

Fall 2015

Dimensions

Department of Physics & Astronomy



Photo courtesy of Guohua Wei

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Faculty News

Claude-André Faucher-Giguère's research group (GalForm @ NU) is part of a multi-institution team that has been awarded a large amount of time to use the Hubble Space Telescope to map the gas flows around the Andromeda galaxy. It will be the first time ever that they will be able to produce a spatially-resolved map of the gas around a galaxy other than the Milky Way. This work is very important because these gas flows regulate how galaxies grow. The observations will be led by collaborators at the University of Notre Dame and the group at Northwestern will develop the theoretical tools needed for the interpretation of the Hubble observations. This ambitious project, called Project AMIGA (Absorption Maps In the Gas of Andromeda), will require an enormous 150 hours of Hubble Space Telescope time.

This new award of a large amount of time to use the Hubble Space Telescope builds on a recent pilot study led by the Notre Dame collaborators which has recently garnered much media attention.

<http://hubblesite.org/newscenter/archive/releases/2015/15/full/>

Gerald Gabrielse, a former chair of the Harvard Physics Department, is coming to Northwestern to found and direct a Center for Fundamental Physics at Low Energy (CFP). A member of the National Academy of Sciences, Gabrielse is world renowned for his high-precision tests of the Standard Model and its fundamental symmetries, and for starting low energy antiproton and antihydrogen physics. The Department of Physics & Astronomy is excited that the Gabrielse group and the CFP will add low energy particle physics done using novel methods from atomic, molecular, and optical physics to the many cutting edge research opportunities offered to its graduate students and postdocs. Gabrielse has prestigious awards for both his research and his teaching, and will be the department's first Board of Trustees Professor.

<http://www.northwestern.edu/newscenter/stories/2015/11/physicist-gerald-gabrielse-to-join-northwestern-.html>

Vicky Kalogera has accepted an invitation to serve on the Committee on Astronomy and Astrophysics (CAA) of the National Research Council. The CAA's purpose is to support scientific progress in astronomy and astrophysics and assist the federal government in integrating and planning programs in these fields. It is a joint committee of the Space Studies Board and the Board on Physics and Astronomy under the National Academies of Sciences, Engineering, and Medicine in Washington, D.C..

Prof. Kalogera has received the 2015 Hans A. Bethe Prize. This distinguished award is given to individuals who have made outstanding contributions to astrophysics, nuclear physics, nuclear astrophysics. Past recipients have included James Lattimer, Stan Woosley, Gordon Baym, John Bahcall, and others.

<http://www.aps.org/programs/honors/prizes/bethe.cfm>

Prof. Kalogera has been elected to the Large Synoptic Survey Telescope Corporation's (LSSTC) Executive Board of Directors. In this capacity, Prof. Kalogera will participate in the oversight and administration of the Corporation.

<http://www.lsst.org/>

In August, Prof. Kalogera spoke to nearly 40 Office for Research staff members at NU Knowledge at Noon, a faculty research presentation series. The series is designed to allow staff to learn directly from Northwestern faculty about the exciting research that takes place at our institution. The series also aims to foster connections across Office for Research staff by providing the opportunity for them to meet in person. In her talk, "NU Astronomy: Big Data, Telescope Innovation, and the Cosmos," Dr. Kalogera covered a brief history of astronomy, but she focused mainly on the very near future: the importance of big data and the value of two large, related initiatives, the Large Synoptic Survey Telescope (LSST) and the Laser Interferometer Gravitational-Wave Observatory (LIGO).

<https://ligo.caltech.edu/>

Jens Koch co-organized and lectured at the international research workshop "Nonequilibrium physics of driven-dissipative many-body systems," hosted by the Center for Quantum Technology at the University of Kwazulu-Natal, South Africa, 21-25 September, 2015. Professor Koch is also an invited lecturer at the workshop "Many-body physics with light," hosted by the Kavli Institute for Theoretical Physics at the University of California, Santa Barbara.

Shane Larson, Research Associate Professor and Astronomer at Adler Planetarium, has been elected a Fellow of the American Physical Society. His citation commends him for "Impacting science and society through the integration of public engagement and research, and for empowering generations of future scientists by his example."

Prof. Larson spoke to a group of 25 NU staffers from across Weinberg with his presentation, "Whispers from the Cosmos." He shared his enthusiasm as both an amateur astronomer and a professional astrophysicist, walking the audience through the past and into the future of the science of gravitational waves.

