

Yale University

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PHYSICS NEWS

Fall 2016



Handwritten notes on the blackboard:

1. $H = \frac{1}{2}(p^2 + q^2)$
2. $\dot{H} = p\dot{p} + q\dot{q}$
3. $\dot{H} = 0$ (stationary point)
4. $\ddot{H} = p\ddot{p} + q\ddot{q}$
5. $\ddot{H} = 0$ (inflection point)
6. $\ddot{H} > 0$ (local minimum)
7. $\ddot{H} < 0$ (local maximum)

8. $\frac{d}{dt} \left(\frac{1}{2} p^2 + \frac{1}{2} q^2 \right) = p\dot{p} + q\dot{q}$
9. $\frac{d}{dt} \left(\frac{1}{2} p^2 + \frac{1}{2} q^2 \right) = 0$
10. $\frac{d}{dt} \left(\frac{1}{2} p^2 + \frac{1}{2} q^2 \right) = 0$



LETTER FROM THE CHAIR



It is a pleasure to once again welcome you to the latest version of the Department Newsletter. As in previous editions, we hope to convey the vibrancy of our department by highlighting some of the exciting research and learning that is taking place within it.

As I write this, workers are busy moving labs and offices out of the J.W. Gibbs building into the newly outfitted Wright Lab. The extensive (and expensive!) renovations will leave the Wright Lab interior barely recognizable to its previous inhabitants, which, as many of you know is a good thing! I invite you to read more about the new Wright Lab in the article penned by its Director, Karsten Heeger.

Wright Lab will host the research programs of two of the four new faculty, all of whom were recruited in the 2015-2016 academic year. We are excited to welcome these young scientists and educators, who bring vibrant, world-leading research programs to Yale, and fresh ideas and enthusiasm to our classrooms. Learn more about our new faculty in the following pages.

Yale Physics had another stellar year of garnering prizes and awards. I want to make special note of two: Meg Urry was elected to the National Academy of Sciences, an honor reserved for the most outstanding scientists in the nation, and Nick Read was the co-recipient of this year's Dirac Medal, given for outstanding contributions to theoretical physics. Congratulations to both Meg and Nick.

Finally, we must say goodbye to the J.W. Gibbs building which will be demolished in the fall of 2016. As a rather versatile space, Gibbs has enabled a lot of great science over its 60 year existence. But as many of you are aware, it did have its flaws. In future volumes of this newsletter I look forward to detailing plans for new space for Physics and more broadly, the physical sciences, here at Yale.

Thank you to all our friends and alumni of the department for your continued support.

Sincerely,

A handwritten signature in black ink that reads "Paul". The signature is written in a cursive, slightly stylized font.

Paul L. Tipton
Chair, Department of Physics
Yale University

Newsletter Editor: Dani Heller
Photography by: Jennifer Stergiou (pg 8-9, 14-15),
Geriana Van Atta (pg 12-13), Karsten Heeger (pg 6-7),
Dani Heller (cover, pg 2-3)
Special Thanks to Geriana Van Atta, Sid Cahn, and Jenn Church

4 Faculty Hires

Highlight 2016 Faculty Recruitment

During the 2014-2015 academic year, the physics faculty focused its attention on developing a strategic plan for the department. The culmination was a list of departmental recommendations and a map for future faculty hiring.

In part because the administration appreciated the thoughtful planning and preparation, last year the department was authorized to conduct four faculty searches. We are happy to report that these searches resulted in four new faculty hires, each of whom is described below.



Meng Cheng comes to Yale from Microsoft's StationQ at U.C. Santa Barbara. Meng, a theorist who will join Yale's faculty in July 2017, has been interested in topological phases of quantum matter, in particular the interplay with symmetries. He has developed a theory of how symmetry acts on the emergent degrees of freedom in topological phases, with applications ranging from new proposals for topological quantum information processing, to classifying exotic quantum phases in magnetic materials. When asked what most excites him about his research, Meng replied: "I'm always amazed by how a simple quantum system with many particles interacting with each other can behave in a remarkably rich and beautiful way. It often turns out that this 'collective behavior' observed in quantum materials needs very deep theoretical ideas to explain, the understanding of which may lead to unexpected applications."

Nir Navon is coming to Yale from Cambridge where he has been a Junior Research Fellow at Trinity College, and works at the Physics Department of the Cavendish Laboratory. Nir uses the 'tunable' nature of trapped ultracold atomic gas systems to study fundamental many-body physics. Recently, he has pioneered the use of Bose-Einstein condensates trapped in laser-made uniform 'box' potentials to investigate complex topics of out-of-equilibrium physics, such as the dynamics of spontaneous symmetry breaking or the emergence of turbulence in a quantum gas. When asked why he chose to study AMO physics, Nir replied: "First, the experiments in my field are probably among the most complicated table-top experiments that can be understood and mastered by a single person. Secondly, the physics encountered is so diverse, that I sometimes feel that these experiments are merely convenient excuses to just keep learning physics in the broadest sense, from pure quantum mechanics to thermodynamics, hydrodynamics, or condensed matter physics."





