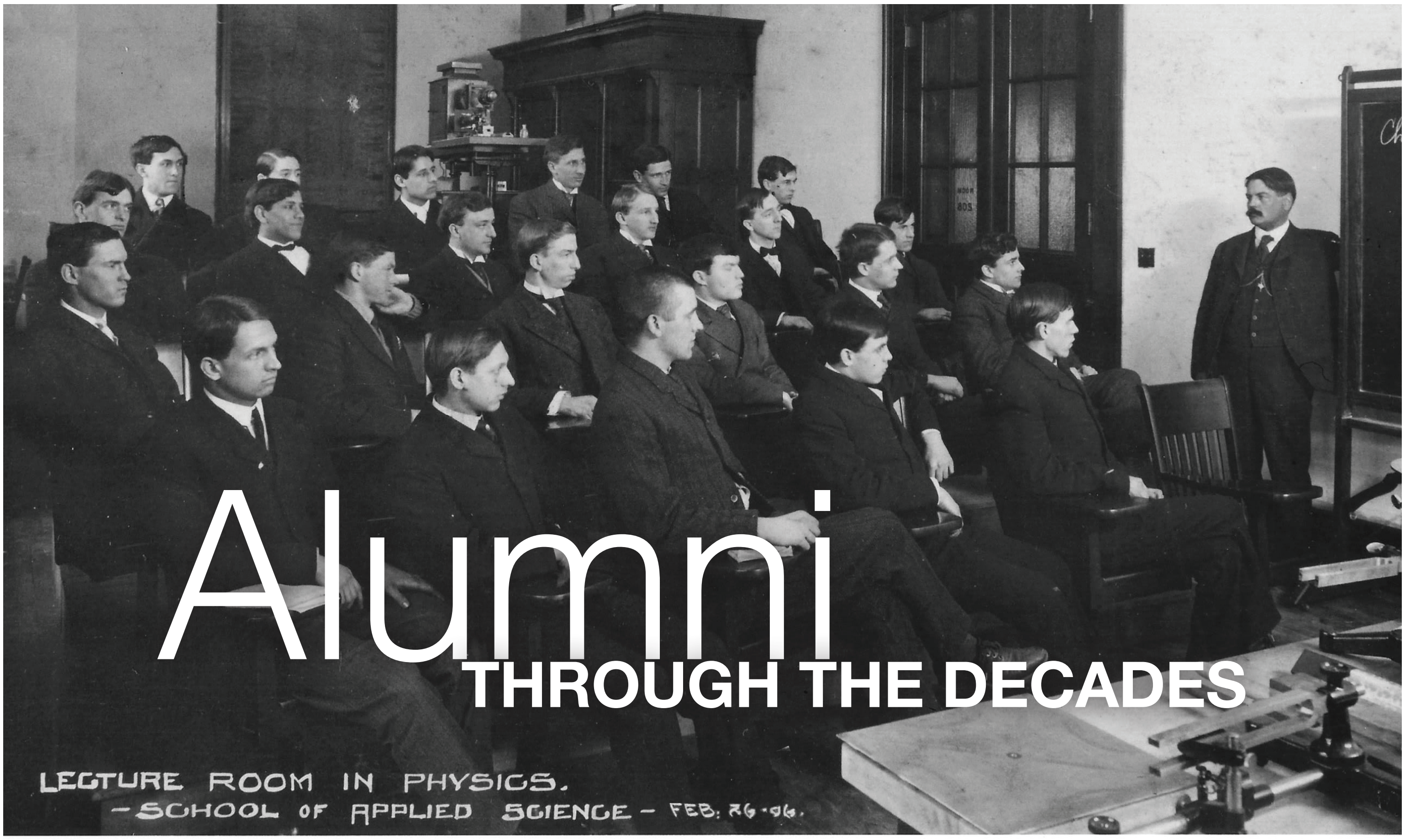
INTERACTIONS

DEPARTMENT OF PHYSICS 2015

Carnegie Mellon University
Physics



Alumni THROUGH THE DECADES

The Department of Physics has a very accomplished family of alumni. In this issue we begin to recognize just a few of them with stories submitted by graduates from each of the decades since 1950. We want to invite all of you to renew and strengthen your ties to our department. We would love to hear from you, telling us what you are doing and commenting on how the department has helped in your career and life.

Alumna returns to the Physics Department to Implement New MCS Core Education

Dorothy Holland-Minkley

When I heard that the Department of Physics needed a hand implementing the new MCS Core Curriculum, I couldn't imagine a better fit. Not only did it provide an opportunity to return to my hometown, but Carnegie Mellon itself had been a fixture in my life for many years, from taking classes as a high school student to teaching after graduation. I was thrilled to have the chance to return.

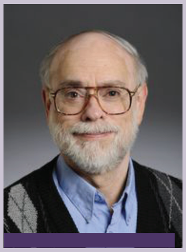
I graduated from Carnegie Mellon in 2008, with a B.S. in physics and a B.A. in Japanese. Afterwards, I continued to teach at CMARC's Summer Academy for Math and Science during the summers while studying down the street at the University of Pittsburgh. In 2010, I earned my M.A. in East Asian Studies there based on my research into how cultural differences between Japan and America have helped shape their respective robotics industries.

After receiving my master's degree and spending a summer studying in Japan, I taught for Kaplan as graduate faculty for a year before joining the Department of Physics at Cornell University. I spent the past several years teaching physics courses there, ranging from lab courses for engineering students to self-paced introductory physics for students in the health sciences. While I truly loved the challenge of teaching a self-paced class of 300 students and mentoring its 30 teaching assistants, the opportunity to return to my alma mater was too good to pass up.

I have now been working here since August as the academic support coordinator for both the Department of Physics and the Office of the Vice Provost for Education's STEM initiatives. I have been loving getting to support Carnegie Mellon's students through advising future physics majors, mentoring tutors in Academic Development and helping shape the implementation of the new Core Curriculum. I'm glad to see that the Department of Physics is doing so well, and am looking forward to watching it continue to grow.

2008

From the Department Head



Steve Garoff

FRIENDS: Much has happened in our department and at Carnegie Mellon since our last Interactions newsletter. For instance, you might have heard that our university recently announced its new 10-year strategic plan. The plan formulates a broadly conceived vision for a world where Carnegie Mellon becomes even more of a keystone for a society built on knowledge, community and excellence. Our department already exemplifies this vision in many ways. These 10 recent highlights from our department are just the beginning:

1. Our Quark Interactions Group (formerly known as the Medium Energy Group) emerged as the highest-ranked university group in a recent DoE review and comparison of medium energy experiment programs.
2. The McWilliams Center for Cosmology is considered among the elite cosmology efforts in the country.
3. Two Physics faculty were recently honored by the American Physical Society with major annual awards: Luc Berger received the 2012 Oliver E. Buckley Condensed Matter Prize and Robert Swendsen won the 2014 Aneesur Rahman Prize for Computational Physics.
4. Last year, five Physics faculty were elected Fellows of the American Physical Society, which brings us to a total of 16 fellows among the active members of the Physics faculty.
5. Physics faculty are central leaders in the planning and construction of two major national science projects, one in cosmology and one in medium energy physics.
6. Physics faculty serve on national advisory panels where they influence national science policy in their fields.
7. Our five recent junior faculty hires have been outstanding. They have already won national prizes and are recognized as leaders in their fields.
8. In high energy physics, quark interactions and cosmology, where work is done in large international collaborations, our faculty hold significant leadership positions.
9. We take advantage of the interactive culture at CMU. Our faculty work with other units at CMU and regularly harness CMU's strengths by participating and leading collaborations with other departments and colleges. Likewise, our students expand their horizons by doing research with faculty from many departments.
10. Our undergraduate program is a source of great pride to our department: We have a long history of faculty winning college and university level teaching awards (16 in total!), we have one of the largest undergraduate physics programs in the country for a school our size, and we have created a community among students and faculty where learning can truly thrive.