Erik Lujten has been elected Vice Chair of GSOF, the APS Topical Group on Soft Matter. This is a position for multiple years, during which he will subsequently transition to become Chair Elect and then Chair of this group.

Adilson E. Motter has been elected Fellow of the American Association for the Advancement of Science (AAAS). He is being honored "For distinguished contributions to the fields of complex systems and nonlinear dynamics, particularly for advances in the network modeling and control of collective dynamics in complex physical and biophysical systems."

<http://www.northwestern.edu/newscenter/stories/2015/11/aaas-fellows.html>

James Sauls and Erik Lujten were appointed co-Directors of the Applied Physics Graduate Program on November 1. Applied Physics is a graduate program offered by faculty of Weinberg and McCormick that offers a PhD in a spectrum of research opportunities in Applied Physics involving Condensed Matter Physics, Physical Chemistry, Materials Physics, Physics and

Chemistry of Earth's Interior, Quantum Optics and Quantum Information. Applied Physics prepares graduates for professional careers in science and technology, ranging from academics to industry.

James Sauls has been named Visiting Scholar of the Institute for Materials Science at Los Alamos National Laboratory. Professor Sauls delivered lectures on frontiers in hybrid quantum materials and devices, and on electrodynamic of topological superconductors at Los Alamos.

Selected Publications

Claude-André Faucher-Giguère

Supernova feedback in an inhomogeneous interstellar medium by Davide Martizzi, Claude-André Faucher-Giguère, Eliot Quataert. **MNRAS, 450, 504 (2015).**

Gusty, gaseous flows of FIRE: galactic winds in cosmological simulations with explicit stellar feedback by Alexander L. Muratov, L. Alexander, Dusan Keres, Claude-André Faucher-Giguère, Philip F. Hopkins, Eliot Quataert, Norman Murray. **MNRAS, 454, 2691 (2015).**

Faucher-Giguère's group is pursuing a two-pronged approach to solving the problem of galaxy formation. On one hand, the Faucher-Giguère group studies the basic physical processes involved in the complex galaxy formation process, such as energy injection from supernova explosions. On the other hand, the group implements the physical insights into the basic physical processes into fully cosmological models. The following pair of new papers is an excellent example of the power of this approach, in which a new understanding of the effects of supernovae on the interstellar medium of galaxies developed in the first paper was used to study the generation of galaxy-scale outflows in a cosmological model of galaxy evolution.

<http://adsabs.harvard.edu/abs/2015MNRAS.450..504M>
<http://adsabs.harvard.edu/abs/2015MNRAS.454.2691M>

Adilson E. Motter

Control of stochastic and induced switching in biophysical networks by D.K. Wells, W. L. Kath, and A. E. Motter. **Phys. Rev. X** **5**, 031036 (2015).

Noise caused by fluctuations at the molecular level is a fundamental part of intracellular processes. This study presents a scalable, quantitative least-action method to predict and control noise-induced switching between different states in genetic networks that, conveniently, can also control transitions between stable states in the absence of noise. This framework offers a systems approach to identifying the key factors for rationally manipulating biophysical dynamics.

This article has been the subject of several independent news articles, including:

-Network control: Letting noise lead the way - Research team leverage cells' noisy nature to keep them healthy, Science Daily (September 17, 2015).

<http://www.sciencedaily.com/>

-Controlling noisy dynamics in biological networks to fight cancer, Serious Science (November 10, 2015).

<http://serious-science.org/>

-Leveraging noise to control complex networks, SIAM News.

<http://sinews.siam.org>

Frederic A. Rasio

Binary Black Hole Mergers from Globular Clusters: Implications for Advanced LIGO by Carl L. Rodriguez, Meagan Morscher, Bharath Pattabiraman, Sourav Chatterjee, Carl-Johan Haster, and Frederic A. Rasio. **Phys. Rev. Lett.** **115**, 051101 (2015).

The predicted rate of binary black hole mergers from galactic fields can vary over several orders of magnitude and is extremely sensitive to the assumptions of stellar evolution. But in dense stellar environments such as globular clusters, binary black holes form by well-understood gravitational interactions. In this Letter, we study the formation of black hole binaries in an extensive collection of realistic globular cluster models. By comparing these models to observed Milky Way and extragalactic globular clusters, we find that the mergers of dynamically formed binaries could be detected at a rate of 100 per year, potentially dominating the binary black hole merger rate. We also find that a majority of cluster-formed binaries are more massive than their field-formed

counterparts, suggesting that Advanced LIGO could identify certain binaries as originating from dense stellar environments.