Laura Newburgh comes to Yale after being a Dunlap Postdoctoral Fellow at the University of Toronto. While there, Laura and her colleagues proposed two radio astronomy facilities (CHIME and HIRAX) in order to collect data from the 21cm line of hydrogen to learn about the expansion history of the Universe in the poorly probed era from redshifts of 0.8 to about 2.5. In Laura's words: "We're building a large radio interferometer to measure neutral hydrogen trapped in galaxies. The large scale distribution of those galaxies can be used as a tracer for the expansion of the Universe, which will allow us to understand the driver of that expansion: dark energy." Laura also has a second detector development program focused on the next generation of Cosmic Microwave Background (CMB) polarization measurements.

Asked what would be the most exciting outcome of her work Laura said: "We could find that dark energy is dynamical, which would entirely change what models we would use to describe it."

David Moore is returning to Yale where he double majored in Math and Physics, receiving his degree in 2006. Most recently Dave has been at Stanford working on a search for neutrinoless double beta decay with the Enriched Xenon Observatory (EXO). Commenting on the state of the field Dave said: "Experiments have been searching for neutrinoless double beta decay for more than 30 years, but experiments are finally reaching the sensitivities needed to see this decay if the masses are close to the lower bounds implied by neutrino oscillations."

While at Stanford, Dave and his colleagues also devised a plan for a table-top sub-atonnewton force sensor using optically levitated microspheres that can facilitate a search for milli-charged objects and test gravity at the micron distance scale.

Moore's experiment, which he plans to build in Wright Lab, has the potential for big physics reach. "It may be possible that our first hints of new phenomena related to some of the major outstanding questions in high energy physics actually come from precision measurements of tiny effects in low-energy experiments."



These four faculty hires serve as a compelling example of Yale's commitment to science in general and physics in particular. Representing more than 10% of the physics faculty, they are also quite literally a significant part of the future of the department. Deputy Provost for Research, Steven Girvin, said: "We are excited to welcome these four excellent hires to the Yale family. This recruiting success is a testament to the benefits of the long-range planning for which the department is known."



The New Yale *Wright Laboratory*

After three years of planning and construction, the new Yale Wright Laboratory recently opened its doors to students, staff, and researchers. The Yale Wright Laboratory is the newest experimental facility of the Yale Physics Department. Following the decommissioning and removal of the Yale Tandem Nuclear Accelerator in 2015, the building underwent a dramatic transformation: new office space, specialized laboratories, and technical infrastructure were built to create a unique experimental facility for a new era of research and teaching in the Yale Physics Department and on Science Hill. The new Wright Laboratory provides unparalleled infrastructure and laboratory space in support of the experimental physics program at Yale. High-bay detector assembly areas, cleanrooms, a cryogenic laboratory, low-vibration rooms for precision measurements, a server room for advanced computing, a remote control room and CAD facilities, as well as a low-background area for the characterization of detectors are now available to physics researchers. An integrated machine shop for teaching and research support, advanced prototyping capabilities, and a professional machine shop complete the technical infrastructure at the Wright Laboratory.

Over the last few weeks research groups from the Physics Department have moved into the recently renovated facilities at Wright Lab. Setup of the new laboratory spaces is expected to be completed by the end of the year. The lab's research program now encompasses a broad portfolio of experiments and instrumentation development in nuclear, particle, and astrophysics with a focus on neutrino physics, fundamental symmetries, and precision measurements. Experiments ranging from table-top efforts like the ADMX-HF axion



A glass entrance and completely renovated interior welcome students and visitors to the new Yale Wright Laboratory.

experiment, to world-wide collaborations such as ATLAS at the Large Hadron Collider and the long-baseline neutrino experiment in the US use the lab's facilities for R&D and development of the next generation of experiments. Yale Wright Lab's research program now includes neutrino physics dark matter searches, relativistic heavy ion physics, collider physics at the energy frontier, beam physics experiments and table-top gravitational and precision experiments. Observational astrophysics and cosmology complement the earth-based laboratory experiments developed here at the lab. Wright Lab researchers are pursuing the study of diverse phenomena including the structure of matter in nuclear physics, the interactions and forces between elementary particles, and fundamental physics from observations at the cosmic scale. Together, these programs form a comprehensive approach to understanding the nature of matter, its interactions, and its role in the evolution of the Universe.