Of course, 10 highlights cannot capture all the great things happening. To mention just a few more: our graduate students have achieved distinctions such as being named the Outstanding Collegiate Member by the Society of Women Engineers and becoming Chair-elect for the American Physical Society Forum on Graduate Student Affairs. This year we welcomed our newest young faculty member, Ben Hunt, recognized the great accomplishments of Bob Griffiths upon his retirement, and celebrated the remarkable life of Lincoln Wolfenstein, who passed away in March.

We have a very accomplished family of alumni. In this issue we begin to recognize just a few of them with stories submitted by graduates from each of the decades since 1950. I want to invite all of you to renew and strengthen your ties to our department. We would love to hear from you, telling us what you are doing and commenting on how the department has helped in your career and life. You can write to me at physics@andrew.cmu.edu. If you are ever in Pittsburgh and can stop by the department, let me know when you will be here. It would be great to talk to you in person. I also encourage you to join our new LinkedIn page at: www.linkedin.com/grp/home?gid=8434243 and connect with other alumni and current faculty and students.

Alumni and friends of our department have been remarkably generous in donating to our mission, and we are enormously grateful for that. These contributions play an essential role in making the many educational programs we offer possible and in helping us to maintain our diverse research successes. We have just begun a campaign for the Endowed Physics Undergraduate Enhancement Fund. This fund will help us continue to grow our efforts to create a vibrant student/faculty community.

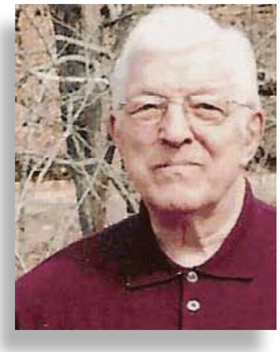
We welcome, and are thankful for, all contributions. If you wish to give to support any of the programs in our department, you will find all the information you need later in the newsletter.

I wish you all the best for an excellent year,

Steve Garoff

1950

Joseph R. Staniszewski



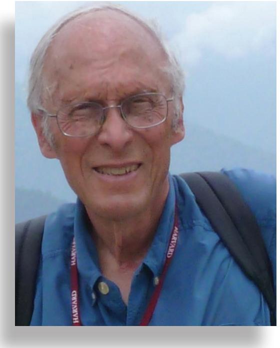
(B.S.1950)

Joseph Staniszewski graduated from Carnegie Institute of Technology with a B.S. degree in physics in 1950. A veteran of WWII, he began his college career in 1947, living at home in Sharpsburg, Pennsylvania, and commuting to campus via streetcar. As a student here, he played clarinet in the Kiltie Band. After graduation he was hired as a field engineer by the Radio Corporation of America (RCA). His first assignment took him to Yokohama, Japan, to set up SCR-548 Radar systems.

In 1958, three months after the launch of the Soviet Sputnik satellite, he transferred to RCA's Astro Electronics Division (Princeton, New Jersey) and began work on Vidicon Cameras for Space Applications. In the early 1960s, as project engineer, he made significant design contributions to the television cameras for the Ranger Spacecraft — a prelude to the NASA Apollo mission.

Following his work on the Ranger Project, Staniszewski continued with RCA as project manager for the Air Force Defense Meteorological Satellite Program, the Navy's Transit Navigation Satellites for the Polaris submarines and various communication satellite programs. A member of the IEEE, he has published several technical papers related to the various projects on which he worked during his 39 years of service. He retired from RCA in 1989. Joseph is married to Dorothy Koztowska, having celebrated their 63rd anniversary in 2015.

James S. Langer



(B.S.1955)

I was a physics major at Carnegie Tech in 1951-55 — in the days of Sergio deBenedetti, Julius Ashkin, Simeon Friedberg, Lincoln Wolfenstein, Walter Kohn and other memorable instructors. In addition to physics, I remember wonderful courses in philosophy, Shakespeare, modern drama, and Greek and Roman literature. I was also a member of the Tech debate team that reached the state finals one year. When I won a Marshall Scholarship to study in England, it was Walter Kohn who advised me to go to Birmingham to do Ph.D. research with Rudolph Peierls, and it was Kohn who attracted me back to Tech in 1958.

The next years in Pittsburgh went by in a great rush, full of teaching, research in condensed matter theory and raising a family. In 1969, I was president of the CMU Faculty Senate, not much older than the students who were protesting the Vietnam War. Ten years later, my wife Elinor was president of the Pittsburgh School Board leading the city's school desegregation effort. Then, in 1982, we moved to Santa Barbara, where I rejoined Walter Kohn as one of the permanent members of his new Institute for Theoretical Physics at UCSB. That institute continues to be a great success, attracting scientists from all over the world to participate in an ever widening range of innovative research programs. I served as its director from 1989 to 1995. Then I served as president of the American Physical Society in 2000, and as vice president of the National Academy of Sciences from 2001 to 2005. I'm officially retired now, but am still publishing research papers.

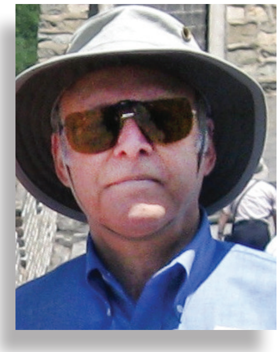
In short, I've had a wonderfully rewarding career. The Carnegie Tech/ CMU Physics Department played a very big role in getting me started and pushing me along.

Victor Bearg
(S.1964)

It was my good fortune to be an undergraduate at Carnegie Institute of Technology (now CMU) at just the right time to witness the birth and growth of computing technologies. It all started for me with a new experimental programming course that could be taken as an alternative to Engineering Drawing II. I didn't know anything about computing, but I knew it had to be better than engineering drawing. Now look at CMU! It has a world leading School of Computer Science. Computer storage has gone from paper tape and punched cards to 'in the cloud.' Instructions per second has gone from in the tens to in the tens of billions.

My entire 41 year working career has been as a computer programmer at Princeton University. First at the Princeton-Pennsylvania Accelerator, in its day known for its copious proton beam. Then for a high energy research group in the Physics Department, for which my physics classes had prepared me really well. And then at the Computing Center, where I built on my problem- solving skills learned as an undergraduate. It has been a great ride to have witnessed the computing revolution from the inside!

Retirement has been made exciting by visiting some of the cultural highlights, interesting places and natural wonders of our planet, both local and far flung. It is hard to pick a favorite adventure, but perhaps it was riding the Trans-Siberian Railway.



Winston Ko (B.S.1965)

Winston Ko received his B.S. in physics from Carnegie Tech in 1965, his M.S. in 1966 and Ph.D. in 1971 in physics from the University of Pennsylvania. In 2013, he retired from the University of California, Davis, after serving on its physics faculty for 41 years, the last 10 as the dean of Mathematical and Physical Sciences.

Ko is an experimental particle physicist. He has performed experiments in high-energy physics laboratories around the world: he has surveyed inclusive reactions during the pioneer days of Fermilab; he has measured the structure of the photon in SLAC (Stanford Linear Accelerator Lab) and DESY (Deutsches Elektronen-Sychrotron); and he has studied electroweak symmetry breaking in Japan's KEK (Ko Energy Kenkyusho).

As a Fulbright Senior Scholar in Europe in 1992, Ko and others at CERN (European Organization for Nuclear Research) developed the CMS (Compact Muon Solenoid) experiment for the LHC (Large Hadron Collider), leading UC Davis with two other UC campuses to be the only U. S. signatories of the CMS Letter of Intent. Subsequently, CMS was approved to be one of the two major experiments for LHC and Ko took on the initial leadership role as the coordinator of software for the muon system. Ko notes that the Carnegie Mellon high-energy physics group is now a CMS collaborator, emphasizing the muon system no less. They are all recipients of the 2013 European Physical Society High Energy and Particle Prize, "for the discovery of a Higgs boson, as predicted by the Brout-Englert-Higgs mechanism."