<http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.115.051101>

James Sauls

Superfluid phases of ^3He in nano-scale channels by Joshua Wiman, and J. A. Sauls. **Physical Review B** **92**, 144515 (2015); DOI: 10.1103/PhysRevB.92.144515

We consider superfluid ^3He confined within long cylindrical channels and report new theoretical predictions for the equilibrium phases under strong confinement. Four stable phases are found: a polar phase stable in the vicinity of T_c , a strongly anisotropic, cylindrical analog of the bulk B phase stable at sufficiently low temperatures, and two chiral A-like phases with distinctly different orbital symmetry, one of which spontaneously breaks rotation symmetry about the axis of the cylindrical channel. The relative stability of these phases depends sensitively on pressure and the degree of pair-breaking by boundary scattering. The broken symmetries exhibited by these phases give rise to distinct signatures in transverse NMR resonance spectroscopy. We present theoretical results for the transverse NMR frequency shifts as functions of temperature, the r.f. pulse tipping angle and the static NMR field orientation.

<http://arxiv.org/abs/1510.01782>

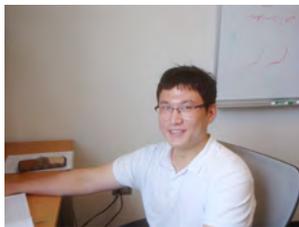
Nathaniel Stern

Silicon-nitride photonic circuits interfaced with monolayer MoS_2 by Guohua Wei, Teodor K. Stanev, David A. Czapslewski, Il Woong Jung and Nathaniel P. Stern. **Applied Physics Letters**, **107** 091112 (2015).

Two-dimensional semiconductors are interesting materials with strong interactions with light despite a thickness approaching atomic-scale limits. We explore the compatibility of these materials for integrated optical circuits by coupling monolayers of molybdenum disulphide with silicon nitride photonic devices. These methods can be applied to diverse two-dimensional semiconductors for assembling hybrid optoelectronic devices such as photodetectors and modulators operating over a wide spectral range.

<http://scitation.aip.org/content/aip/journal/apl/107/9/10.1063/1.4929779>

Research Staff



Young Sul Cho joined the Motter group as a post-doctoral fellow in July 2015. He was previously a graduate student at the Seoul National University in South Korea.

Dr. Cho is conducting research in synchronization dynamics.



Peter Groszkowski comes to Northwestern from Canada. As an undergraduate, he studied physics and computer science at the University of Toronto and University of Queensland. He then

worked in telescope software development at the Gemini Observatory. After three years, he went back to graduate school at the Institute for Quantum Computing (University of Waterloo) and studied the physics of superconducting circuits in the context of quantum computing and information. He is excited to join Jens Koch's group at Northwestern as a postdoc to continue his research in related fields. He states that his favorite pastime is drinking beer and playing ping-pong... at the same time.



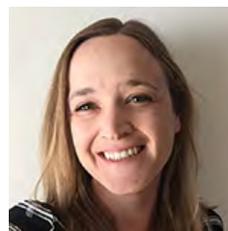
Ben Nelson joined Northwestern University and CIERA in September 2015 as Northwestern's first Data Science Scholar; Ben is part of a new University-wide program, overseen by the Northwestern

Institute of Complex Systems (NICO). He comes to CIERA from Pennsylvania State University, where he worked with Dr. Eric Ford at the intersection of Bayesian probabilistic modeling and orbital dynamics of exoplanet systems.



Chris Pankow is a new CIERA Postdoctoral Associate; he started in September 2015 as a new post-doc in Professor Kalogera's group. Most

recently, Chris was a Research Associate at the University of Wisconsin in Milwaukee. Here at Northwestern, he will work in Dr. Kalogera's Laser Interferometer Gravitational-wave Observatory (LIGO)



Laura Sampson joined Professor Kalogera's group in September 2015 as a CIERA Postdoctoral Fellow. Laura comes to Evanston from Montana State University, Bozeman, where she worked with

Dr. Neil Cornish and Dr. Nico Yunes; here at Northwestern, she is part of the gravitational-wave group, and in particular, she is interested in the use of pulsars to detect gravitational-waves.