The new facilities of the Wright Laboratory now support the experimental programs of sixteen faculty and support the work of over one hundred students, staff and scientists. Professors Baker, Baltay, Caines, Fleming, Harris, Heeger, Lamoreaux, Maruyama, and Tipton use the Wright Lab facilities for their experimental and technical work. Professors Casten and Iachello continue the long-standing program in experimental and theoretical nuclear structure research at Yale. We are pleased to welcome our newest faculty members David Moore and Laura Newburgh with their new experimental program in neutrino physics, precision tests of gravity, and observational cosmology at the lab. Wright Lab supports adjunct faculty Beausang, Cavanna, Ullrich,

Palamara, Hirshfield, and Werner and continues the successful collaboration of Yale scientists and students with leading experimental initiatives worldwide.

The Yale Wright Laboratory continues the tradition of hands-on research on campus by developing instrumentation that defines the forefront of nuclear, particle, and astrophysics: Last year, Wright Lab scientists have helped create the coldest cubic meter in the Universe, detected nuclear decays with lifetimes much longer than the age of the Universe, and searched for new forms of matter with detectors deep underground. This fall classes in instrumentation development will be taught in the new machine shop spaces of the Wright Laboratory. Research and teaching are now colocated and are an integral part of the mission of the new Wright Lab.

Modern meeting spaces and video conferencing facilities are integrated throughout the building and enable international collaborations with Wright Lab scientists.

Machine shop facilities in the new Yale Wright Lab for teaching and research support. Students, scientists, and staff are trained in instrumentation development and prototyping and develop skills in computer aided design.

Leveraging the newly created infrastructure at the Wright Laboratory our research groups will be able to build the next generation of instruments that define the frontiers of fundamental physics for the next decade and beyond. The range of in-house expertise and infrastructure will enable Yale Physics to lead experiments at the forefront of the field and train the next-generation of scientists. Wright Laboratory's location on Yale's Science Hill will foster synergistic activities with the instrumentation and computational needs of interdisciplinary efforts in biology, chemistry, and astronomy.

The decommissioning of the historic nuclear accelerator and the active art community on Yale campus have presented a unique opportunity to interpret the recent transformation of the lab from an artist's perspective. Over the course of the last couple

of years several Yale art students have pursued projects inspired by the former accelerator, the science, and technical work of the Wright Lab. Their work is now on display at the lab and available to view on our website.

With the move out of the soon-to-be-demolished Gibbs building into the renovated Wright Lab, a historic transformation has changed the landscape of experimental physics at Yale. We are excited about the new opportunities at the Wright Laboratory and look forward to leading the next scientific breakthroughs and training a new generation of scientists.

For more information, see <http://wlab.yale.edu>.

*~Karsten Heeger
Director, Yale Wright Laboratory*



Hanging sculpture created by Yale art student Virginia Montgomery Lee with materials from the Yale nuclear accelerator.

Student Awards & Achievements

Graduate Students

Stephen Eltinge • *Theoretical Condensed Matter*

Won 2016 National Science Foundation Graduate Research Fellowship



Daniel Seara • *Biological Physics*

Won 2016 National Science Foundation Graduate Research Fellowship



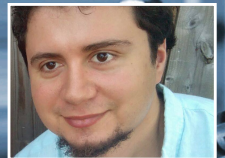
Savannah Thais • *High Energy Physics*

Won 2016 National Science Foundation Graduate Research Fellowship



Alexandru Bogdan Georgescu • *Condensed Matter Theory*

Received 2016 D. Allan Bromley Graduate Fellowship in Physics



Undergraduate Students

Grace Pan 2017 • *Physics Intensive Major*

Named 2016 Barry Goldwater Scholar



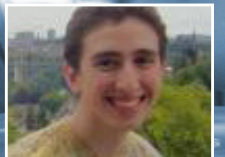
Elizabeth Himwich 2016 • *Physics Intensive Major*

Won 2016 National Science Foundation Graduate Research Fellowship



Daniel Pollack 2016 • *Mathematics & Physics Major*

Won 2016 National Science Foundation Graduate Research Fellowship



Faculty Awards & Achievements



Bonnie Fleming

Appointed Deputy Chief Research Officer of Fermilab & elected General Councillor for APS



Leonid Glazman

Named Donner Professor of Physics



Karsten Heeger

Won 2016 Breakthrough Prize in Fundamental Physics



Francesco Iachello

Received Honorary Doctorate from the Hebrew University of Jerusalem



Reina Maruyama

Promoted to Associate Professor with Tenure



Peter Rakich

Received 2015 Packard Fellowship



Nick Read

Awarded 2016 Dirac Medal & Prize



Rob Schoelkopf

Elected to the National Academy of Science, and named one of the 'Most Influential Scientific Minds'



Meg Urry

Elected to the National Academy of Science



John Wettlaufer

Elected to the Royal Swedish Academy



Steve Girvin & Nikhil Padmanabahn

Each named one of the 'Most Influential Scientific Minds'

Yale Open Labs

Open Labs (theOpenLabs.org) is a science-outreach organization founded by Yale Physics graduate student, Zlatko Minev, with the mission of educating and mentoring underprivileged and underrepresented young scholars to pursue careers in physics and the sciences. It has grown across four states, with Open Labs chapters at Columbia, Penn, and Princeton.

