Annual Report of the Center for Nanophysics and Advanced Materials, University of Maryland

January 1 – December 31, 2014
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Awards/Fellowships

Johnpierre Paglione was appointed as member of the Canadian Institute for Advanced Research (CIFAR).

Talks

Anlage, Steven


“As Time Goes By, ’Backwards!,” Physics Colloquium, University of Crete, Heraklion, Crete, Greece, 16 October, 2014.

“Smaller, Faster, Colder: Superconducting Metamaterials,” Crete Center for Quantum Complexity and Nanotechnology Seminar, Physics Department, University of Crete, Heraklion, Greece, 16 October, 2014.

“Coherence and Transparency in rf SQUID Metamaterials,” Crete Center for Quantum Complexity and Nanotechnology Seminar, Physics Department, University of Crete, Heraklion, Greece, 14 October, 2014.


“As Time Goes By,” ‘Backwards!,” Electromagnetics Seminar Series, University of Waterloo, Waterloo Canada, 17 September, 2014


“The Anisotropic Nonlinear Meissner Effect – A New Superconducting Gap Node Spectroscopy,” NanoCore Research Institute, Physics Department, National University of Singapore, Singapore, 23 May, 2014

“Coherence and Collective Behavior in SQUID Metamaterials,” Invited talk at the 5th International Conference on Metamaterials, Photonic Crystals and Plasmonics, Nanyang Technological University, Singapore, 21 May, 2014

“Understanding Electromagnetic Properties of Complex Metallic Enclosures by Means of Wave Chaos,” Electromagnetic Effects Research Laboratory, EEE Department, Nanyang Technological University, Singapore, 20 May, 2014

“As Time Goes By, ’Backwards!,” Laboratory for Physical Sciences Seminar, College Park, MD, 23 April, 2014.


“Play It Again Sam, This Time Backwards!” Invited talk, NASA/Goddard Space Flight Center Scientific Colloquium, Greenbelt, MD, 10 January, 2014.

Appelbaum, Ian


Drew, H. Dennis


Greene, Richard L.

“What do electron-doped cuprates tell us about Cooper pairing in high-Tc superconductors,” NUSNNI Advances in Condensed Matter Physics Workshop, NUS Nanotechnology Institute, Singapore (January 2014).

“Topological Surface States in the Kondo Insulator SmB6,” NUSNNI Advances in Condensed Matter Physics Workshop, NUS Nanotechnology Institute, Singapore (January 2014).


Lathrop, Daniel

“Generating magnetic fields the way planets and stars do’. Balticon, Baltimore, Maryland, May 2014.

“Visualization and characterization of quantum fluid dynamics”. Dynamics Days Asia Pacific 08, Chennai, India, July 2014.

“Liquid sodium models of the Earth’s core”. SEDI, IUGG, Shonan Village Center, Kanagawa, Japan. August 2014.

Lobb, Christopher


Ouyang, Min


“Tailoring bottom-up nanostructure for new frontiers of ultrafast nano-optical physics,” Department of Chemistry, Tsinghua University, Beijing, 2014.
“Non-Centrosymmetric hybrid nanooligomers: LEGO synthesis and applications.” Department of Materials Science and Engineering, Beijing Institute of Technology, Beijing, 2014.


Paglione, Johnpierre


“Hybridization gap, metallic surface states and quantum transport in SmB6,” European Materials Research Society Fall Meeting, Warsaw, Poland, September 2014.


“Segregation of antiferromagnetism and superconductivity in Ca1-xLaxFe2As2,” 2nd International Conf. on Multi-Condensate Superconductors and Superfluids, Italy, June 2014.

“Separation of antiferromagnetism and high-temperature superconductivity in Ca1-xLaxFe2As2,” 13th International Ceramics Conference-6th Forum on New Materials, Italy, June 2014.

“Ferromagnetism and 1D edge state transport in SmB6,” Related Problems Workshop, Vancouver, Canada, May 2014.


“Toward True Topological Insulators,” University of California, Riverside, Riverside, CA, April 2014.


“Toward True Topological Insulators,” University of California, Los Angeles, Los Angeles, CA, February 2014.