Oleksii Shevtsov joined the Sauls group as a post-doctoral fellow in October. Oleksii did research on quantum transport in low-dimensional conductors at the CEA in Grenoble,

received his PhD from Université Grenoble Alpes, France in 2012. Dr. Shevtsov pursued research on non-equilibrium dynamics of graphene and hybrid superconducting-magnetic materials as a post-doctoral fellowship at Chalmers University, Gothenburg Sweden.

Graduate Achievements



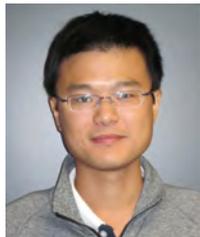
Trevor LaMountain started at Northwestern with a TGS Ryan Fellowship for work in nanoscience. The fellowship provides graduate students from a broad spectrum of scientific and engineering

disciplines with the education and experience to assume leadership roles in the realm of nanotechnology. Trevor is in the Applied Physics Program, and he joined the Stern group in Physics this Fall.

<http://www.tgs.northwestern.edu/funding/fellowships-and-grants/internal-fellowships/ryan-fellowship.html>



Andy Li (advisor Koch), **Wei-Ting Lin** (advisor Schwab), and **Robert Regan** (advisor Sauls) attended the Michigan State Summer School on "Modern Trends in Condensed Matter and Mathematical Physics", August 2015.



Hao Wu gave an invited talk on "Weyl Fermions, mass current and phase transitions in confined superfluid ^3He films" at the International Conference on Quantum Fluids and Solids, Niagara Falls, NY, August 15, 2015.

Undergraduate Achievements



Casey Chu, an NSF REU student in CIERA during the 2015 summer, presented his summer research at a poster session for the Research Experiences for Undergraduates (REU) Symposium on October 25 & 26 in Arlington, Virginia.

The REU Symposium is held annually by the Council on Undergraduate Research, and invites a select group of the top students participating in REU programs from across the country to showcase their work from the previous summer. Casey was nominated by Aaron Geller (REU director and Co-PI) and Vicky Kalogera (PI) for his research this summer at CIERA with professor Yoram Lithwick and postdoctoral fellow Fabio Antonini. At the symposium, Casey presented his poster titled, "Inferring the Gravitational Potential of the Milky Way," to several NSF program administrators as well as other REU students from across the nation.

<http://bitsofpancake.github.io/potential-inference/>

Fall 2015

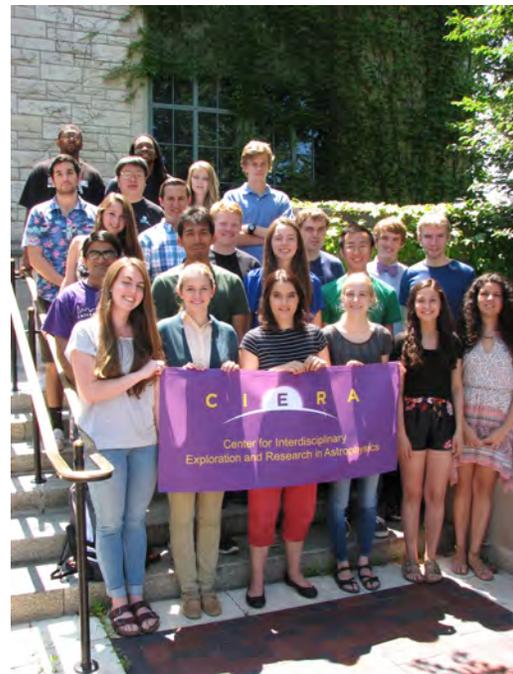
35 Summer Students worked closely with researchers at CIERA. Several of these students were funded through an educational grant awarded by NASA to Northwestern University through the Illinois Space Grant Consortium.