“What is quantum optics?” “How do you pay for your Ph.D, Charles?” Surrounded by 120 New Haven middle and high school students and parents, Charles Brown, a Yale physics Ph.D student, clears up the misconceptions behind these questions and plants the seeds of excitement in physics. “Ph.D students in physics are rewarded for their merit, and don’t have to pay anything!” he continues. At this Yale Open Labs event, Charles is one of the 4 speakers drawn from the network of two dozen fellow graduate students forming the Open Labs initiative to bridge the disparity gap in New Haven.



Charles Brown speaks with New Haven Students

Open Labs is a volunteer organization of graduate students, united by a shared passion: to reach young minds who are drawn by the power of physics and other sciences to redefine the landscape of tomorrow, but who find themselves in an underserved environment. Even two hours after Charles’ short, TED-like presentation, he continued to answer question after question in one of the many breakout discussion groups, joined by other physics graduate students, Savannah Thais and Nick Frattini. Although the event was large, 40 middle and high school students from the New Haven community still had to be waitlisted.

The popularity of these events serve as a testament to the ability of the Open Labs model to inspire young scholars and the New Haven community at large. Zlatko Minev, a physics graduate student and a Graduate and Professional Student Senate member, founded the Open Labs in 2012 and it has already reached over 1,200 students and parents in the greater New Haven area. The name “Open Labs” reflects Zlatko’s desire to make science and science career pathways accessible to young scholars by placing them in the shoes of a scientist at a “real” lab.

This year, the success of the Open Labs model promoted its expansion to the University of Pennsylvania, Princeton University, and Columbia University with this initiative led by Darryl Seligman, a Ph.D. student

in Astronomy. These three new Open Labs chapters have already reached several hundred students and parents beyond New Haven. In the meantime, the team at Yale is planning for further expansion.

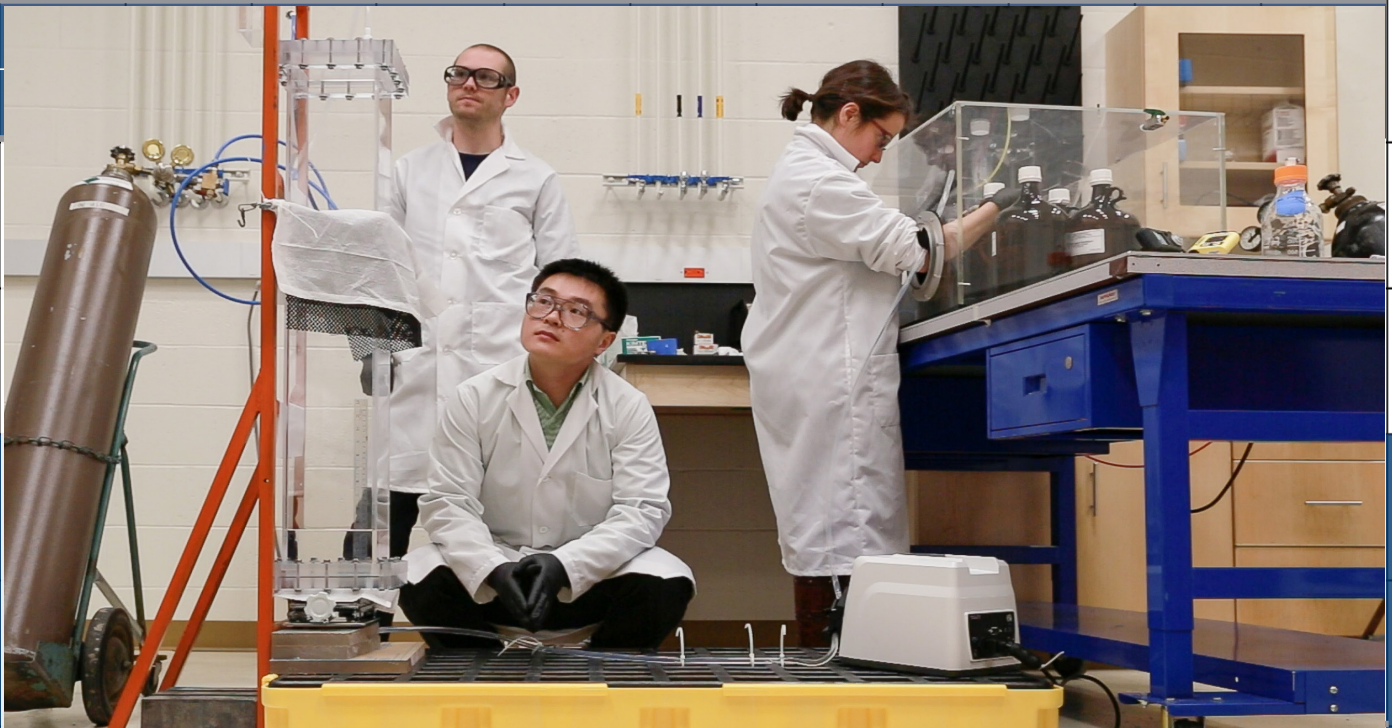
In addition to being an active fellow at Open Labs, in 2016, Charles co-founded the Yale League of Black Scientists (YLBS) with Brooke Russell (Yale Physics graduate student) to focus on the socioeconomically disadvantaged members of our community and support the pursuit of their scientific knowledge. Collaboration between Open Labs and YLBS has formed a powerful resource for those of the local community who seek exposure to STEM disciplines, as well as mentorship from graduate researchers.