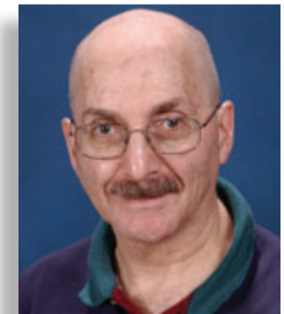
As physics chair (1998-2003), Ko led the building of UC Davis' cosmology program from grounds up into being one of the top-ranked programs in the country. In five years he recruited seven cosmology faculty members, including Professor Tony Tyson, then the director and now the chief scientist of LSST (Large Synoptic Survey Telescope). When completed in 2022, LSST will be the forefront ground-based facility for cosmology. Ko notes that Carnegie Mellon is now involved with LSST in a big way. Dean Fred Gilman is also the chair of the AURA (Association of Universities for Research in Astronomy) Management Council for the LSST.

Ko's educational philosophy is much influenced by the Carnegie Plan of Professional Education that he was indoctrinated with in his undergraduate years, which emphasized learning the fundamentals well and hands-on problem-solving skills. He found it particularly relevant to physics. As the physics chair, he facilitated and supported the "inquiry based" introduction physics course. As the dean, he made sure that mathematical and physical sciences would give solid foundation to all science and engineering majors on campus, e.g., pioneering one of the nation's first "Calculus for Biology and Medicine" programs.

1960

1960

Michael Bass (B.S.1960)



Michael Bass received his B.S. in physics from Carnegie Mellon University in 1960, his M.S. in 1962 and Ph.D. in 1964 in physics from the University of Michigan. He has been active in laser and modern optics research since his discovery of and thesis on optical rectification. For his discovery of this phenomenon that was later found to enable generation of broadband terahertz sources, Michael Bass was awarded the R.W. Wood Prize of the Optical Society of America in 2014.

After graduate school he spent time as a post doctoral fellow in physics at the University of California at Berkeley. He then worked at the Raytheon Company Research Division before joining the University of Southern California in 1973. In 1987, he moved east to help a young university establish its research activities and be part of what would become CREOL, The College of Optics and Photonics at the University of Central Florida.

He is responsible for the use of the statistical approach to understand laser-induced damage. He is the co-inventor of the YAlO3 laser host and the use of fiber optics and lasers for the treatment of internal bleeding and tumors. He used laser calorimetry to study very small absorptions in optical materials and pioneered its use in the first absolute measurements of two-photon absorption. More recently he developed the theory of passively Q-switched lasers including excited state absorption in the Q-switch, showed that the variation of laser performance with environmental temperature depends solely on the temperature dependence of the stimulated emission cross section and established a theoretical explanation for thermal gradient induced lensing and birefringence in crystalline laser materials that requires no assumptions. In 2006, he was the first to demonstrate lasing in gain-guided index anti-guided fiber lasers. His recent research centers on the design of improved solid state and fiber lasers, beam combining using volume Bragg gratings and novel ceramic crystal optical materials.

Bass is fellow of OSA, life fellow of IEEE, fellow of the Laser Institute of America, 2013 fellow of the National Academy of Inventors, fellow of the Russian National Academy of Engineering Science, member of Sigma Xi and Tau Beta Pi and a proud alumnus of Carnegie Mellon University – Physics.

He used laser calorimetry to study very small absorptions in optical materials and pioneered its use in the first absolute measurements of two-photon absorption.

John Unguris

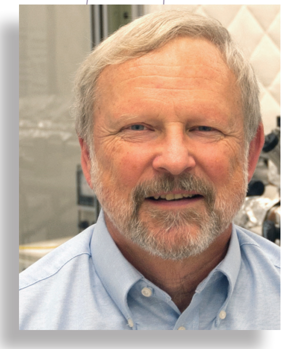
1970

I entered Carnegie Tech in 1969 and graduated from Carnegie Mellon in 1973. It was an unsettled, very interesting time with all of the Vietnam war protests and the culmination of the turbulent Sixties. My physics classes were an enjoyable refuge from all of the unrest during this period. However the best thing that happened to me was meeting my wife, Pam (Pamela Hudson '73).

After CMU I went to graduate school at the University of Wisconsin where I just barely struggled through the graduate level physics courses, but had a great time learning and doing research. My research focused on the adsorption of gasses and their interactions on metal surfaces which required mastering various surface analytical techniques based on electron diffraction and spectroscopy.

I continued playing with electrons and surfaces after graduating and taking a National Research Council Postdoctoral Fellowship at the National Institute of Standards and Technology (NIST), but now the focus of my research shifted to understanding how electron spins interacted with surfaces. This work led to new methods of producing and analyzing spin polarized electrons, along with developing new measurement techniques based on spin polarized electrons. One of these techniques, Scanning Electron Microscopy with Polarization Analysis (SEMPA) is especially useful for imaging the nanoscale magnetic structure in magnetic materials and devices. Working at NIST has been enjoyable; a nice combination of basic and applied research. In addition, my work in nanomagnetism has also allowed me to reconnect with folks at CMU who were doing research in magnetic recording and magnetic materials.

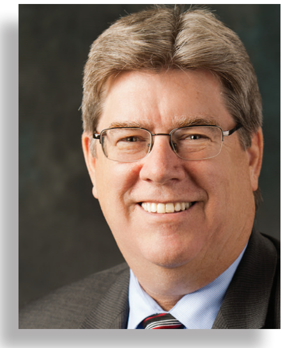
I am currently a project leader in the Center for Nanoscale Science and Technology at NIST, where I am investigating the physics of magnetic nanostructures. I am a fellow of the American Physical Society and recipient of the 2015 APS Joseph F. Keithley Award for Advances in Measurement Science.



(B.S.1973)

J. Michael McQuade

(B.S.1977, M.S.1978, Ph.D.1983)



J. Michael McQuade is senior vice president for Science & Technology at United Technologies Corporation. His responsibilities include providing strategic oversight and guidance for research, engineering and development activities throughout the business units of the corporation and at the United Technologies Research Center. UTC is a global leader in aerospace (jet engines, landing systems, wheels and brakes, electrical generation and distribution, air management, surveillance and reconnaissance, etc.) and buildings and industrial systems (climate management, building controls, transportation cold chain, elevators, escalators, fire detection and suppression, and security systems). Across the company, UTC's products deliver safety and mission critical complex engineered solutions with a major focus on energy efficiency and sustainability.

McQuade holds three degrees in physics from Carnegie Mellon: B.S.1977, M.S.1978 and Ph.D.1983. His Ph.D. was based on an early hadronic charm search experiment (E515) conducted at Fermilab with Professor Jim Russ as his thesis advisor.

Prior to joining UTC, McQuade spent 25 years as a research and development scientist and business leader in various health care businesses including 3M, Imation and Eastman Kodak, with particular emphasis on diagnostic imaging systems and advanced medical devices.

In November 2013, McQuade was appointed to serve on the Obama administration's President's Council of Advisors for Science and Technology. He also currently serves as a member of the Secretary of Energy Advisory Board. McQuade is a member of the Board of Trustees for Carnegie Mellon University, the Board of Directors of Project HOPE and the Board of Trustees for Miss Porter's School.

Paul A. Medwick (B.S.1988)

Paul A. Medwick is senior group leader in the Glass Coatings Group at PPG Industries' glass research and development center near Pittsburgh, Pennsylvania. He earned a B.S. degree in physics with University Honors from Carnegie Mellon University (MCS 1988), and M.S. and Ph.D. degrees in applied physics from Cornell University. During his undergraduate studies, Medwick held four consecutive summer internships at Princeton Plasma Physics Laboratory where he participated in research on interactions of plasmas with surfaces inside magnetic fusion reactors. His Ph.D. research, advised by Professor (now emeritus) Robert O. Pohl, focused on phonon physics of bulk solids and thin films at ambient and cryogenic temperatures. Medwick has over 20 years of experience developing and commercializing multilayer thin film-coated glass products for architectural, solar and other specialty applications. He also served as principal investigator of a project, co-funded by PPG and the U.S. Department of Energy, to develop high-performance mirrors for concentrated solar power applications. Medwick's research interests include thin films, vacuum-based deposition processes and plasma-based processing of materials. Medwick has received several professional awards, including the Carnegie Science Award for Advanced Manufacturing in 2008 and 2012, the PPG Innova Award for Innovation in 2009, and the PPG President's Award for Outstanding Technical Achievement in 2006 and 2014. He is the author of seven journal articles/conference proceedings, holds 14 issued U.S. patents, and is named an inventor on 19 pending U.S. patent applications. He is a member of several professional societies, including the American Physical Society, Materials Research Society, American Vacuum Society and the Society of Vacuum Coaters.