NASA Undergraduate Research Fellows



2nd Row - Jessie Duncan, Seth Krantzler, Eric Scott, CJ Hansen, 1st Row - Leah Perri, Amanda Newmark, Daniela Deleon, David Rice

2015 Summer Students



5th Row - Jason Parks, Tim Sanders, 4th Row - Seth Krantzler, Han Setiawan, Jessie Duncan, Eric Scott, 3rd Row - Amanda Newmark, David Rice, Paul Williams, Justin Scaife, CJ Hansen, 2nd Row - Harris Khan, Cesar Bustos, Kayla Leonard, Casey Chu, Andrew Loach, 1st Row - Tessa Thorsen, Sheila Dunne, Eryn Cangi, Larissa Markwardt, Leah Perri, Daniela Deleon

Alumni Focus



Shyam Bharadwaj, who did research on cosmological simulations of galaxy formation in the CIERA research group of Claude-André Faucher-Giguère, was accepted to several prestigious Ph.D. programs including Stanford University, the University of Washington, and Cornell University. Shyam received an Illinois Space Grant award in summer 2014. Shyam is starting his Ph.D. in electric and computer engineering at Cornell in fall 2015.



Vasily Kuznetsov worked with the Schellman group on the MINERvA experiment starting in his freshman year at Northwestern. He used Python and Postgres to make a client-server high voltage control system and a tracking database for calibration constants. He graduated Magna cum Laude with majors in Mathematics and Economics with a minor in Business Institutions. He now uses the data skills he learned on MINERvA as a Software Engineer at Facebook.



Chris Pratt analyzed Z boson decays on the D0 experiment while getting degrees in Integrated Science and Mathematics (with a certificate in Finance from Kellogg) at Northwestern. He uses the data analysis skills he learned in the Schellman group as an Associate Analyst at NERA Economic Consulting in Chicago.



Tracy Taylor Thomas received her doctorate in the Schellman group on the D0 experiment at Fermilab. Her 1997 doctoral thesis was on

“Strongly interacting color singlet exchange in proton – anti-proton collisions at 1800-GeV.” Instead of staying in Illinois as a postdoc, she moved to Portland Oregon and used her computing skills as a software engineer at U.S. Software, she is now the Director for Professional Services Operations at Jive Software and a popular Portland beer critic.



Brandon Walker graduated from Northwestern in 2010 with Bachelor’s degrees in Physics and Astronomy and in Mathematics. He did his honors thesis in the Schellman group on "An Algorithm for Particle Tracking and Analysis of Muons in the Main Injector Experiment v-A (MINERvA)." He is currently a doctoral student in Medical Physics at the University of Wisconsin at Madison



Leah Welty-Rieger got her PhD from the University of Indiana on the D0 experiment. After a year as a web designer she joined the Schellman group as a postdoc. While at Northwestern she independently applied for and received a URA Fellowship to join the g-2 magnetic moment experiment. She now works part-time as a GEANT consultant for the g-2 experiment at Fermilab.



Erhai Zhao, received a PhD in 2005 from Northwestern (advisor Sauls), was promoted to Associate Professor of Physics with tenure at George Mason University effective August 1. Erhai presented invited lectures on "Edge modes in periodically driven quantum Hall insulators and p-wave superconductors" at the Workshop on Emergence in driven solid-state and cold-atom systems hosted by University of Hamburg on September 1, and "Competing phases in dipolar quantum gas," at the Workshop on Frontiers in Quantum Simulation with Cold Atoms hosted by the Institute of Nuclear Theory, University of Washington on May 6, 2015.

