LANL).

David Marasco (*Weinberg*, 2002) Dr. Marasco is currently a professor at Foothill College, and chair of the Physics, Engineering and Astronomy departments. He is active in AAPT at both the local and national levels. In addition, he is the program chair and section rep for the NorCal/Nevada section, and the incoming chair of the Committee for Diversity in Physics. He is involved outreach, the "Foothill College Physics Show" which is a demonstration show for the public. Their performances have reached over 100k people.

Neal Hulkower (*Weinberg*, 1970**)** After receiving his BA in Physics at Northwestern, Neal received his M.S. in Applied Mathematics at Northwestern University in 1973, followed by a Ph.D. in Applied Mathematics from Northwestern University in 1977. Neal held many different jobs across the country and is now currently residing in McMinnville, Oregon.

Milo Sampson, **MD** (*MS*, 1965) Dr. Sampson attended medical school and received his MD from Indiana University in 1971.

Zuyu Zhao (*PhD*, 1990) Dr. Zhao's (Ketterson Group) thesis title: "Studies of Non-Conventional Superfluids: Ultrasound Propagation in 3He-B and the Microwave Surface Impedance of the Heavy-Fermion Superconductor UPt3," is currently working at Janiz Research Company in Woburn, MA and is the Board Director, Executive Vice President and Principal Scientist.

John Andrew Milsom (*PhD*, 1996) Dr. Milsom is an Associate Professor of Practice at the University of Arizona and the Director of Undergraduate Studies.

Raghunathan Krishnaswamy (*PhD*, 1978) Dr. Krishnaswamy studied with Dr. Ralph Segel. After 1974, he

joined Argonne National Labs, in the low energy nuclear structure physics experiments. He left in 1977 and got his Ph. D. degree in 1978. After a couple of years at NOAA satellite service, he joined Intelsat, a Global consortium and worked there until 1995 and then again from 2000 till 2006.

Lawrence Jones (*Weinberg*, 1948) Dr. Jones began his college education at Northwestern in the summer of 1943, and was drafted into the army in the winter of 1944. After two years in the service (including about 7 months in Europe, including the end of the war in 1945) Dr. Jones was discharged and returned to Northwestern where he received his BS in both Physics and Zoology. Dr. Jones received his PhD from the University of California at Berkeley in 1952. After earning his PhD, he was hired by the University of Michigan in 1952, and has been there ever since.

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

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2018

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