

Fall 2016

dimensions

Department of Physics & Astronomy



In this issue:

Two new faculty members, Zosia Krusberg and Raffaella Margutti, join the department

Professor Andrea Ghez (UCLA) delivers 2016-2017 Heilborn Lectures

Inauguration of the annual "Rapid Fire Research" contest

Northwestern University

On the cover:

Shown is graduate student **Dan Baxter** (Dahl) working on the installation of the PICO-60 detector at SNOLAB. PICO is an international collaboration with the goal of detecting the rare interactions between hypothesized WIMP dark matter and an ordinary nucleon. PICO constructs and operates bubble chambers able to remain superheated for long periods of time while awaiting an interaction to deposit enough energy to nucleate an event. In an event, the local molecules near the interaction site will boil, forming a bubble that grows to macroscopic size and is detected with external cameras. Pressure and acoustic sensors monitor the bubble genesis and growth to characterize the interaction. By tuning the pressure and temperature settings, the energy threshold can be set to remove problematic radioactive backgrounds, leading to a hypothetically background free state in which to search for a rare WIMP signal. Existing PICO detectors currently set the best constraints on a specific type of dark matter interaction that cares about the spin of a proton target. PICO-60 is a 40L detector filled with C3F8 which hopes to improve these constraints by at least an order of magnitude. It is currently operational in SNOLAB, one of the worlds cleanest, deepest physics labs, 6800ft underground in Lively, Ontario. By going deep underground, problematic backgrounds from cosmic rays are shielded away by the Earth itself, creating a low-background environment to search for rare signals.

Faculty News

Three Physics and Astronomy faculty members made the ASG Honor Roll. Congratulations to **Jens Koch, Andrew Rivers and Mike Smutko**.

Brian Odom has been named Faculty Director of the Research Shop, a modernized core facility scheduled to open in Summer of 2017.

Adilson Motter received the Scialog Collaborative Innovation Award which will support the study of temporal order of gene knockouts.

Giles Novak, Fabio Santos and Visiting Scholar Marc Berthoud helped build a camera for the SO-FIA observatory.

Fred Rasio was part of an AAS press conference to announce that the dynamical formation theory was supported in the forming of the binary black holes detected by LIGO.

This month Oxford University Press published "The Physics of Solids" by department member **John Ketterson**. At over 1000 pages there are

chapters on most of the important subfields within the discipline. The book starts with topics suitable for undergraduates and then progresses to the graduate level, finishing up with discussions of some currently active research areas.

Chris Jacobsen was named an Argonne Distinguished Fellow. <https://www.anl.gov/about-argonne/leadership/argonne-distinguished-fellows>

Kamal Seth gave an invited Keynote address, entitled "*First Measurements of Time-like Form Factors of Hyperons, and Evidence of Diquark Correlations*" at the MENU 2016 Conference in Kyoto, Japan, on July 26, 2016.



New Faculty Additions to the Department



Raffaella Margutti

Assistant Professor

Professor Margutti grew up in a small village close to Milan (Italy) and has shown a strong passion for "exploding things" since she was a child, with great attraction to everything connected to fire, light and.... gravity.

As an adult, she has the fortune to make her living on the very same things. She studies eruptions, disruptions and stellar explosions: the greatest fireworks in the Universe.



Zosia Krusberg

Professor of Instruction

Zosia Krusberg is a theoretical cosmologist and mind, brain, and education researcher. She is deeply committed to promoting and supporting excellence in physics education as well as the inclusion and retention of women and other historically underrepresented minorities in physics. Zosia is a devoted meditation practitioner – spending one to two months a year in retreat in addition to her daily practice – and teaches meditation in a range of academic and community settings. The daughter of a Swedish diplomat and an Italian business man, she grew up across Europe and the Middle East. She is a student of Jungian depth psychology, a yoga practitioner, a photographer, a nature lover, and cat mom to Moon and Sola.



Dearborn Observatory Visiting Schedule

Fall/Winter Hours (October—March)

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

9-10 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.