Wellstood, Fred


Williams, James


Publications

Anderson, J. Robert


Anlage, Steven M.


Appelbaum, Ian


Greene, Rick L.

“Internal static electric and magnetic field at the copper cite in a single crystal of the electron-doped high-Tc superconductor,” Pr1.85Ce0.15CuO4−y, Guoqing Wu, F. Zamborszky, A. P. Reyes, P. L. Kuhns, R. L. Greene, and W. G. Clark, Phys. Rev. B 90, 214506 (2014).


Lathrop, Dan P.


Lobb, Christopher


Ouyang, Min


Paglione, Johnpierre


Wellstood, Fred

“Physics 261 Laboratory Manual”, Fall 2014 edition, F. C. Wellstood and S. Cowen, Department of Physics, University of Maryland.

“Physics 271 Laboratory Manual”, Fall 2014 edition, F. C. Wellstood and S. Cowen, Department of Physics, University of Maryland.


Williams, James


Grants

Anlage, Steven

National Science Foundation, “GOALI: Dynamically Tunable Low-Loss Active Metamaterials to Enhance Access to the Radio Spectrum,” 08/1/2012 – 07/30/2015, $474,999. Support for 2 graduate students. PI


Office of Naval Research, “Center for Applied Electromagnetics (AppEl) at the University of Maryland,” 03/01/2009-02/28/2014 $5,000,000. Support for one graduate student and one post-doc. PI

Appelbaum, Ian

National Science Foundation (NSF), “Harmonic detection of the Majorana fermion in narrow bandgap InAsSb”, $120,000 (PI, 6/14 - 5/15).


Drew, H. Dennis

NSF, Room Temperature Tunable Plasmonic-Enhanced Graphene Terahertz Photodetectors, $150,000 (2014)

NSF, THz Magneto-optical, Terahertz Photodetectors Invariants in Dirac, $157,000, (2014)

ONR, Materials and GaAs 2DEG, Graphene Plasmonics for THz photonics, $600,000 (2014)

DOE, Infrared Hall Effect in correlated electronic materials, $150,000 (2014)
Greene, Richard

Emergent quantum phenomena in topological Kondo insulators, NSF DMR 1410665, 7/31/14 to 7/31/17, $140K per year.

Exploration and Development of Advanced Superconducting Materials, AFOSR, 5/1/2014 to 4/30/19, approximately $400K per year (co-PI with Johnpierre Paglione).

Lathrop, Daniel

National Institute for Standards and Technology, "NIST Center for Nanoscale Science and Technology Cooperative Agreement," $15,000,000, January 2010 to December 2015. (P.I.)

National Science Foundation, EAR-1417148, "Experiments in the three meter diameter geodynamo model," $500,000, 2014 to 2017 (P.I.).


Lobb, Christopher

C. J. Lobb and F. C. Wellstood, National Institute for Standards and Technology, "NIST Center for Nanoscale Science and Technology Cooperative Agreement," $15,000,000, January 2010 to December 2015. (P.I.)

F. C. Wellstood and C. J. Lobb, Atomic Resolution Dual-Point Superconducting Phase STM, NSF 1409925, 2014-2015, $100,000 one year total funding.

National Science Foundation, EAR-1417148, "Experiments in the three meter diameter geodynamo model," $500,000, 2014 to 2017 (P.I.).


Coupling Networks for Superconducting Quantum Devices, 2014-2017, $1,438,011 four years total funding.

F. C. Wellstood and C. J. Lobb, Atomic Resolution Dual-Point Superconducting Phase STM, NSF 1409925, 2014-2015, $100,000 one year total funding.
Manucharyan, Vladimir