1980

Raymond "Chip" Brock

(Ph.D.1980)

Raymond Brock is an experimental particle physicist and University Distinguished Professor at Michigan State University. He received his B.S. in electrical engineering from Iowa State University in 1972. After a year in industry he switched to physics with an M.S. from Northern Illinois University and a Ph.D. degree in physics from Carnegie Mellon in 1980. After two years as a postdoc at Fermilab, he joined the MSU Department of Physics and Astronomy (PA) in 1982. Brock is the author or co-author on over 500 publications in experimental and phenomenological particle physics, is a fellow of the American Physical Society, a recipient of the two Michigan State University all-university awards for research and teaching, and was named University Distinguished Professor in 2011.

Brock was department chair from 1993-2000 during which he oversaw the construction of a new building and facilitated MSU's participation in the creation of the SOAR 4m telescope in Chile.

He was spokesperson of a Fermilab neutrino experiment and is a charter member of the D0 collaboration, active in detector construction, grid computing and important electroweak measurements.

Brock is PI of the MSU ATLAS group working at CERN's LHC. He just completed an upgrade to ATLAS trigger system and with the University of Michigan, jointly directs one of five ATLAS Tier 2 data centers.

He was the chair of the APS Division of Particles and Fields, a member of the High Energy Physics Advisory Panel, was the U.S. representative to the International Committee on Future Accelerators, and just completed a second term on the Fermilab Physics Advisory Committee. He is currently the U.S. ATLAS Institutional Board chair and was the co-convener of the DPF Snowmass 2013 Energy Frontier study.

Brock has taught across the undergraduate and graduate curriculum and has dedicated himself to teaching general education students with the creation of two courses for non-science majors.

He is an avid baseball fan and coached baseball many years at the high school level in Michigan.

Andrew Steiner

(B.S.1997)

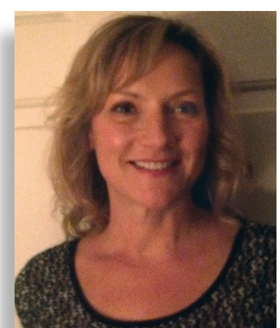
This past year has been a noteworthy year for me: I married Cari Crane, we moved to Knoxville, Tennessee, and I began a new assistant professor position at the University of Tennessee at Knoxville (with a joint appointment at Oak Ridge National Laboratory).

After graduating from CMU in 1997, I obtained my Ph.D. from Stony Brook University in 2002. My thesis was on quark matter in neutron stars, and led to the American Physical Society's Dissertation Award in Nuclear Physics. My research now covers almost all of the nuclear physics aspects of neutron stars.

Neutron star evolution is driven by the structure of nuclei and the nature of the nucleon-nucleon interaction. As an example, neutron star radii are correlated with the neutron radii of 48Ca and 208Pb, as will be accurately measured (with CMU involvement) at Jefferson Lab. If the neutron radii of these nuclei are relatively large, it means that neutron stars must be larger than we expect as well. In turn, this will potentially impact our understanding of core-collapse supernovae, neutron star mergers and r-process nucleosynthesis. Some of my most cited works utilize Bayesian inference (pioneered at CMU) to obtain information about the nucleon-nucleon interaction from neutron star mass and radius measurements. In effect, we can deduce the nature of the interaction between neutrons and protons on earth by observing distant stars.

Of course, I remember my years at CMU fondly, and I always enjoy the chance to visit with CMU colleagues and friends.

Lisa Milan



(B.S.1993)

I entered Carnegie Mellon as a transfer student from Community College of Allegheny College (CCAC). Dr. John Fetkovich interviewed me and cautioned me that my academic transcript from CCAC and my (abominable) high school grades were no guarantee that I would be successful. Upon graduating in 1993, I was one of three females in a class of 30 physics majors. I was one of two students that graduated with honors, and I received the Monteverdi Award along with the Physics Alumni Award. Professor Fetkovich was also the one to present the awards at graduation, and mentioned my entrance interview as well when he introduced me and gave me the awards.

Throughout the time I was at Carnegie Mellon earning my degree, I had the opportunity to do pedagogical research with Bruce Sherwood and Ruth Chabay, who were developing their "hands-on" course in Electricity and Magnetism. I also worked one summer as a teaching assistant for Dr. Fetkovich in the Advanced Placement/Early Admission (AP/EA) program, so I was already developing my teaching skills.

My first job after graduation was teaching physics and computer science in an all-girl high school, The Buffalo Seminary, where I worked for three years before returning for a master of science in education degree from the University of Pennsylvania. My first job in the Pennsylvania public school system was as a permanent substitute for a year. I was then hired by Hampton Township, where I taught honors and general physics for eight years and developed a program for advanced placement (AP) physics.

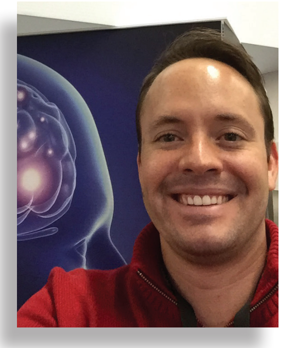
I left Hampton in 2006, and returned to Carnegie Mellon, enrolling in the Educational Leadership program at the Heinz School of Public Policy. I earned a Master's of Public Management (MPM) degree in December 2006, and began taking graduate coursework at the University of Pittsburgh. I worked as an instructor and field supervisor for pre-service teachers. By 2008, I had earned certificates in elementary education and K-12 principal, and tried both roles briefly before returning to teaching physics.

In 2010, I accepted a position with Springdale Jr-Sr High School. I also consult for the Learning Research Development Center (LRDC) at the University of Pittsburgh, where my students are involved in developing intelligent computer-based tutorials in physics. Most recently, I've begun a part-time program in medical physics through the University of Florida. I am taking online coursework in anatomy, radiation theory and imaging, with the intention of earning enough graduate credits in physics to be able to eventually teach at the college/university level.

2006

Adam Lichtl

(Ph.D. 2006)



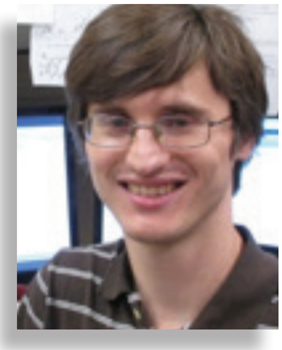
In September of 2006, Adam defended his dissertation to receive a Ph.D. in computational physics under Dr. Colin Morningstar in the field of Lattice Quantum Chromodynamics. A researcher and teaching assistant by day, Adam took evening courses at the Tepper School of Business, receiving his MBA in May of 2005. While holding a postdoctoral fellowship in the RIKEN-BNL Research Center at Brookhaven National Laboratory, his interest shifted to particle accelerator physics and design, and he participated in research related to two next-generation accelerator concepts: the Muon Accelerator Program, and the Plasma Wakefield Accelerator.

In February of 2009, Lichtl joined Morgan Stanley, where he became a vice president of Quantitative Analytics in the Commodities Trading Department. This work kept his mind sharp and developed his leadership skills, but did not resonate with his interest in large-scale computing for the greater good. An opportunity arose to join SpaceX, which he joined in March of 2012. Initially responsible for developing a new computational fluid dynamics system to simulate combustion processes in the rocket engines, Lichtl advanced to the position of director of Analysis, and then to director of Research, where he had the privilege of leading a brilliant team of mechanical engineers, computational physicists, data scientists, software developers and nuclear engineers, to tackle some of the thorniest long-term challenges facing the company.

In August of 2015, Lichtl left SpaceX and started his own company, Delta Brain Inc., based in Los Angeles, California. The mission of this new organization is to combine the latest advances in signal processing, machine learning and neuroscience with established best practices in engineering and software development, to breathe new life into existing treatments for serious neurological disorders. Delta Brain Inc. is exploring powerful new approaches to treating depression, epilepsy and Parkinson's disease.

In January of 2016, Lichtl and his wife will welcome their first child into the world and are waiting to find out the gender.