Selected Publications

“Dynamical Formation of the GW150914 Binary Black Hole” Carl L. Rodriguez, Carl-Johan Haster, Sourav Chatterjee, Vicky Kalogera, and Frederic A. Rasio

The Astrophysical Journal Letters, Volume 824, Number 1 (2016)

<http://iopscience.iop.org/article/10.3847/2041-8205/824/1/L8/meta>

“GW151226: Observation of Gravitational Waves from a 22-Solar-Mass Binary Black Hole Coalescence” B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) **Phys. Rev. Lett. 116, 241103 (15 June 2016)**

<http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.116.241103>

“Numerical and Analytical Modeling of Transit Timing Variations” Sam Hadden and Yoram Lithwick, Published 2016 August 26, **The Astrophysical Journal, Volume 828, Number 1**

<http://iopscience.iop.org/article/10.3847/0004-637X/828/1/44/meta>

“Balloon-borne Submillimeter Polarimetry of the Vela C Molecular Cloud: Systematic Dependence of Polarization Fraction on Column Density and Local Polarization-angle Dispersion,” Laura M. Fissel, Peter Ashton, Giles Novak et al. Published 2016 June 21, **The Astrophysical Journal, Volume 824, Number 2**

<http://iopscience.iop.org/article/10.3847/0004-637X/824/2/134/meta>

“Deformation of rectangular thin glass plate coated with magnetostrictive material”, Xiaoli Wang¹, Youwei Yao², Tianchen Liu¹, Chian Liu³, M P Ulmer² and Jian Cao¹, Published 19 July 2016 • © 2016 IOP Publishing Ltd, **Smart Materials and Structures, Volume 25, Number 8**

<http://iopscience.iop.org/article/10.1088/0964-1726/25/8/085038/meta>

Symmetric states requiring system asymmetry, Takashi Nishikawa and Adilson E. Motter, **Phys. Rev. Lett. 117, 114101 (2016)**

<http://physics.aps.org/synopsis-for/10.1103/PhysRevLett.117.114101>

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 32 graduate faculty and 12 faculty at other ranks (instructional and research faculty). Our graduate program generally has about 99 graduate students and 27 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.



Professor Art Schmidt performs a demonstration at the annual Chemistry Halloween show.

Research Staff and Graduate Student Achievements

Matthew Rickert (Yusef-Zadeh) was awarded the Reber Fellowship and is currently working in Socorro, New Mexico, with the Jansky Very Large Array (VLA).

Junjing Deng (Jacobsen) was co-winner of the Werner Meyer-Ilse Award, for the best PhD student research presented at the biennial international x-ray microscopy conference, in Oxford in August. Junjing is now a staff scientist at the Advanced Photon Source at Argonne.

Zach Hafen (Faucher-Giguere) was the winner of the inaugural Rapid Fire Research event, with **Katie Breivik** (Larson) taking second place.

Zach Hafen's (Faucher-Giguere) visualization of one of his galaxy simulations was selected by Northwestern Science in Society's Scientific Images contest. The image will be exhibited with other winning images in several locations in the Chicago area, including the rotunda of the Museum of Science and Industry.

Katie Breivik (Larson) and **Sam Hadden** (Lithwick) showcased their skills in public speaking at an event entitled "Seven Minutes of Science", organized by Ready Set Go (RSG). This program was created to increase awareness for the need of excellent science communicators and to coach graduate students and postdoc researchers to improve their presentation skills.

CIERA Postdoctoral Fellow **Laura Sampson** won the L'Oreal 2016 Women in Science Fellowship.



Graduate student **Yuanzhao Zhang** has completed an outreach project at Regina Dominican, an all-girls college preparatory high school. The project applied kinesthetic learning techniques to teach high school students complex scientific concepts. The students, in turn, created a dance piece titled "Syncing Up Without Sameness" expressing these concepts. Zhang is a student in Prof. Motter's group and was guided through the project by Alyssa Motter.

<https://www.youtube.com/watch?v=qFCX2pZXDBg>

Staff Achievements

Marsha Coffey won the Dean's Excellence Award. This award honors a staff member exemplary in service focus, efficiency and leadership. Additionally, they consistently demonstrate an outward focus and represent their department, the College and the University in a positive manner.