Welcome to our 2015 Graduates Students



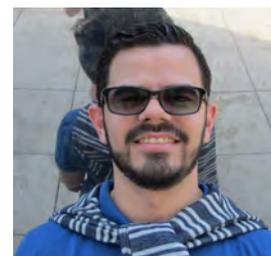
Aaveg Aggarwal



James Bueghly



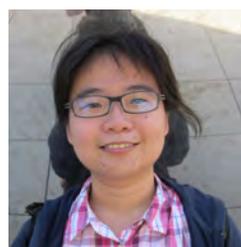
Ziheng Chen



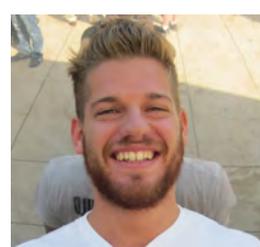
Joseph Cordero Mercado



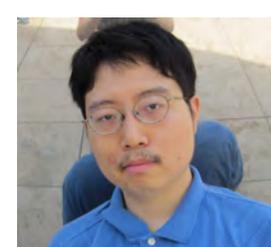
Travis Douglas



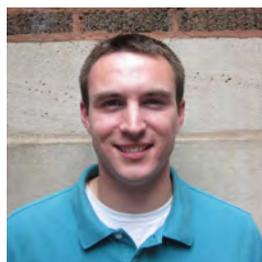
Panpan Huang



Andrea Isgro



Hyun Jin Kim



Kyle Kremer



Daniel Martinez Zambrano



Ingrid Stolt



Dylan Temples



Mesut Unal



Mingwei Wei



Paul Williams



Zhewei Yin



Yuanzhao Zhang

Welcome to our 2015 Masters Program Students



Pinzhang Chen



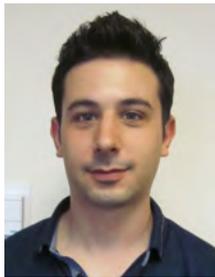
Aprajita Hajela



Michael Katz



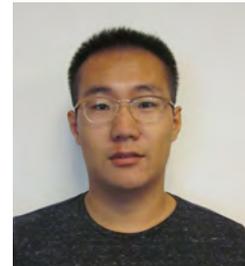
Hu Li



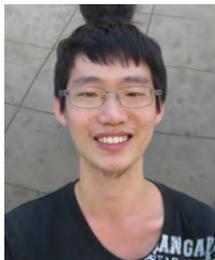
Brandon Miller



Tarun Patel



Pinrui Shen



Hung Tan



Shi Ye



Sangjun Yoo



Northwestern's Society of Physics Students (SPS)



SPS exec board and various members for the year 2015-2016

Over the past year, the Society of Physics Students has hosted a variety of events to build student interest in all things physics. During spring quarter 2015, we hosted a lake-side barbecue for the department, a dinner for majors at Prairie Moon, and invited a professor in the department to give a lecture regarding her work on the discovery of the Higgs Boson.

This quarter, SPS has been busy building up interest in physics through our annual welcome meeting, where we introduced new members to the magic of 3D printing and made liquid nitrogen ice cream, and through our frequent outings to the lakefill and various beaches in Wilmette to observe the universe through our telescope.

In the future, the Society of Physics Students hopes to expand interest in physics through the development of stronger bonds among faculty, staff, and students in various departments across the Northwestern community, and the continued hosting of various educational (and fun!) events.



Physics dinner at Prairie Moon in Spring 2015

Department Events

1700 People Attend Rooftop Viewing of Lunar Eclipse

On September 29, 2015 was the largest public viewing event hosted by CIERA, 1700 students, faculty, staff, and community members attended a viewing of the total lunar on September 27. The eclipse was especially notable because it occurred during a time the moon was a supermoon. The Northwestern Newscenter and The Daily Northwestern both reported on the event.

<http://www.northwestern.edu/newscenter/stories/2015/09/lunar-eclipse-turnout.html>

<http://dailynorthwestern.com/2015/09/28/campus/northwestern-hosts-lunar-eclipse-viewing-party/>



Photo courtesy of Guohua Wei

Chemistry Halloween Show with Professor Art Schmidt

Professor Art Schmidt made his annual cameo appearance at Eberhard Zwergel's Chemistry Halloween Show on October 30, Halloween Eve. This year he came as a motorcycle gangster. Among his demonstrations he levitated a beach ball on a leaf blower. He called it the physicist's way to blow things up. He snuffed out a candle with a smoke ring vortex generator from ten feet away. In the finale he lit Eberhard's gas torch with the departments Jacob's Ladder. Eberhard then ignites balloons filled with Hydrogen and Oxygen mixtures for a real blast.



Physics Outreach Program at the Skokie Library

Professor Art Schmidt has made two presentations of physics demonstrations this fall at the Skokie Library to about twenty grade schoolers. In October, he talked about Gravity and the nature of things in free fall. And this November his presentation involved things that rotate. He exhibited "the Chair" and spun around while holding weights in extended arms. When he tucked in the weights he spun faster. He showed the students several gyroscopic effects. He has been invited to continue monthly presentations in the winter and spring of next year.