Alexander Greenwood



(B.S. 2007)

During the summers of 2005 and 2007, I was an undergraduate researcher in the Nagle lab, which specializes in X-ray diffraction-based measurements of the lipid bilayer, which surrounds all living cells. The first summer, as a Howard Hughes Medical Institute (HHMI) scholar as part of the Summer Research Institute (SR), I made volume measurements of lipids and cholesterol. This was accomplished using the neutral flotation method, where the density of lipids is measured by testing whether they "sink or swim" in mixtures of H_2O and D_2O. This measurement is an important parameter in the analysis of X-ray diffraction data, as well as an important constraint/test of molecular dynamics (MD) simulations. This produced a paper — my first — which to my surprise has been more heavily-cited than any of my papers that have followed to date! The summer after I graduated with a B.S. in physics, I continued my work with the Nagle group, accompanying them on a trip to the Cornell High-Energy Synchrotron Source (CHESS) where we took vital data for a second project on the effect of HIV-derived peptides on the mechanical properties of membranes. As it happens, Cornell was where I subsequently attended graduate school for biophysics. At Cornell, I learned a new technique, solution-state Nuclear Magnetic Resonance (NMR) spectroscopy, applied to studies of protein structure and dynamics. My project centered on interactions between proline-rich sequences and protein domains that bind them, with a focus on the impact of slow isomerization steps in this process. I received my Ph.D. in the beginning of 2014, and am currently a postdoctoral fellow at the University of Illinois at Urbana-Champaign, learning solid-state NMR spectroscopy. Coming full circle, I am currently studying lipid-ligand interactions and the properties of molecules embedded within the lipid bilayer!

Eric Dahl (B.S. 2002)

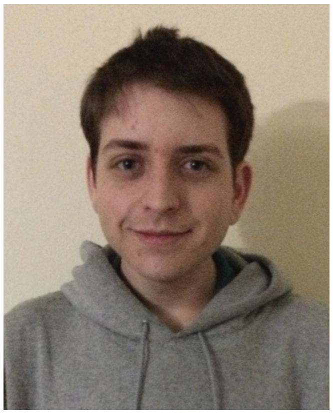
To learn more, experimentalists like Dahl build specialized particle detectors and deploy them thousands of feet underground in an attempt to unambiguously detect passing dark matter particles from the Milky Way's dark matter halo.

Eric Dahl, now an assistant professor in the Department of Physics and Astronomy at Northwestern University, has spent the last decade hunting dark matter. Astrophysical and cosmological observations from single galaxies to the entire visible universe all indicate that there is five times more "dark matter" in the universe than normal matter. Not much is known about the dark matter, but the requirements that it be stable, electrically neutral, massive and non-baryonic (not made of protons or neutrons) already eliminate every particle in the standard model. To learn more, experimentalists like Dahl build specialized particle detectors and deploy them thousands of feet underground in an attempt to unambiguously detect passing dark matter particles from the Milky Way's dark matter halo.

Dahl began working on dark matter detection (after a very brief stint in string theory) as a graduate student at Princeton, working with advisor Tom Shutt on the Xenon10 experiment, a liquid xenon time projection chamber. In 2009, Dahl went to the University of Chicago as a Kavli fellow and joined the COUPP collaboration (now called PICO), another dark matter detection experiment whose technology of choice was the bubble chamber. At Northwestern, Dahl continues work with both PICO and LZ (the next big xenon TPC) and has received a DOE Early Career Award to develop a xenon bubble chamber, combining the strengths of both detector styles. All of these efforts are trying to solve the same problem: how can one distinguish the exceedingly rare dark matter signal, which yields perhaps one event per year in a 100-kg detector, from a cacophony of backgrounds that include cosmic rays, natural radioactivity and even solar neutrinos.

So far no convincing dark matter signal has been seen, and to make progress the detectors are getting bigger (LZ weighs in at 10 tons) and backgrounds are being pushed lower. Even so, since nobody knows what dark matter is made of, there are no guarantees that signal will be forthcoming. Already many theoretical models have been ruled out, and it's entirely possible that this style of experiment may never make a detection. On the other hand, several theories suggest that a discovery could be just around the corner, a discovery that would open a new window into just what the universe is made of.

Samuel Greess (B.S. 2014)



Greess inside MPDX while we were installing the T-REX coils and the B-dot probe

I am a second-year graduate student in the Department of Physics at University of Wisconsin-Madison. I spent my first academic year here working as a teacher's assistant for the engineering department's introduction to electricity and magnetism course, but I'm now a research assistant working on the Terrestrial Reconnection Experiment (T-REX), which operates in the Madison Plasma Dynamo Experiment (MPDX).

MPDX is a spherical (r=1m) vacuum chamber lined with magnets in which plasmas are generated for the purposes of simulating a dynamo (an object which transforms rotational energy into magnetic energy) or any number of different astrophysical plasma environments. These plasmas can be maintained for timescales on the order of a few seconds, and measurements can be taken using any instruments that can be inserted into the chamber's many sealable ports.

T-REX is a set of coils and probes that is inserted between the hemispheres of MPDX to simulate some of the magnetic reconnection regimes found in space plasmas, such as those in the upper atmosphere and at the surface of the sun. Magnetic reconnection is the process by which magnetic field lines break apart and reconnect with each other to form a less complicated topology, transferring energy from the magnetic field to the plasma (usually in the form of a driven current and moving bursts of particles). Magnetic reconnection is driving force behind the creation of solar flares and coronal mass ejections, and is thought to play a significant role in the coronal heating problem. T-REX uses a set of internal coils and MPDX's external Helmholtz coils to create opposing magnetic fields that reconnect over a timescale of tens of milliseconds.

My work on T-REX has been centered on the construction, testing and operation of a 160-channel B-dot probe. This probe is essentially 160 separate cells made of multiple turns of very fine wire, which carry the currents generated by time-varying magnetic fields a la Faraday's Law. These coils are arranged across a series of rows, each of which is triangular in shape, forming a radial wedge that hangs in MPDX between the two internal T-REX coils. With the data from these coils, we've been able to reconstruct the magnetic field lines as they move through the vessel and reconnect, as well as the current layer that is generated in the reconnection region; we can also create movies showing how these lines and layers develop with time. We plan to present our results at APS' Department of Plasma Physics meeting in late November.

T-REX is a set of coils and probes that is inserted between the hemispheres of MPDX to simulate some of the magnetic reconnection regimes found in space plasmas, such as those in the upper atmosphere and at the surface of the sun.

Udom Sae-Ueng (Ph.D. 2014)

I earned a Ph.D. in physics in December 2014. I had been working with Prof. Alex Evilevitch during my Ph.D. years on the topic of physical mechanisms of viral life cycle. I investigated physics and mechanics of viral structures and infections using physical measurement including nano-indentation technique of atomic force microscopy and isothermal titration calorimetry. Starting with the purification steps of virus samples, we studied their physical and mechanical aspects by focusing on several critical parameters such as integrity, stiffness and maximum force virus structures can withstand. Understanding the virus properties in terms of their biological relevance allows us to interrupt the infection pathway or even to manipulate them for other nanotechnology applications such as viral nano-containers.

I earned the scholarship from the Royal Thai Government during my undergraduate years at Cornell University; hence, I was obligated to go back and work in government-affiliated institutions in Thailand such as national research centers or public universities. In February 2015, I started my work at National Center for Genetic Engineering and Biotechnology, which is the national research center for all biology- and biotechnology-related research of Thailand. We both fund research and conduct research ourselves. As a developing country, the focuses of our research are leaning toward applications rather than fundamental sciences. In fact, we have specific research policies in a way that we divide biology-related research into several main categories. One of them is undoubtedly tropical disease as Thailand is in the tropical region. One of my main tasks here is drug discovery for malaria. Specifically, I investigate the binding mechanism and its thermodynamics of compound candidate and target proteins in folate pathway, using my knowledge from biophysics. In the future, I expect to pursue research in my own interest that agrees with the research policy of Thailand.