Lisa Raymond became the Information Coordinator for CIERA on leap year in 2016. Before moving to the Chicago/Evanston area, Lisa attended the University of Michigan in her hometown of Ann Arbor, graduating with dual-degrees in English and Creative Writing. She still loves to write in her free time and to engage in other artistic ventures. Lisa has been loving every bit of her time at Northwestern and is so proud to be a part of CIERA's dedicated administrative team.

Undergraduate Achievements

Senior **Rebecca Diesing** (Yusef-Zadeh) was selected as an Oliver Marcy Scholar for 2016-2017. This award is given to three Weinberg students who complete their junior year with the best record in experimental, observational or mathematical sciences.

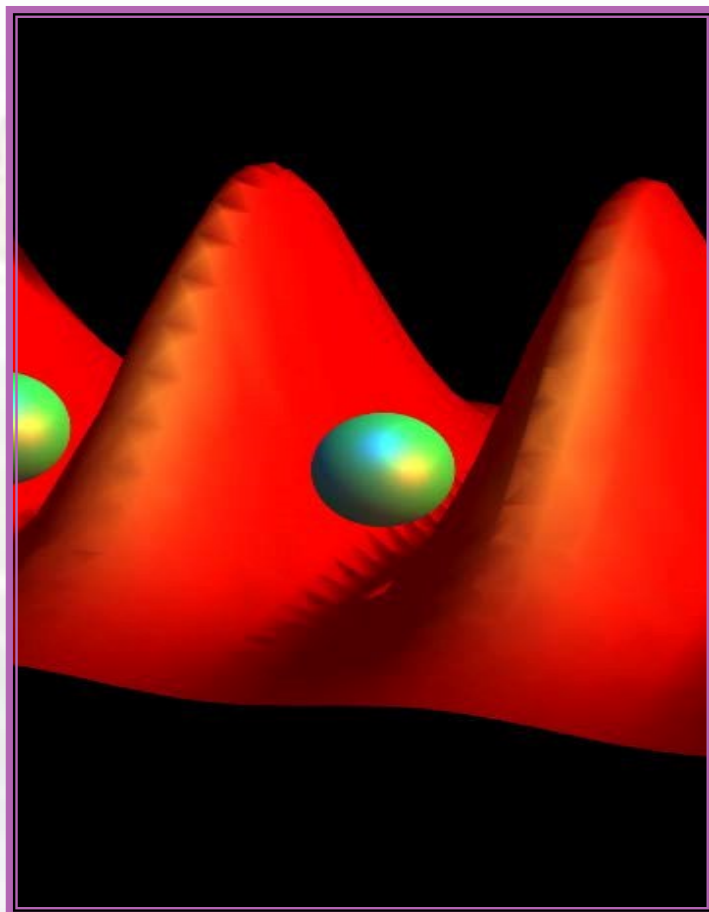
Trent Cwiok was the winner of the inaugural Rapid Fire Research event, with **Benjamin Moy** as the runner up of the Inaugural Rapid Fire Research event.

Staff News

In July, the department hired two new staff members to assist with administrative support for our faculty, students and research staff.

Yassaman Shemirani is our new undergraduate program assistant, replacing Monica Brown. Yas is responsible for tracking majors and minors, assisting the Director of Undergraduate Studies and issuing permission numbers. Yas is also responsible for Dearborn Observatory reservations, marketing and scheduling the telescope operators.

Tina Hoff is our new faculty support assistant who is responsible for support for the CMP, CS and AMO research groups. Tina provides seminar support, including travel arrangements for guest speakers and processing expense reports for our research groups and visitors. In addition to these duties, Tina has worked tirelessly to update our Department Directory.



Christina Hoff

Faculty Support Assistant

Tina graduated from the University of Wisconsin – Oshkosh with a Bachelor of Arts in Theatre Design and Technology. Outside of Physics and Astronomy, Tina is a costume designer for local theatres and enjoys cooking and crafting.

Tina supports the CMP, CS and AMO research groups.



Yassaman Shemirani

Undergraduate Program Assistant

Yassaman grew up in Chicago and attended the University of Kentucky for college. She studied Integrated Strategic Communication with a focus on Public Relations. After graduating this May, she returned back home where she began working for Northwestern this summer. She is excited to be back home with her family and friends and work for a very welcoming department.