This year, Open Labs was awarded the public outreach grant by APS in collaboration with NSF. With this funding and support of donations, Open Labs seeks to educate and mentor young minds in underprivileged environments in New Haven and across the nation. Presently, Open Labs continues its mission to inspire and support young scholars through showing them what it is to be a Yale scientist who pushes back on the boundaries of the known.

~ Zlatko Minev



Minev during a Science Café in 2013



Yale Department of Physics

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Alumni News

Harry H. Landen, '51 Ph.D.:

Harry is enjoying his retirement in Camden, Maine. He is rereading old books, especially Henry Margenau's old Yale text "The Nature of Physical Reality" from which he studied at Yale.

Mark A. Heald, '54 Ph.D.:

Mark worked briefly on controlled fusion at Princeton University (PPPL predecessor). He then spent 38 years in the Physics Department at Swarthmore College. He retired to Tennessee CCRC in 1997.

You can reach him at mheald@frontiernet.net.

Russell W. Dreyfus, '60 Ph.D.:

Russell, Fellow of the American Physical Society and Optical Society of America has been retired in Sarasota, FL for 20 years and enjoying boating, golf, and bridge. Before retirement, he was at IBM Thomas Watson Research for 35 years, and subsequently he was a Guest Research Professor at CNRS, University of Aix-Marseilles; Applied Physics Department at the University of Hull, UK; and the Institute of Optics at the University of Madrid, Spain.

William Fickinger, '61 Ph.D.:

After retiring from Case Western Reserve University's physics department where he worked for 30 years on experimental particle physics, Bill spends much of his time as the secretary of Cleveland Peace Action, working on the elimination of all nuclear weapons, giving powerpoint talks, writing LTE's, and reaching out to Congress members.

Bob Birgeneau, '66 Ph.D.:

After 13 years leading large, complicated public research universities, he

has transitioned back to the faculty and has resumed his life teaching and doing research in quantum materials at Berkley. He has also been involved in two major projects, the American Academy's Lincoln Project and the newly formed Science Philanthropy Alliance. The former is focused on maintaining access and excellence in U.S. public research universities and the latter is trying to increase philanthropic giving to discovery-based research in the physical and life sciences. The rest of Bob's time is spent with his family including 12 grandchildren.

Khalil Bitar, '66 Ph.D.:

Khalil is currently a professor of physics at the American University of Beirut, Lebanon. He has served for 12 years as Dean of the Faculty of Arts and Sciences during the period of August 1997 - August 2009. He is currently teaching courses on QFT and Particle Physics.

Joseph Comfort, '67 Ph.D.:

Joseph retired in May after 35 years as a Professor of Physics at Arizona State University, joining the Emeritus College. Even so, in his last semester, he was strong-armed into joining a collaboration to prepare a new experiment at Fermilab. He is mentoring two undergraduates. Joe's wife of 31 years passed away in 2014. His two children and 6 grandchildren live nearby. In addition to his physics 'hobby', Joe loves adventure; he took education cruises around the Baltic in 2015, and to Scotland and Norway in 2016. More to come!