Other than being a researcher at the national research center, I am also a guest lecturer at Sirindhorn International Institute of Technology (SIIT) and Mahidol University, teaching various courses including General Science, Advanced Topics in Biotechnology, and Special Topics in Microbiology.

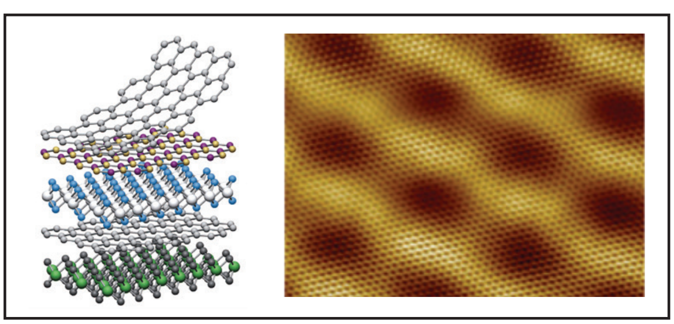
Ben Hunt

NEWEST FACULTY MEMBER

Ben Hunt

One of the most important abilities that we have in condensed-matter physics is the ability to control the flow of electrons in real materials. This idea is at the heart of much of our modern technology: a transistor works on the principle of being ON (electrons flowing) or OFF, depending on the presence or absence of a controlling voltage on a nearby gate electrode. This control becomes much easier when we restrict the motion of electrons from three dimensions to two (or fewer) dimensions. Two-dimensional semiconductor structures have traditionally been created by a growth technique called molecular beam epitaxy (MBE), but with little more than adhesive tape and a microscope, we can create atomically-flat, layer-by-layer "van der Waals'' (vdW) heterostructures" by stacking two-dimensional crystals such as graphene and boron nitride
(Fig. 1, left). These vdW structures are conceptually similar to structures that are created by MBE, but we have much freedom to choose the component materials and crystallographic alignment, which means that we can engineer systems with designer properties using 2D metals and semimetals such as graphene, as well as insulators, superconductors, semiconductors, ferromagnets and a wealth of other materials that harbor even more exotic electronic phases.

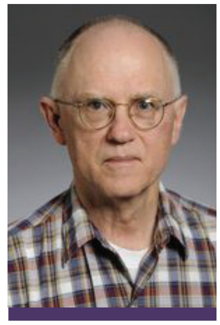
In my lab, we are interested in creating new types of heterostructures in which we can manipulate both the charge and the spin of electrons, but also other properties of the electrons such as the "valley" degree of freedom that emerges in certain types of materials. Recently, for example, we showed that we could turn graphene from a semimetal into a semiconductor by placing on top of boron nitride with a particular twist angle between the layers (Fig. 1, right). Low-dimensional systems continue to find essential applicability in fields as diverse as quantum computing. Sometimes this requires that we go to extremes of the universe available in the lab, such as ultra-low temperatures and ultra-high magnetic fields in order to access the interesting physics.



(Left) Van der Waals heterostructure of graphene, BN, and transition-metal dichalcogenide crystals. (Right) Graphene on boron nitride, producing a moire pattern that turns graphene from a semimetal into a semiconductor.

RETIREMENT

Robert Griffiths



Robert Griffiths

Robert Griffiths retires after 50 years as a member of the CMU physics faculty.

He offers the following reminiscences of his long career, which includes more Carnegie Tech and Carnegie Mellon connections than anyone might have imagined.

After finishing my high school education in India, where my parents were Presbyterian missionaries, I earned an A.B. degree at Princeton in 1957, and a Ph.D. at Stanford in 1962. At Princeton, Robert Dicke, who is well-known for his work in atomic physics and cosmology, was my teacher in the introductory freshman physics course, and also my first course in quantum mechanics. He persuaded me to switch majors from electrical engineering to physics, and in my final year supervised my senior thesis, which involved constructing a novel atomic beam light source, with results published in the *Review of Scientific Instruments.*

My thesis advisor at Stanford was George Pake, a Carnegie Tech alumnus. I began some experiments on electron paramagnetic resonance, but they did not work out very well. So I switched to theoretical calculations on some subjects that interested Pake, and wrote my thesis on a topic in spin-lattice relaxation, and the properties of Heisenberg-coupled spin chains. The latter required numerical solutions, which meant carrying a stack of punched cards to the main Stanford computer — there was only one in those days. I fondly remember the time when the top card in my stack had an error in it, and the operator told me to repunch the card. Which I did in the next room and brought it back — during which time the main computer for the whole university was sitting there idle waiting for the next job to show up. Times have changed!

For postdoctoral work I went to the University of California in San Diego where Walter Kohn, previously a faculty member at Carnegie Tech, was my supervisor. At that time he was inventing density functional theory, for which he later received the Nobel Prize, and had I been smart, I would have joined him in that enterprise. But I was more interested in statistical mechanics and thermodynamics, and that was my area of research when I arrived in Pittsburgh in 1964 to join the faculty of Carnegie Tech, which became Carnegie Mellon three years later. Aside from sabbaticals and other leaves of absence I have been here ever since.

While here I have taught a variety of different courses, including freshman physics, thermodynamics, statistical mechanics, classical mechanics, and at both the undergraduate and graduate levels, courses in quantum mechanics and mathematical physics. Years ago I taught a course in Christianity and Science, which has been continued in recent times by Gary Patterson in the Chemistry Department. All of these I found enjoyable except the freshman physics, which I think requires a certain amount of showmanship that I lack.

My research activities have shifted a bit over the years, but I think of them as falling into three distinct though related categories. When I first arrived I was interested in equilibrium statistical mechanics and thermodynamics, especially as applied to phase transitions and critical phenomena. This was a good fit with Jim Langer's theoretical and Sim Friedberg's experimental work, and John Nagle joined us shortly thereafter. Those were exciting years, especially the study of phenomena near a critical point in fluids and ferromagnets. I had a chance to meet a number of worldwide leaders in that field, among them Michael Fisher, Leo Kadanoff and Ken Wilson (who received the Nobel Prize for his renormalization-group approach).

Though I did not realize it at the time, stage two began in the spring of 1972 when for the very first time in my career I was asked to teach a course in quantum mechanics, a one semester undergraduate course on `Wave Mechanics,' roughly the equivalent of our current `Advanced Quantum Physics.' I assigned one of the textbooks used previously for that course and began reading through it as I prepared my lectures. As someone familiar with (classical) statistical mechanics, and having a taste for clean and rigorous mathematics, I was horrified at the sloppy way probabilities were introduced in the textbook, and so I decided I would do it properly. (It was only much later that I encountered Feynman's famous statement: "Nobody understands quantum mechanics!") In those days there were no faculty course evaluations, so two years later, after I had returned from a sabbatical, I was again asked to teach the same course. By then I had learned my lesson, and with a lot of hard work and after much struggle I managed to put quantum mechanics and probability together in a consistent way. I didn't think this was worth publishing until a physicist I met in France during another sabbatical encouraged me to do so. The resulting manuscript, which later became one of my most cited papers, was turned down by the *Physical Review* but accepted by the editor (Joel Lebowitz) of the *Journal of Statistical Physics*, whom I knew because of our common interest in statistical mechanics. This was my entry into the field of quantum foundations, and it remains one of my principal interests.

Stage three of my career began in 1994 when after knocking at my office door, in walked three Computer Science professors. "What do you know about Peter Shor?" they asked. I said I had never heard of him. "What do you know about quantum computation?" Nothing. "Do you know anything about quantum mechanics?" My affirmative answer to this last question began an informal collaboration in which we taught each other some of the basics of our respective disciplines. Peter Shor, in case you don't know, was the computer scientist who showed that a quantum computer, if it could be built, could be used to factor long numbers much faster than an ordinary computer ("classical") computer. This initiated the modern era of quantum information, a topic that continues to receive a lot of attention. Carnegie Mellon, at my urging, awarded Shor the Dickson Prize in 1999. But by that time our computer scientists had lost interest in the topic, though I have continued doing research in this field ever since, and taught an introductory course on quantum information and computation a total of eight times between 2001 and my retirement in 2014. It may be that the computer scientists are again becoming interested in the subject, as right now (fall of 2015) one of their junior faculty members is teaching a course in quantum computation. We'll see.