2016 Incoming Graduate Students

PhD Students



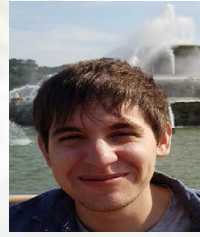
Baker, Brian



Chase, Eve



Dragan, James



Gurvich, Alexander



Huang, Ziwon



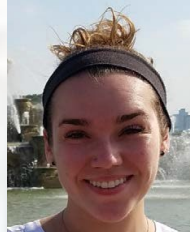
Ionescu, Andra



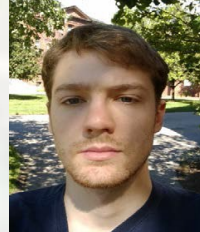
Jusino, Giancarlo



Katz, Michael



Manzagol, Renee



Myers, Thomas



Rabelo, Greg



Rabinowitz, Jacob



Rath, Jeremy



Shah, Phalguni



Ye, Shi (Claire)



Yoo, Sangjun

MSc Students



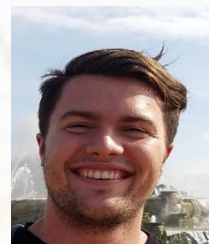
Fujisaki, Tatehito



Mahajan, Aruj



van der Poel,
Constantijn



Wilmes, Dominic



Zhang, Hao

The Department Welcomes our Incoming Students!

Northwestern's Society of Physics Students (SPS)

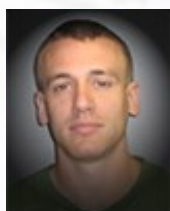
President: Joon Park
Treasurer: Mihir Swaroop
Secretary: Kelly Powderly
Public Relations Chair: Lauren Barmore
Programming Chair: Luis De La Garza
Publicity Chair: Dara Rubin
Social Media Chair: Rachel Inderhees
Historian: Daniel Kinch



Society of Physics Students Officers-Elect for 2016-2017

Left to Right: Lauren Barmore, Dara Rubin, Rachel Inderhees, Luis De La Garza, Kelly Powderly, Daniel Kinch, Joon Park, Mihir Swaroop, and advisor, Art Schmidt

Congratulations to our PhD and MSc Graduates (Summer/Fall 2016)



Joshua Dempster (Monica Olvera de la Cruz)
Controllable Nanoparticle Assembly and Actuation with Modified Dipole Potentials in Simulation



Tarun Patel (Nathan Stern)
Understanding Chirality of Plasmonic Near fields using TMDC monolayers



Golam Kashef (Sara Solla)
A Subpopulation Based Ising Model Extension of the Maximum Entropy Theory of Neuronal Networks



Resham Sarkar (Selim Shariar)
Schrodinger Cat State Atomic Interferometer with Heisenberg-Limited Sensitivity and Detection of Collective States



Peter Lee (William Halperin)
Nuclear Magnetic Resonance Study of the High Temperature Superconductors and Unconventional Mass Diffusion



Joel Schwartz (Fred Rasio)
I Think I See the Light Curve: The Good (and Bad) of Exoplanetary Inverse Problems



Brandon Miller (Vicky Kalogera)
GPU Accelerated Parameter Estimation of Gravitational Waves from Compact Binary Mergers



Christopher Seck (Brian Odom)
Quantum State Control of Trapped Atomic and Molecular Ions



Nicholas Mucia (Michael Schmitt)
The search for the decay of a Z boson into an electron and a muon



Pinrui Shen (Brian Odom)
Stabilizing Diode Lasers to High-Finesse Cavities

Department Events

Heilborn Lectures October 2016

Walter and Christine Heilborn Lectures 2016-17
Department of Physics and Astronomy
Northwestern University



Prof. Andrea Ghez

Professor of Physics & Astronomy, UCLA
Lauren B. Leichtman & Arthur E. Levine Chair in Astrophysics
Founder and Director of Galactic Center Group

Monday, October 17 at 4:00 pm in Tech F160:

“Unveiling the Supermassive Black Hole at Center of our Galaxy”

Wednesday, October 19 at 4:00 pm in Tech L211:

“Our Galactic Center: A Laboratory for Exploring the Physics & Astrophysics of Black Holes”

Friday, October 21 at 3:30 pm in Tech Ryan Auditorium:

“The Monster at the Heart of our Galaxy”

Coffee served before lectures
Technological Institute, 2145 Sheridan Road, Evanston, IL

For more information, contact Pam Villalovoz: pmv@northwestern.edu or Kamal Seth: kseth@northwestern.edu

Since 2001, the Department of Physics & Astronomy has invited distinguished scientists to deliver lectures supported by the Walter and Christine Heilborn fund.