Thomas H. Curtis, '68 Ph.D.:

After leaving Yale with a degree in Nuclear Physics, Tom did a post-doc at the Lawrence Radiation Lab, then went to Bell Labs where he had a 30 year career in R&D. He left Bell Labs in 2000 to form an Optical Switching start up with an engineering professor from Princeton, then headed a Branch Office in NJ for the Johns Hopkins

Applied Physics Lab, retiring in 2011. Since then he has been busy with the Yale Graduate Student Alumni Association, helping organize and speak at the annual 'What Comes After Yale' career seminar for grad students. He also enjoys skiing, sailing, tennis, golf, playing the bagpipes, enjoying his two grandchildren, and sharing his life with his partner Barbara.

William D. Langer, '68 Ph.D.:

Bill Langer, a Senior Research Scientist at JPL/Caltech, continues his astrophysics research into star formation and galactic structure, combining observations and modeling. His research leverages off his recent leadership of a Key Observational Program with the Herschel Space Observatory and follow up observations with Herschel and the SOFIA airborne observatory. He has enjoyed a return to research in the past several years after a five-year stint as the head of JPL's Science Division. Bill considers himself fortunate to be able to continue physics and astronomy research past nominal retirement age.

John C. Norvell, '68 Ph.D.:

Following his Yale degree, John continued research training in physics and biophysics at Riso (Denmark), Los Alamos, and the University of Wisconsin. His research career in biophysics and structural biology began at Brookhaven and then at the National Institutes of Health (NIH). Moving into research administration at the National Institute of General Medical Sciences (one of the NIH institutes), he directed numerous programs and subsequently served as assistant director of NIGMS. Since his retirement from NIH, he and his wife have been deeply involved in photography and he serves as a research assistant in a genomics group at the University of Maryland and as a guide at the Smithsonian Museum of Natural History.

**Carlisle Lee Morgan, '68 M.Ph,
'71 Ph.D:**

Carlisle retired from his Radiology practice in 2012. Carlisle belongs to several clubs, including The Country Club of Virginia, Hermitage Country Club, The Commonwealth Club, and The Deep Run Hunt Club. The clubs occupy his time a great deal. He formerly belonged to the Yale Club of New York City which he would recommend to anyone visiting New York frequently or on a regular basis. Carlisle is a member of The Yale Club of Greater Richmond and is currently serving a 3 year term as the Alumni Representative of the Club. For this, Carlisle attends The Yale Alumni Annual Assembly in New Haven every November. Carlisle travels extensively as always, nationally as well as internationally, particularly in Europe and usually with groups. His travel will often involve archaeological tours; most recently he went on an archaeological tour of Bulgaria. He will be doing a Danube cruise in September. Carlisle is working as always on his collections and, in particular, currently on his ancient numismatic collection. This occupies a great deal of his time as well as research. Carlisle has visited and continues to visit many archaeological and historical sites.

Richard A. Lindgren, '79 Ph.D:

Richard retired several years ago as Research Professor of Physics, Emeritus at the University of Virginia. He has significantly cut back on nuclear physics research and is no longer Director of the Masters of Physics Education Program which he co-founded at the University of Virginia. He has continued to teach introductory physics at UVa and recently lead a 4 year MSP state funded UVa-JLab collaboration project for K-12 teachers in physical science from 2012 -2016. Richard also continues to teach online courses at UVa and also over the last 6 summers has

been a visiting Professor teaching physics at Hue University in Hue, Vietnam. He will continue this work in the near future as long as he continues to remain healthy. Richard has 4 children and 9 grandchildren all living in the Charlottesville area.

Howard Georgi, '71 Ph.D:

2016 DPF Mentoring Award has been presented to Howard Georgi, Harvard University, "For his unique dedication to mentoring and supporting a large and diverse community of students and post doctoral fellows, whose creative theoretical endeavors have had an enormous impact on particle physics as well as the larger scientific community."

Joseph L. McCauley, '72 Ph.D:

Joseph has worked in statistical physics, superfluids, nonlinear dynamics (two Cambridge University Press books), cosmology, and finance/economics/stochastic dynamics (3 Cambridge University Press books). He has recently returned to his old interest in hydrodynamics and marine propellers. His focus there is on surface-piercing propellers for high performance boats, where he has discovered three new scaling laws for predicting performance.

Richard Hadsell, '75 Ph.D:

After 23 years, Dick still enjoys computer software development for Blue Sky Studios. He also sings with the Desoff Choirs and the Renaissance Street Singers in NYC. He plays horn only rarely, but it was great to see John Mauceri again at the Yale Symphony's 50th anniversary alumni event.

Mike Lauterbach, '77 Ph.D:

After being Dean of the Yale School of Nursing for 10 years his wife, Margaret Grey is finally on sabbatical. They went to Australia and New Zealand for 6 weeks and cruised around Italy for 2.5 weeks. He is enjoying being retired.