Co-PI, Physical Frontiers Center at the Joint Quantum Institute

Ouyang, Min

NSF MRI Grant 1228957 (co-PI): $345,800
DOD ONR Grant N000141410328 (single PI): $499,659
DOE BES Grant DESC0010833 (single PI): $389,392
NSF DMR1307809 Grant (single PI): $391,640
Research Corporation for Science Adv., Scialog Program 22382 (single PI): $100,000
DOD ONR Grant 16689855 (single PI): $431,244
DOD ONR N000140710787 P00005 Grant (single PI): $84,225
NSF DMR0547194 Grant (single PI): $500,000
NSF MRI 0619191 Grant (co-PI): $500,000
DOD ONR N000140710787 Grant (single PI): $374,773
Beckman Foundation 0609259093 Grant (single PI): $300,000
NSF MRSEC Seed Grant (single PI): $48,000
Sloan Foundation BR4615 Grant (single PI): $45,000
ORAU 0605017971 Grant (single PI): $10,000

Paglione, Johnpierre

2013-14 ARO-STIR (lead PI): Nonequilibrium Floquet States in Topological Kondo Insulators
2010-15 NSF-CAREER: MilliKelvin Magnetic Field-Angle-Resolved Probe of Quantum Materials
2009-14 AFOSR-MURI (co-PI): Broad-Based Search for New and Practical Superconductors

2012-17 NIST (co-PI): NCNR / University of Maryland Center for the Advancement of Neutron Scattering

2013-14 ARO-STIR (lead PI): Nonequilibrium Floquet States in Topological Kondo Insulators

Wellstood, Fred

"Magnetic Field Imaging for Stacked Chip 3D Fault Isolation", with A. Orozco (Neocera) and F. Wellstood, IARPA subcontract from Neocera, 12/2010 to 11/2014, approx. $200k to $230k/year


<table>
<thead>
<tr>
<th>Date</th>
<th>Speaker</th>
<th>Institution</th>
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<tbody>
<tr>
<td>September 4</td>
<td>Kyle Shen</td>
<td>Cornell</td>
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<tr>
<td>September 11</td>
<td>Tyrel McQueen</td>
<td>Johns Hopkins</td>
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<tr>
<td>September 18</td>
<td>Leonid Rokhinson</td>
<td>Purdue</td>
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<td>September 25</td>
<td>Javad Shabani</td>
<td>UCSB</td>
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<tr>
<td>October 2</td>
<td>Vidya Madhavan</td>
<td>University of Illinois, Urbana-Champaign</td>
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<tr>
<td>October 9</td>
<td>Andrew Wray</td>
<td>NYU</td>
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<tr>
<td>October 16</td>
<td>Dan Dougherty</td>
<td>NC State</td>
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<td>October 23</td>
<td>Milton Cole</td>
<td>Penn State</td>
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<tr>
<td>October 30</td>
<td>Mike Lilly</td>
<td>Sandia National Lab</td>
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<tr>
<td>November 6</td>
<td>David Hsieh</td>
<td>CalTech</td>
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<tr>
<td>November 13</td>
<td>Alexey Bezryadin</td>
<td>University of Illinois</td>
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<tr>
<td>November 20</td>
<td>Andrea Damascelli</td>
<td>University of British Columbia</td>
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<tr>
<td>December 11</td>
<td>Nadya Mason</td>
<td>University of Illinois</td>
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<tr>
<td>January 30</td>
<td>Jake Koralek</td>
<td>Lawrence Berkeley National Lab</td>
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<tr>
<td>February 6</td>
<td>Andrew M. Rappe</td>
<td>University of Pennsylvania</td>
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<tr>
<td>February 20</td>
<td>Arkady Shekhter</td>
<td>Los Alamos National Lab</td>
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<tr>
<td>February 27</td>
<td>Aditi Mitra</td>
<td>New York University</td>
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<tr>
<td>March 13</td>
<td>Ivar Martin</td>
<td>Los Alamos National Lab</td>
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</table>
March 27        Angela Kou, Yale University  
April 3         Steven Anlage, University of Maryland  
April 10        Kathryn Krycka, NIST Center for Neutron Research  
April 17        Brad Ramshaw, Los Alamos National Lab  
April 24        Jonathan Denlinger, Lawrence Berkeley National Lab  
May 1           Chris Marianetti, Columbia University  
May 8           Dmitry Abanin, Perimeter Institute
Personnel

Faculty

J. Robert Anderson
Steven Anlage
Ian Appelbaum
H. Dennis Drew
Richard Greene
Daniel Lathrop
Christopher Lobb, Director
Vladimir Manucharyan
Min Ouyang
Johnpierre Paglione
Frederick Wellstood
Ellen Williams
James Williams