While April is traditionally the month in which the Department generally celebrates the Heilborn lectures, this year the lectures were held the week of October 17—21, 2016. Our guest lecturer was **Professor Andrea Ghez**, Professor of Physics and Astronomy at UCLA and the Founder/Director of Galactic Center Group.

Professor Ghez earned her B.S. in Physics from MIT in 1987 and her Ph.D. from Caltech in 1992, and has been on the faculty at UCLA since 1994. She has used the Keck telescopes to demonstrate the existence of a supermassive black hole at the center of our galaxy, with a mass 4 million times that of our sun. This is the best evidence yet that these exotic objects really do exist, and provides us with a wonderful opportunity to study the fundamental laws of physics in the extreme environment near a black hole and to learn what role this black hole has played in the formation and evolution of our galaxy.

Professor Ghez has actively disseminated her work to a wide variety of audiences through more than 100 refereed papers and 200 invited talks, as well features in textbooks, documentaries, and science exhibits. She has received numerous honors and awards including the Crafoord Prize, a MacArthur Fellowship, election to the National Academy of Sciences and the American Academy of Arts & Sciences, the Aaronson Award from

the University of Arizona, the Sackler Prize from Tel Aviv University, the American Physical Society's Maria Goeppert-Mayer Award, the American Astronomical Society's Newton Lacy Pierce Prize, a Sloan Fellowship, a Packard Fellowship, and several teaching awards. Her most recent service work includes membership on the National Research Council's Board on Physics & Astronomy, the Thirty-Meter-Telescope's Science Advisory Committee, the Keck Observatory Science Steering Committee, and the Research Strategies Working Group of the UC Commission on the Future.

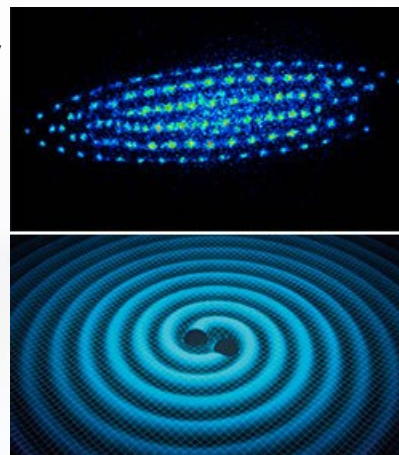
Professor Ghez delivered lectures on Monday, October 17, Wednesday, October 19, and Friday, October 21, entitled “Unveiling the Supermassive Black Hole at Center of our Galaxy”, “Our Galactic Center: A Laboratory for Exploring the Physics & Astrophysics of Black Holes”, and “*The Monster at the Heart of our Galaxy*”, respectively. Following the October 21st lecture, members of the faculty hosted a dinner in honor of Prof. Ghez. Recordings of her talks may be viewed at the Heilborn website: heilbornlectures.northwestern.edu/videos/

Department Events and News

Department of Physics and Astronomy is Rising in Impact and Visibility

Over the last 15 years, Northwestern's Department of Physics and Astronomy has emerged as a force in the field, with new researchers pushing innovative projects, compelling collaborations and groundbreaking discoveries that have elevated the standing and reach of the department.

Thanks to the continued support of Weinberg College and Northwestern leadership, standout researchers continue to join the department's faculty, including the likes of **Enectalí Figueroa-Feliciano**, a former MIT professor who conducts innovative research on X-ray astronomy, dark matter and neutrino physics, as well as supernovae expert **Raffaella Margutti**. Next year, renowned physicist **Gerald Gabrielse**, a longtime Harvard professor and leader in super-precise measurements of fundamental particles and the study of anti-matter, will make the move to Northwestern and launch the Center for Fundamental Physics at Low Energies.