Future plans. I have less energy than I used to, and it takes me a lot longer to get things done, which is why I decided to retire. However, I am at present continuing some research in quantum information, and also pursuing interests in quantum foundations. I would like to see some of the newer ideas about quantum mechanics, material that I and various other people have developed, made part of introductory quantum mechanics courses, so students have a better appreciation of that subject and don't find it so confusing. As for Great Unsolved Problems, I must leave quantum gravity to those better qualified, but I would myself like to better understand the statistical basis (classical and quantum) of thermodynamic irreversibility, a topic that has interested me for over 40 years.

David Menasche

2015 MELLON COLLEGE OF SCIENCE RECIPIENT OF THE GUY C. BERRY GRADUATE RESEARCH AWARD

David Menasche

Understanding the thermo-mechanical responses of polycrystalline condensed matter has been a formidable roadblock toward the development of materials engineered for specific applications, due in part to the challenges associated with developing nondestructive, three-dimensional, in-situ probes of material structure. It is exactly at this intersection of physics, materials science and technology that Guy Berry award winner David Menasche seeks to make an impact. Menasche was just enrolling in the graduate program in 2011, when, while at CMU, the president introduced the Materials Genome Initiative, a charge that dared researchers and industrial partners to halve the time to functionally deploy state of the art materials. This charge has since guided his research under Professor Robert Suter, toward the further development and use of high-energy diffraction microscopy (HEDM) a synchrotron-based X-ray imaging technique able to study 3-D material response nondestructively on a fundamental level.

Continued on page 19

Degrees Granted in 2015

Doctor of Philosophy in Physics

Kiyotaka Akabori
Aristotle M. Calamba
Benjamin Taylor Carlson
Brendan Michael Fahy
Yu Feng
Guowei He
Yutaro Iiyama
Udom Sae-Ueng
Daniel Lee Stahlke
Tabitha Christine Voytek
Huizhong Xu

Doctor of Philosophy in Molecular Biophysics and Structural Biology

David W. Bauer

Master of Science in Physics

Michael Benjamin Andrews
Mukund Bapna
Jacob Fallica
Devashish Prakash Gopalan
Alexa Noelle Johnson
Hsiu-Hsien Lin
Zongge Liu
Zhonghao Luo
Michael Alan Malus
Victoria Merten
Tanmay Kamalakar Mudholkar
Siddharth Satpathy
Prashant Shrivastava
Vikesh Siddhu
Bijit Singha
Mustafa (Mert) Terzi
Evan Corey Tucker
Hongyu Zhu

Undergraduate Honors

Christopher A. Addiego
University Honors
College Honors

Stephanie Cheung
University Honors
College Honors

Steven P. Harris
University Honors
College Honors

Arjun Kar
University Honors
College Honors
Phi Beta Kappa

Brooke Kuei
University Honors
College Honors

Benjamin J. Marinoff
University Honors
Phi Beta Kappa
Phi Kappa Phi

Philip T. Massey
University Honors

Michael Matty
University Honors
College Honors
Phi Beta Kappa
Phi Kappa Phi
Andrew Carnegie Society Scholar

Kathryn McKeough
University Honors
College Honors
Phi Beta Kappa
Phi Kappa Phi
Andrew Carnegie Society Scholar

Grace Moraca
University Honors
College Honors

Sonal Nanda
College Honors

Lauren O'Neil
University Honors
College Honors
Phi Beta Kappa

Keisuke Osumi
University Honors

Isaac Shelby
University Honors
Phi Beta Kappa

Samuel L. Simon
University Honors
College Honors

Sam A. Smith
College Honors

Undergraduate Degrees

Bachelor of Arts in Physics of Form, Minor in Architecture (August 2015)

Phineas Taylor-Webb

Bachelor of Science and Arts in Physics and Art

Stephanie A. Cheung

Bachelor of Science and Arts in Physics and Drama

Catherine Schwartz

Bachelor of Science and Arts in Physics and Musical Performance

Sam A. Smith

Bachelor of Science: Double Degree in Mathematics and Physics, Minor in Computer Science

Nir Neerman

Bachelor of Science: Double Degree in Physics and Chemistry, Minor in History

Lauren P. O'Neil

Bachelor of Science: Double Degree in Physics and Computer Science

Philip T. Massey

Bachelor of Science: Double Degree in Physics and Computer Science, Minor in Philosophy

Arjun Kar

Bachelor of Science: Double Degree in Physics and Mathematical Sciences

Keisuke T. Osumi

Bachelor of Science in Mathematics, Additional Major in Physics

Samuel L. Simon

Bachelor of Science in Physics

Christopher A. Addiego
John A. Dieser
Steven P. Harris
Grace L. Moraca
Francis A. Ray

Bachelor of Science in Physics, Additional Major in Statistics

Kathryn E. McKeough

Bachelor of Science in Physics, Applied Physics Track

Laure E. Carroll
Ryan J. Davis
Sonal Nanda

Bachelor of Science in Physics, Applied Physics Track, Minor in Robotics

Garrett D. Zinke

Bachelor of Science in Physics, Minor in Computer Science

Benjamin J. Marinoff
Michael F. Matty

Bachelor of Science in Physics, Minor in Mathematics

Veronica R. Ebert
Isaac M. W. Shelby

Bachelor of Science in Physics, Minor in Professional Writing

Brooke Kuei

Minors in Physics

Brendan A. Barwick
Evan Cavello
Peter L. Chiappa
Benjamin Chung
Zachary A. Cohen
John H. Cole
Jonathan Dunstan
David G. Franklin
Jordan M. Harry
Kevin H. Hunter
Brian C. Ip
David K. Isenberg
Madhav Iyengar
Thomas W. Klein
Ozichukwu M. Konkwo
Rhiannon M. Malia
Peter J. McHale
David F. Mehrle
Jeremy D. Meza
Jennine M. Nash
Annika L. Peterson
Raphael J. Segal
Sharman Shukla
David Y. Zhou

FACULTY APPOINTMENTS & RECOGNITION

New Appointments

Benjamin Hunt | Assistant Professor

Faculty Promotions

Alex Evilevitch | Promoted to Associate Professor with Indefinite Tenure

Faculty Retirements

Robert Griffiths

Faculty Recognitions

Honors and Awards

Shelley Anna | Fellow American Physical Society

Roy Briere | Fellow American Physical Society

Tiziana Di Matteo | Fellow American Physical Society

Raphael Flauger | Sloan Foundation Fellow

Gregg Franklin | Consultant and star performing role in Emmy Award winner Jonathan Hock's "FASTBALL" documentary

Shirley Ho | Cooper-Siegel Development Chair in Physics
Carnegie Science Center Emerging Female Scientist Award
Outstanding Young Researcher Award (Macronix Prize)

Tina Kahniashvili | Named Senior Associate of the International Center for Theoretical Physics

Colin Morningstar | Fellow American Physical Society

Reinhard Schumacher | Fellow American Physical Society

Robert Swendsen | Best Physics Professor in Pittsburgh, *Pittsburgh Magazine*

Helmut Vogel | 2015 MCS Richard Moore Award

Physics Faculty in the National Press

Raphael Flauger | "Astronomers Hedge on Big Bang Detection Claim"
NY Times, June 19, 2014
"Criticism of Study Detecting Ripples From Big Bang Continues to Expand"
NY Times, Sept. 22, 2014

Alex Evilevitch | "Body temperature linked to DNA activity inside disease-causing virus", *Pittsburgh Post-Gazette November 11, 2014*

Ira Rothstein | "The Perils of Romanticizing Physics"
Wall Street Journal, December 8, 2014

Robert Suter | Work represented (by his Post-doctoral fellow) at the Science, Engineering, Technology Exhibition at the British Parliament

Matt Walker | "Gamma Rays May Be Clue on Dark Matter"
NY Times, March 10, 2015

National Leadership Positions

Markus Deserno | Editorial Board Biophysical Journal

Randy Feenstra | Associate Editor, Physical Review Letters

Steve Garoff | Co-Chair, National American Chemical Society Colloid and Surface, Chemistry Division Annual Meeting

Fred Gilman | Chair, AURA Management Council for LSST

Shirley Ho | Co-Chair of Dark Energy Spectroscopic Instrument (DESI) Clustering Working Group
Co-Chair of Large Synoptic Survey Telescope Cooperation Science Collaboration and Large Scale Structure Working Group

Rachel Mandelbaum | Analysis Coordinator and Co-leader of the Weak Lensing Working Group of the Dark Energy Science Collaboration

Curtis Meyer | Spokesperson Jefferson Lab GlueX Experiment

Manfred Paulini | Chair, Institutional Board for a major instrumentation package at the Large Hadron Collider

Reinhard Schumacher | Editorial Board Physical Review C

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or email us at physics@andrew.cmu.edu

Name: ______________________ Class Year: ______________

Email Address: ______________________

News Brief: *(News briefs may be chosen for printing in our next issue of INTERACTIONS.)* ______________

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FACULTY APPOINTMENTS & RECOGNITION CONT.