Ya-hui Chiu, '79 Ph.D:

Ever since his retirement from Hong Kong-based Asia Satellite Telecommunications Company, Ya-hui Chiu has been living in New Jersey. He and Meiling chose NJ to retire because NJ is close to NYC (hence a great deal of fun) and convenient to get together with his two daughters, one in Manhattan and the other in Washington DC. Also, there are many Taiwanese living in NJ and as such there are many activities and trips. They visited Central-America (Maya culture), salmon run in British Columbia, Belgium & Netherlands and most recently traveled to Portugal, Spain, Andorra and France with a group of fellow Taiwanese (70+ or older) in the past two years! Ya-hui recently wrote a few articles in Mandarin about his experience on using Chinese Launch Vehicle (Long March vehicles) in Xichang and Russian Proton launch vehicle in Baikonur, upon request by the NYC Pen Club. He was pleased to be informed that they were well received.

**Thomas A. Moore, '78 M.Ph,
'81 Ph.D:**

This spring, McGraw-Hill published the 3rd edition of Tom's introductory calculus-based physics textbook "Six Ideas That Shaped Physics". He recently published a paper in American Journal of Physics (Vol. 84, 360) entitled "Using Worksheets to Solve Einstein's Equation" which describes and extends a method described in his 2013 textbook "A General Relativity Workbook" (University Science Books). His research interests in gravitational wave physics led to several invitations to speak about the first detection of gravitational waves announced in February. Tom teaches at Pomona College in Claremont, CA.

Akif Baha Balantekin, '82 Ph.D:

Eugene P. Wigner Professor at the University of Wisconsin, Madison,

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pursuing research at the interface of nuclear, particle physics and astrophysics. He recently finished his term as the chair of the Scientific Advisory Board for the European Centre for Theoretical Nuclear Physics and Related Areas (ECT*) in Italy, the first person from outside Europe to lead this prestigious board.

Mauro M. Doria, '83 Ph.D:

Professor of Physics at the Universidade Federal do Rio de Janeiro, Brazil; visiting professor at the Università degli Studi di Camerino, Italy (2015-2016); visiting professor at the Universität Antwerpen, Belgium (2006-2007). Current interests in Physics are in the theory of Superconductivity and of Statistical Mechanics. For the former the focus is in the intertwinement of pairing with magnetism and charge in layered compounds. For the latter the focus is in the use of numerical solutions of the Boltzmann equation on a lattice to understand semi-classical fluids such as the electron gas in metals.

Dimitra Karabali, '86 Ph.D:

Dimitra Karabali is a Professor at Lehman College, City University of New York.

Fabio Dellagiocoma, '88 Ph.D:

Fabio has been working for the past 20 years in the area of Information Technology for the major Italian Telco. He is responsible for the project management activities providing solutions in building the reporting layer related to both voice and data service delivery and assurance, based on the application of Business Intelligence methodology. His analytical skills developed during the years spent in the Wright Nuclear Structure Lab at Yale have played a key role enab-

ing him to approach different fields ranging from seismic migration, domain decomposition in fluid dynamics, and network management.

Robert Michaels, '89 Ph.D:

Dr. Michaels is preparing two experiments, on which he is a co-spokesperson, to be run in the next few years at Jefferson Lab in Newport News, VA.

Michael Mann, '91 Ph.D:

Dr. Mann is Director of the Penn State Earth System Science Center. His research focuses on climate change. He was selected by Scientific American as one of the fifty leading visionaries in science and technology in 2002, was awarded the Hans Oeschger Medal of the EGU in 2012 and the National Conservation Achievement Award of the NWF in 2013. He made Bloomberg News' list of fifty most influential people in 2013. In 2014, he received the Friend of the Planet Award from NCSE. He is a Fellow of the AGU, AMS, and the AAAS, and has authored more than 200 publications, and two books including *Dire Predictions* and *The Hockey Stick and the Climate Wars with a third—The Madhouse Effect*, due out this fall.

Aimé Fournier, '98 Ph.D:

Aimé is a Research Associate Professor in the CU Denver Department of Mathematics and Statistics, researching high-dimensional non-Gaussian spatial covariance for application in meteorology, and other topics, and teaches numerical analysis. He is also part-time at the MIT Earth Resources Lab, where he researches about physics-based risk assessment and decision analysis in extraction geophysics, and other topics.

Kin Seng Lai, '98 Ph.D:

Kin Seng has been heading a research laboratory in DSO (Singapore) working with several other young physicists in the R&D of good beam quality diode-pumped solid-state

lasers, including fiber and thin disk lasers.