Crystallized ions from the Odom Lab (top) and a rendering of gravitational waves, reflecting findings with key involvement by Vicky Kalogera and Shane Larson.

Inaugural COFI Advanced Instrumentation and Analysis Techniques Summer School July 2016

The First COFI Advanced Instrumentation and Analysis Techniques Summer School took place in San Juan, PR, from July 11, 2016, to July 19, 2016. It consisted of various lectures that provided an introduction to the particle detector and other various topics. More specialized courses on novel cryogenic and noble gases detectors were given; these detectors are characterized by ultra low noise, and therefore are appropriate not only for fundamental physics, such as searching for direct dark matter detection, but also for medical physics and homeland security. Detectors used for atmospheric and cosmic ray physics were also discussed, as were the latest trends in climate change observed based on those detectors. Additional lectures on medical physics with special emphasis in radiation detection and production techniques used for diagnosis and treatment, including hadron therapy for cancer patients, were held.

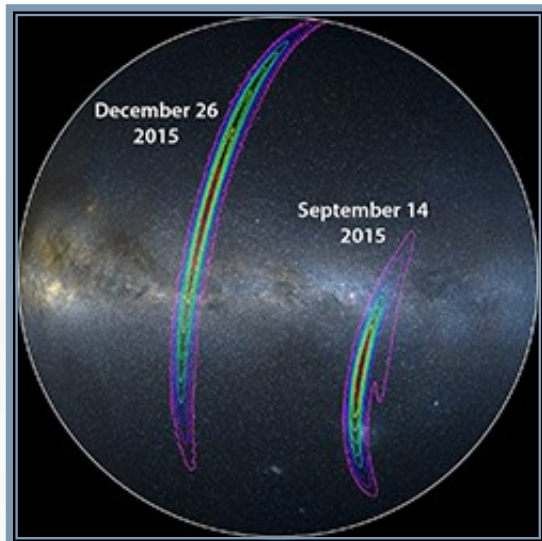
The analysis techniques sessions include detailed courses on: statistics with applications in physics, astronomy, biology and finance; machine learning techniques as used in the hard sciences and engineering; Monte Carlo simulation techniques and available programs for particle physics detectors, medicine and space science. A highly specialized course was included on the computational techniques needed in Cosmology and our current understanding of the evolution of the universe. These courses were complemented by five colloquial style lectures on the grand challenges in Astro-Biology, Particle Physics and Cosmology, Dark Matter, and Neutrino Physics.



LIGO Team Announces Second Gravitational-Wave Event

The new window onto the universe just opened a little bit wider. For the second time in history, an international team of scientists and engineers, including CIERA astrophysicists, has detected gravitational waves -- ripples in the fabric of spacetime -- and a pair of colliding black holes.

LIGO's first detection of gravitational waves and merging black holes occurred Sept. 14, 2015 ([see CIERA news item](#)) -- an event that made headlines worldwide, confirming a major prediction of Albert Einstein's 1915 general theory of relativity. The field of gravitational-wave astronomy was born with a little chirp "heard" on Earth that forever changed the way we see the universe.



The second detection occurred Dec. 26, 2015, and is known as the "Boxing Day event" (after the holiday celebrated in the U.K.). [Read the full Northwestern News story.](#)

CIERA director Vicky Kalogera, a member of the LIGO Scientific Collaboration (LSC), attended the American Astronomical Society meeting and was present at the media briefing where the news was announced. Dr. Kalogera leads Northwestern's LSC group, which includes Shane L. Larson, research associate professor of Physics and Astronomy at Northwestern and an astronomer at the Adler Planetarium in Chicago, and Selim Shahriar, professor of Electrical Engineering and Computer Science at Northwestern's McCormick School of Engineering.

To view the recording of the American Astronomical Society press conference where this discovery was announced, go to the [AAS Press Conference Webcast Archive](#) and click on "**Latest News from the LIGO Scientific Collaboration**" under the AAS 228 San Diego meeting (June 12-16, 2016). At minute 32, when the Question & Answer section begins, Dr. Kalogera is cited as the expert on astrophysics.