In Memoriam

Lincoln Wolfenstein | emeritus university professor, died on March 27, 2015. Lincoln was a world renowned scientist, a dedicated educator, and a passionate thinker about the human condition. He was a member of the CMU community for 66 years.

Special Events

2015 Buhl Lecture | Larry Abbott

William Bloor Professor of Theoretical Neuroscience and co-director of the Center for Theoretical Neuroscience, Columbia University

"Learning to Predict: Studies of Neural Circuits in Fish and Flies"

2014 Bennett-McWilliams Lecture | Neta A. Bahcall

Eugene Higgins Professor of Astrophysics, Princeton University

"Lighting up the Dark: Where is the Dark Matter?"

Symposium in Honor of Robert Griffiths | Pittsburgh Quantum Institute

Graduate Honors and Awards

Matthew Daniels | Recipient of award from the East Asia and Pacific Summer Institutes program of the NSF

Sergio de la Barrera | Pake Graduate Fellowship

Krista Freeman | Chair-elect for the American Physical Society Forum on Graduate Student Affairs

Invited participant in the 65th Lindau Nobel Laureate Meeting

Qin Gao | McWilliams Graduate Fellowship

Bai-Cian Ke | People's Graduate Fellowship

Zachary McDargh | DeBenedetti Graduate Fellowship

Recipient of award from the East Asia and Pacific Summer Institutes program of the NSF

David Menasche | 2015 Guy Berry Award

Michelle Ntampaka | Best student talk at Neighborhood Workshop on Astrophysics and Cosmology, Penn State

Michael Sinko | McQuaide Nanophysics Fellowship

Tabitha Voytek | Outstanding Collegiate Member Society of Women Engineers

Undergraduate Honors and Awards

Kelsey Hallinen | 2014 Monteverdi Award

Michael Matty | Phi Beta Kappa Early Initiate

Andrew Carnegie Society Scholar

Katherine McKeough | Phi Beta Kappa Early Initiate

Goldwater Scholarship Honorable Mention

Andrew Carnegie Society Scholar

Staff Recognitions

Chuck Gitzen | 45 years of service

University Andy Award for Dedication

Joe Rudman | 55 years of service

University Andy Award for Citizenship

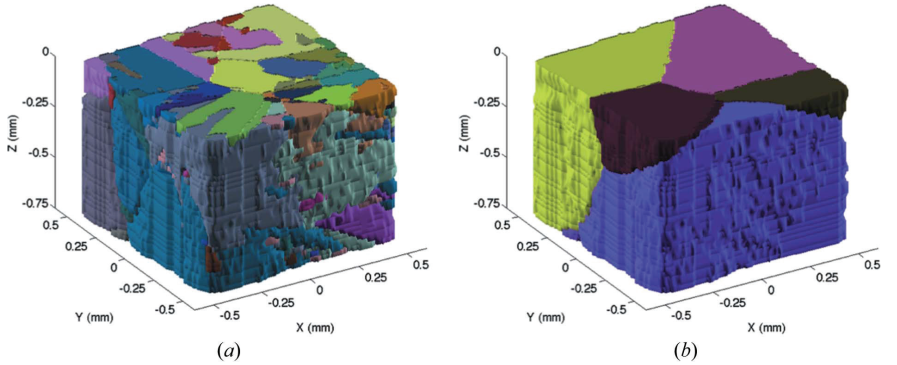
Thank you for your support of the Physics Department and its programs. To make a gift to Physics please visit **www.giving.cmu.edu/physics** or use the donation envelope found in the centerfold.

Tell us about yourself! (additional space)

News Brief: *(News briefs may be chosen for printing in our next issue of INTERACTIONS.)* ______

Continued from page 15

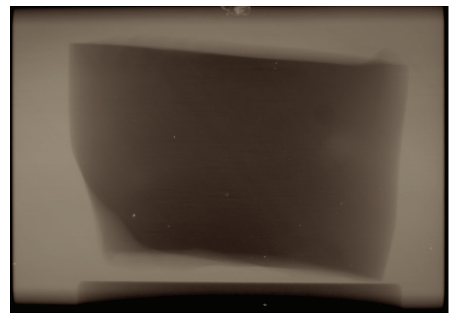
Menasche's work to date has focused primarily on combining multiple X-ray techniques to resolve critical events in material structures subject to external mechanical strains, with the goal of understanding why and how materials deform and fail. Working with collaborators at Los Alamos National Laboratory, he has spearheaded the first effort to correlate damage nucleation sites with a known initial structure in a ballistically shocked sample. This work led to additional collaborations with the Air Force Research Laboratory to study how material stress, crystallography and morphology combine to modulate crack formation and propagation, science that can inform future material engineering. That collaboration most recently resulted in Menasche developing a novel feedback system at Argonne National Laboratory's Advanced Photon Source (APS) that leverages on-site massively parallel HPC resources and an existing codebase to enable researchers at the synchrotron to image their materials in real time and make informed decisions about their experiments.



I) (a) Reconstructed HEDM data reveals the room temperature crystal grain structure of a 1 mm x 1mm x 0.75 mm Ti-6Al-4V sample measured with collaborators as part of an Office of Naval Research (ONR) grant. (b) Subsequent analysis of the crystal structure of (a) allows for the deduction of the speciman's structure at high temperature. See E Wielewski, DB Menasche, PG Callahan, RM Suter, Journal of Applied Crystallography 48 (4), 1165-1171.

This system proved its worth during a recent experiment designed to capture the onset of plastic behavior in Ti-6Al-4V, a commercially critical alloy used throughout the aerospace industry.

While not supporting X-ray measurements at (APS) or analyzing data, Menasche acts as a mentor for undergraduate students doing research with Professor Suter, in addition to performing both data and cluster administration duties. He will graduate in the spring of 2016 and plans to pursue opportunities in the Boston area.

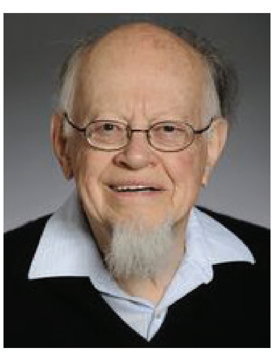


II) Raw (unreconstructed) tomographic radiograph of the ballistically shock-loaded high-purity copper sample. Prior to flyer-plate impact, the sample was cylindrical.

IN MEMORIAM

Lincoln Wolfenstein

1923-2015



We mourn the passing of esteemed colleague Lincoln Wolfenstein, who died on March 27, 2015, in Oakland, Calif. Lincoln received his Ph.D at the University of Chicago in 1949 and was a member of the faculty in the physics department at Carnegie Mellon University for 52 years before officially retiring in 2000. He continued to be active in the department until just last year, when he and his wife, Wilma, moved to California to be closer to family. A University Professor, Lincoln was a member of the National Academy of Science and the recipient of Sakurai Prize (1992) and the Pontecorvo Prize (2005). He is best known for his theoretical work in elementary particle physics, specifically the physics of neutrino oscillations. A celebration of Lincoln Wolfenstein's life and work was held on October 24.

Carnegie Mellon University
Physics

5000 Forbes Avenue
Pittsburgh, PA 15213

INTERACTIONS

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