Jack Challis, '09 Ph.D:

Jack Challis is Director of Knowledge Management at Elekta, a global radiation oncology hardware and software vendor. In this role, he prioritizes development in business intelligence and registry for cancer treatment. Jack is deeply interested in radiomics to personalize cancer treatment, the use of medical images as data rather than simply pictures to uniquely characterize tumors. If you are interested in how images can be used as data to accelerate treatment, please email him at jack@clincast.net. In his free time, Jack enjoys exploring Northern California with his wife Rachel and daughter Penelope.

Rongrong Ma, '14 Ph.D:

Rongrong joined the STAR experiment at the Brookhaven National Laboratory as a Goldhaber Fellow after graduation. His main research interest is to study the properties of the deconfined nuclear matter created in heavy-ion collisions. In particular, he is working on measuring the modifications to the production of various quarkonium states in the medium, utilizing the newly installed muon detector.

Nicole Larsen, '16 Ph.D:

In January 2016, Nicole joined the Kavli Institute for Cosmological Physics at the University of Chicago as a KICP Fellow. She is studying the Cosmic Microwave Background with the BICEP3 and Keck Array telescopes currently deployed at the South Pole. Additionally, she is working on site characterization for the planned next-generation CMB telescope, CMB-S4.

Alexandru Petrescu, '16 Ph.D:

Alex is a postdoctoral research associate in the Electrical Engineering Department at Princeton University.

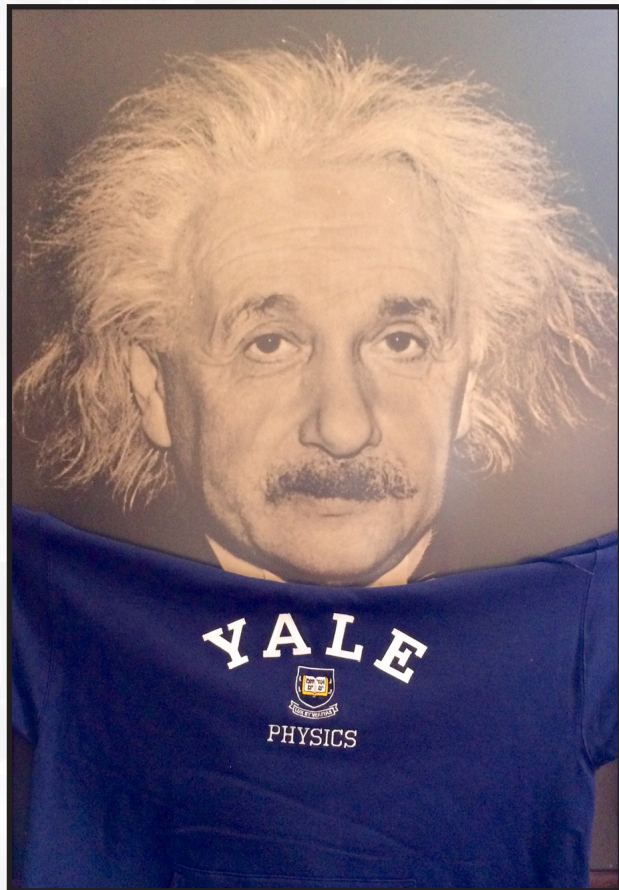
The Graduate School Alumni Board meets twice a year in New Haven to advise the Dean and the AYA alumni relations staff on how best to engage Graduate School alumni with Yale. GSAA leaders also work together to create their own projects to engage alumni, and play an active role in events held for Graduate School alumni in their local regions. For example, six of the GSAA Board serve on the Wilbur Cross Medal Selection Committee each year.

The Board has always had a disproportionately strong representation from Physics. Currently the following Physics Graduates serve on the Board:

Peter Andersen, '78 M.S
Faustin Carter, '15 Ph.D
Tom Curtis '68 Ph.D as Treasurer
Glen Hickey '74 Ph.D as Secretary

One of the most successful recent initiatives of the Board has been the establishment of the annual career mentoring workshop each May for students in all stages of graduate study – from first year to fifth year or more! Titled ‘*Where do I go from Yale?*’, this day-long workshop showcases a variety of career paths taken by graduate school alumni, in academia and beyond, in order to help graduate students at all levels think creatively about turning their Ph.Ds into meaningful careers. In May 2016, a powerful panel of over 50 speakers (with a strong emphasis on Yale Alumni) shared experiences, provided advice, and initiated introductions to assist graduate students. The feedback from students on this experience has been quite exceptional.

Should any more Physics Alumni be interested in nominating for the Board or assisting at the ‘*Where do I go from Yale?*’ workshop, the existing Board Members would be delighted to hear from them.



Yale Physics Hoodie Order Form

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Yale University Department of Physics
P.O. Box 208120
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