Dearborn Observatory Featured in Weinberg Magazine

The universe may be vast, but many of its secrets have been revealed by an 18.5-inch lens housed within



Northwestern's own Dearborn Observatory. Built by master craftsmen in 1862, the lens was for a time the largest in the world. Its unprecedented resolution enabled researchers to discover hundreds of double stars and nebulae and to measure the precise rate of continental drift. By the early 20th century, the Northwestern observatory had become a hub for major astronomical conferences, drawing attendees such as Edwin Hubble, whose discovery of the ever-expanding nature of the universe may well have been inspired by a talk he heard on campus in 1914. Today, the historic lens rests

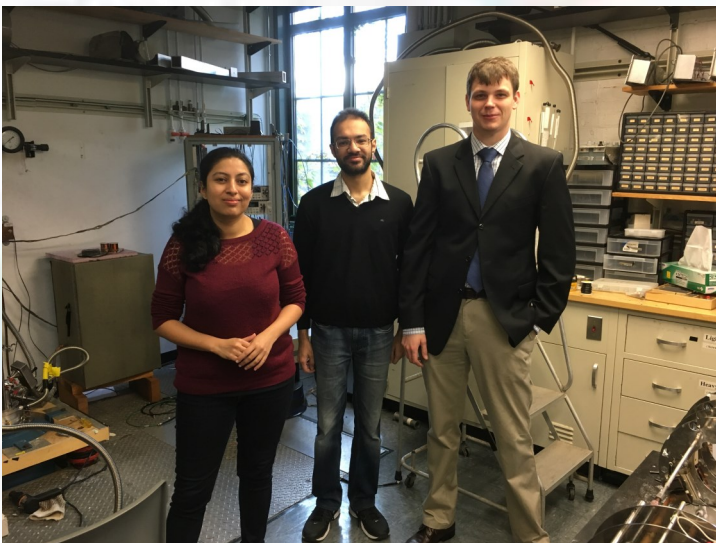
within a refurbished tube at the observatory, where students, faculty and visitors continue to study the timeless principles of astronomy.

Faculty Spotlight: Professor Venkat Chandrasekhar

The primary focus of the Mesoscopic Physics Group is the study of small structures and devices; not small on the atomic scale, but small enough that coherent quantum effects can be observed. This requires that these devices and structures be typically less than a micron in size, with the smallest features on the order of 10s of nanometers. In order to fabricate these devices, we employ the techniques of nanolithography, using the electron-beam writer as well as the large range of fabrication equipment in our group. This allows us to make complex, multilevel devices that combine normal metals, superconductors, ferromagnets and more exotic materials to study the interaction between fundamental phenomena on the nanoscale. Some examples of such devices are shown here.

As the quantum coherent behavior of interest manifests itself only at the very lowest temperatures, we have a range of cryostats that enable measurements at temperatures all the way down to a few 10s of milliKelvin, in magnetic fields of up to 12 Tesla. The unique capabilities of our group is in the range and flexibility of measurement tools at our disposal, and in the ability to make high-resolution, low-noise measurements. In addition to electrical transport measurements, we also perform thermal transport, magnetometry, capacitance, scanning probe microscopy (which encompasses atomic force microscopy, magnetic force microscopy, electrostatic force microscopy and Kelvin probe microscopy) and ferromagnetic resonance. A major focus is in the development of new instruments and techniques: we are currently developing an entirely custom-built scanning probe microscope for operation at millikelvin temperatures, and microwave instrumentation for noise measurement and quantum manipulation experiments, also at millikelvin temperatures.

A long term research interest has been the investigation of the interplay between superconductors and other materials in hybrid devices, particularly the correlations induced in the electrons in these materials due to their interaction with the superconductor. Earlier work studied quantum coherent electrical, thermal and thermoelectric transport and noise in superconductor/normal-metal hybrids, as well as the interaction between magnetism and superconductivity in ferromagnet/superconductor heterostructures. Currently, we are looking at hybrids made from superconductors and thin films of transition metal dichalcogenides such as MoS_2 and WSe_2 , where the presence of strong spin-orbit interactions leads to the locking of an electron's spin to its momentum, resulting in topologically non-trivial electron states, and potential external control of spin-polarized currents. Another current interest is in the properties of correlated electron systems such as the two-dimensional electron gas formed at the interface between complex oxides such as LaAlO_3 (LAO) and SrTiO_3 (STO), where the simultaneous presence of spin-orbit interactions, magnetic correlations and superconductivity result in the coexistence of competing and sometimes antagonistic physical phenomena, with often surprising results.