Research Scientists

William Cullen
Binhui Hu
Greg Jenkins
Pengke Li
Don Martin
Shanta Saha
Don Schmadel
Andrei Sushkov
R.D. Vispute

Faculty Affiliates

Nicholas Butch
John Cumings
Michael Dreyer
Liangbing Hu
Bruce Kane
Sang Bok Lee
Kevin Osborn
Ben Palmer
Raymond Phaneuf
Efrain Rodriguez
Lourdes Salamanca-Riba
Lawrence Sita
Charles Tahan
Ichiro Takeuchi
Edo Waks
Research Associates

Wenzhong Bao
Benjamin Cooper
Tim Corrigan
Rami Dana
Lei Fang
Tieren Gao
Li Geng
Sergey Gladchenko
Jianxiao Gong
Brian Hemingway
Jared Hertzberg
Joshua Higgins
Halyna Hodovanets
Jia Huang
Ye-Ping Jiang
Hyun Soo Kim
Myoung-Hwan Kim
Sung Kyoung Kim
Arron Gilad Kusne
Pengke Li
Shingo Maruyama
Yasuyuki Nakajima
Tiberiu Onuta
Aruma Ramanayaka
Jenn Robinson
Yaniv Rosen
Johgmoon Shin
Tim Stacey
Micah Stoutimore
Santiago Triana
Kefeng Wang
Limin Wang
Pengpeng Wang
Xiangfeng Wang
Yiming Wu
Waltraut Wustmann
Peng Xu
Jen-Hao Yeh
Jia Yong
Xiaohang Zhang
Daniel Zimmerman
## Graduate Students

Matthew Adams  
Paris Alexander  
Brandon Anderson  
Ryan Artuso  
Huizhi Bai  
Andrew Ballard  
Cody Ballard  
John Bavier  
John Biddle  
Rangga Budoyo  
Kristen Burson  
Xinghan "Harold" Cai  
Shaon Chakrabarti  
Meng Cheng  
Benjamin Cooper  
Joyce Coppock  
Stephen Daunheimer  
Jasper Drisko  
Tyler Brunson Drye  
Jonathon Duay  
Sean Fackler  
Kristy Gaff  
Anirban Gangopadhyay  
Eleanor Gillette  
Shilpi Goyal  
Lauren Graham  
Michelle Groce  
Zhe Gui  
Micah Hawkins  
Jack Hellerstedt  
Amber Hopkins  
Junkai Hu  
Hoi Yin Hui  
Chaun Jang  
Alex Jeffers  
Khim Karki  
Moe Khalil  
Dohun Kim  
Hyun Kim  
Kevin Kirshenbaum  
Tomek Kott  
Kwan Lee  
Jing Li  
Kai Li  
Liang Li  
Qiuzi Li  
Chien-Hung Lin  
Qiang Liu  
Shule Liu  
Zhiyue Lu  
Dibyendu Mandal  
David Meichle  
Joseph Mitchell  
Pavel Nagomykh  
Hanna Nilsson  
Hans Nordsiek  
Sergey Novikov  
Oliver Oberg  
Myunghwan Park  
Ayoti Patra  
Paul Patrone  
Sergey Pershoguba  
Jinglei Ping  
Juraj Radic  
Rick Remsing  
Chad Ropp  
Anita Roychowdhury  
Luz Sanchez  
Bahman Sarabi  
Nicole Schneck  
Da Song  
Jaeehee Song  
Deepak Sridharam  
Nat Steinsultz  
Rich Suchoski  
Baladitya Suri  
Paul Syers  
Biniyam Taddese  
Tamin Tai  
Ted Thorbeck  
Jeremy Ticey  
Jacob Tosado  
Shu-ju Tsai  
Kristen Voigt  
Norvik Voskanian  
Yi Wang  
Lin Weng  
Justin Wilson  
Shudong Xiao  
Mahito Yamamoto  
Jen-Hao Yeh  
Vitaley Zaretskey  
Steve Ziemak