2015 Midwest Relativity Meeting Hosted by CIERA



October 1 – 3, 2015, CIERA hosted the Midwest Relativity Meeting (MRM) with over 100 participants from across North America, including some of the leading experts in the country on the theory of relativity. The annual MRM aims to bring together researchers from across the Midwest and beyond to discuss general relativity and a broad range of topics in gravitational physics (classical and quantum gravity, numerical relativity, relativistic astrophysics, cosmology, gravitational waves, and experimental gravity). CIERA hosted this meeting during the 100th anniversary of Einstein publishing the General Theory of Relativity; to celebrate the centennial anniversary, the traditional 2-day

format of MRMs was extended to include a set of invited reviews and an evening public lecture by Dr. John D. Norton: Einstein's Discovery of the General Theory of Relativity.

http://ciera.northwestern.edu/MRM2015_Talks.php

CIERA Seventh Annual Public Lecture: New Horizons Leader Alan Stern

New Horizons is NASA's historic mission to explore the Pluto system and the Kuiper Belt. The fastest spacecraft ever launched, the New Horizons left Earth on January 19, 2006. It made the first exploration of the Pluto system—3 billion miles from Earth—in 2015, culminating with a highly successful flyby inside the orbits of all five of Pluto's moons on July 14th. The spacecraft carries a sophisticated payload of imagers and other scientific instruments that were used to revolutionize our knowledge of Pluto and its five moons. A crowd of 275 turned out at Tech Ryan Auditorium November 5th to hear the principal investigator of New Horizons, Dr. Alan Stern, describe the history of this mission, the science behind it, the capabilities of payload, our encounter with planet Pluto, and the major scientific discoveries made to date. He also outlined the New Horizons extended mission to fly across the Kuiper Belt, exploring further into space.



CIERA Fall Interdisciplinary Colloquium: Dennis Lehmkuhl Shares the History of Einstein's Discoveries



We are often told that General Relativity tells us that the gravitational field is nothing but an aspect of spacetime structure: gravitation supposedly is geometry. Modern textbooks claim that this is a direct result of the theory. However, recent historical research shows that Einstein himself did not believe this; indeed, he actively opposed this interpretation of General Relativity. Dr. Lehmkuhl, Research Assistant Professor of History and Philosophy of Science at Caltech, described Einstein's own interpretation of general relativity, how it evolved between 1912 and the late 1920s; and asked whether we can still learn something from Einstein's interpretation that is not "just" of historical interest. About 75 people heard the talk on November 10th.

Please visit the Physics and Astronomy website for a complete list of upcoming events:
www.physics.northwestern.edu/events

Be sure to check out our Facebook Fan page and our LinkedIn Group Page.
Type in "Department of Physics and Astronomy, Northwestern University".

Dearborn Observatory Featured in Open House Chicago 2015



Photo by Bruce Powell

For the first time, the Chicago Architecture Foundation expanded their annual Open House Chicago event to include buildings in Evanston. Three Northwestern buildings were featured in Open House Chicago 2015: Charles Deering Library, Alice Millar Chapel, and Dearborn Observatory. The Observatory was open for the event from 1pm to 5pm on Sunday, October 18th.

Visitors got a chance to walk through the building (built in 1889, and the oldest building of the three featured); many also observed the Sun through a 'spotting scope' mounted on the main telescope, as well as through a purpose-built solar telescope, also fixed to the side of the main telescope. 602 people visited Dearborn on that Sunday, creating a line that sometimes snaked its way from the second floor of Dearborn down to the first floor, and all of the way out to the front of the Observatory. We hope all of our visitors enjoyed their time at Dearborn!

<http://www.northwestern.edu/newscenter/stories/2015/10/chicago-architecture-foundations-open-house-chicago.html>

Networks All Around!

Professor Takashi Nishikawa and others from Prof. Motter's group were at the Museum of Science and Industry in Chicago this Fall teaching K-12 students about the world of network science research, as part of the museum's Junior Science Café series. The "Networks All Around!" activity was designed in collaboration with researchers at Northwestern's Office of STEM Education Partnerships (OSEP) and the School of Education & Social Policy.

Wearing electronic badges, students built their own network of

interactions and were able to visualize and analyze the results. Forty students participated in the activity: fourth-graders from Rogers Elementary School and eighth-graders from the Barack Obama School of Leadership and STEM.

Collaborators: Takashi Nishikawa (Research Associate Professor), Luciana Z. Tytenicz (Research Associate) and Adilson E. Motter (Professor), Department of Physics & Astronomy, Northwestern University; Corey Brady (Research Assistant Professor), Kai Orton (Research Assistant Professor), Gabriella Anton (PhD student), and Sebastian Rodriguez (Undergraduate student), School of Education & Social Policy, Northwestern University.



Dimensions was compiled by Monica Brown

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 Monica Brown monica.brown@northwestern.edu.

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