The Chandrasekhar Research Group (from left to right): Varada Bal, Aaveg Aggarwal and Sam Davis

PhD, Yale University, 1989

Awards and Honors

NSF National Young Investigator

Alfred P. Sloan Fellow

David and Lucille Packard Fellow

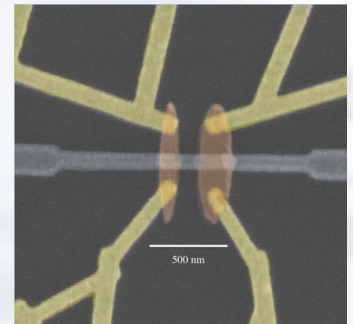


Figure 1. Scanning electron micrograph of a ferromagnet/superconductor device fabricated by electron-beam lithography on an oxidized silicon substrate. Grey is Al (superconductor), gold Au (normal metal) and brown is permalloy (ferromagnet).



Figure 2. MoS_2 device in a Hall bar configuration. Green is the 5 nm thick MoS_2 flake; gold shows the normal metal contacts.

Physics in the Northwestern Community



2016 Halloween Spectacular

Each year, Professor Art Schmidt joins Eberhard Zwergel (Chemistry) for the Chemistry Halloween Show. This year's show took place on Friday, October 28, 2016, and dazzled hundreds of students with all things chemistry and physics.

Professor Schmidt went as Bob Dylan and played a verse from "Blowin' in the Wind", where he then created a tornado of fire, over which he toasted a marshmallow.

Professor Schmidt levitated a beach ball on the air stream of a leaf-blower and extinguished a candle from ten feet away using a vortex generator he made from a 50 gallon trash container.

First Annual Rapid Fire Research Competition

Describing your research in a clear, concise, and stimulating way is as much of an art as a science, and is crucial for getting that funding or landing that dream job. Rapid Fire Research is an event showcasing the physics and astronomy student research at Northwestern, with a focus on developing the skills necessary for constructing an elegant and simple pitch of your research. Presenters must be graduate or undergraduate students active in physics or astronomy research. Winning presentations will be featured on the Rapid Fire Research website and receive cash prizes.

Graduate Students

1st Place—Zach Hafen

"Interpreting the Massive Gas Flows Around Galaxies"

2nd Place—Katie Breivik

"Distinguishing Between Formation Channels for Binary Black Holes with LISA"

Undergraduate Students

1st Place—Trent Cwiok

"Acoustic Signaling in a Xenon Scintillating Bubble Chamber"

2nd Place—Benjamin Moy

"Microstructure of Aerogel"

Alumni Focus



Carl Rodriguez

Carl Rodriguez (2016) was awarded the MIT Pappalardo postdoctoral position at MIT. Carl studies the formation, dynamics, and gravitational-wave implications of black holes from dense star clusters. Here at Northwestern, he worked with Professor Fred Rasio on modeling globular clusters and with Professor Vicky Kalogera on gravitational-wave parameter estimation. His dissertation, titled “Modeling Dense Star Clusters and Their Implications for Advanced LIGO,” focused on the interface between the two subjects. Carl contributed significantly to CIERA’s work in public outreach and STEM education while at Northwestern. He gave numerous public lectures over the years, served as a mentor, and taught high school

students as a GK12 Fellow in the [Reach for the Stars](#) program.

View movies by Carl Rodriguez on his web site: [BH Dynamics](#)

View Carl’s TEDx Northwestern talk: [Listening to Einstein’s Final Symphony](#)

Joel Schwartz (2016) accepted a postdoctoral position at McGill University.



Joel Schwartz



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



Follow us on [Facebook](#)!

Contact Us

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(847) 491-3685

Fax:
(847) 467-6857

physics-astronomy@northwestern.edu

Alumni News

Name: _____

Degree: _____

Graduation Year: _____

e-mail Address: _____

Phone Number: _____

News: _____

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 send in items using this form (just fold and staple the page), or to email your news to Yas Shemirani at yassaman.shemirani@northwestern.edu

Please fold here.



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