Physics@PennState:
2015-2016

(Physical Review Letters)

(LIGO detects gravitational waves!)

(Science Advances)

(Nature Nanotechnology)
Our mission

- Advancing the frontiers of knowledge through influential fundamental discoveries about the universe
- Training students to develop into future leaders of science, technology and society
- Sharing our advances in knowledge and understanding with the local community and beyond
New Faculty: 2016

Prof. B. S. Sathyaprakash (Cardiff): Gravity
Prof. Carmen Carmona (UCSB): dark matter 
Prof. Luiz DeViveiros (UCSB): dark matter & neutrinos 
Prof. Cui-zu Chang (MIT): topological quantum matter 
Prof. Randall Mcentaffer (Iowa): x-ray astronomy 
Dr. Michael Smitka (Texas A&M): lecturer 

& Postdocs: 
Rajan Modak (AMO theory) 
Youjian Tang (CM theory)
The Graduate Class of ~2022

Wuqiong Chai (Wuhan, China)
Edgar Dimitrov (UC-Berkeley)
Ding Ding (Lanzhou, China)
Garrett DuCharme (Univ. Illinois-UC)
Kaifei Kang (Xian Jiaotong, China)
Lev Krainov (Moscow Institute of Physics & Tech)
Lizhong Li (PKU, China)
Valerie Lindner (PSU)
Mingzu Liu (Tsinghua, China)
Jiali Lu (USTC)
Ryan Magee (Washington State)
Jeffrey Rable (UPenn)
Jordan Rozum (Univ. Illinois-UC)
Aakash Sarkar (IISER, India)
Jonathan Schirmer (UNC-Chapel Hill)
Martinus Van Kuppeveld (Radboud Univ., Netherlands)
Run Xiao (USTC, China)
Chengchao Yuan (Nanjing, China)
Tongzhou Zhao (USTC, China)
Yifan Zhao (Shandong, China)
Fan Zou (Shanghai Institute of Optics)
Research: how are we doing?

Thomson-Reuters
(“Penn State Univ SAME Dept Phys” + corrections)
Research impact

Thomson-Reuters
(“Penn State Univ SAME Dept Phys” + corrections)
Discoveries: 2015/2016

~410 publications, including:
• Physical Review Letters & PRX (27)
• Physical Review A thru E (75)
• Science (1), Science Advances (3)
• Nature Communications, Chemistry, Materials, Nanotechnology, Photonics, Physics (21)
• 20 “highly cited” papers
• 6 “HOT papers” (!)
According to the Thomson-Reuters Web of Science, there are 23 “hot papers” published from Penn State University from 2014-2016. Of these, 9 are from Physics. Benchmark: Princeton (physics) 23, Illinois (physics) 23.
Advertising our discoveries

Science Advances

Ultrasensitive sensor using N-doped graphene

New, better way to build circuits for world’s first useful quantum computers

27 June 2016

The era of quantum computers is one step closer as a result of research published in the current issue of the Journal Science. The research team has devised and demonstrated a new way to pack a lot more quantum computing power into a much smaller space and with much greater control than ever before. The research advance, using a 3-dimensional array of atoms in quantum states called quantum bits -- or qubits -- was made by David S. Weiss, professor of physics at Penn State University.

The research team led by David Weiss at Penn State University.

Physical Review Letters

New clues in the hunt for the sources of cosmic neutrinos

18 February 2016

The sources of the high-energy cosmic neutrinos that are detected by the IceCube Neutrino Observatory buried in the Antarctic ice may be hidden from observations of high-energy gamma rays, new research reveals. These high-energy cosmic neutrinos, which are likely to come from beyond our Milky Way Galaxy, may originate in incredibly dense and powerful objects in space that prevent the escape of the high-energy gamma rays that accompany the production of neutrinos. A paper describing the research will be published in the early online edition of the journal Physical Review Letters on February 18, 2016.

"Neutrinos are one of the fundamental particles that make up our universe," said Kohta Murase, assistant professor of physics and of astronomy and astrophysics at Penn State and the corresponding author of the studies. "High-energy neutrinos are produced along with gamma rays by extremely high-energy radiation known as cosmic rays in
Research funding

Faculty Participation Awards (M$)

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Research funding

$1M MRI grant:
Cyber-laboratory for Astronomy, Materials & Physics
“CyberLAMP”
Cowen, Ford, Kandemir, Van Duin

NEW FUNDING OBTAINED FOR GPU CLUSTER

The Penn State IceCube group is partnering in new large GPU-centric cluster, the Cyber-Laboratory for Astronomy, Materials and Physics (CyberLAMP), funded by the NSF MRI program. D. Cowen is a co-PI for CyberLAMP, a $1M-scale compute cluster emphasizing the use of GPUs for scientific applications.

Center for Atomically Thin Multifunctional Coatings
Materials & Physics
“ATOMIC”
Terrones, Robinson

13 companies; $1M/year
NSF funds national user facility for $17.8 million to develop 2-D crystals

Redwing, Crespi, Samarth, Hudson, Robinson
Faculty Promotions, Awards & Honors

- Abhay Ashtekar: National Academy of Sciences
- Reka Albert: Hungarian Academy of Sciences
- Kohta Murase: Physical Society of Japan Young Scientist Award
- Kin Fai Mak: AFOSR Young Investigator
- Michael Rechtsman: Sloan Fellow
- Mauricio Terrones: Faculty Scholar Medal
- Chad Hanna: Freed Career Development Professorship
- Marcos Rigol: promotion to professor
- Kirstin Purdy-Drew, Dan Costantino: promotion to senior lecturer
The Breakthrough Prize(s)

Penn State scientists share in Special Breakthrough Prize in Fundamental Physics

Penn State part of team that wins 2016 Breakthrough Prize in Fundamental Physics
Graduate Awards & Honors

- Graduate TA Award: Michael Bell, James Delaunay, Shafat Mubin, Lavish Pabbi
- Stan Shepherd Teaching Award: Sumithra Surendralal
- Peter Eklund Award for Scientific Communication: Aruna Kesavan, Mark Dellostrito
- POSGSR: Kelly Malone, Mark Dellostrito
- Helmholtz Alliance: Alan Coleman
- Chateaubriand STEM Fellow: Alan Coleman
- PSU Alumni Association Dissertation Award: Ajit Balram

Physics has won this award every year from 2005-2012, 2014, 2016
Undergraduate Awards & Honors

- Melissa Quinnan: NSF graduate fellow, David Bohm award (UCSB)
- Jacob Wisser: Goldwater Scholar, IUG program (Stanford)
- Valerie Lindner: Physics Student Marshall, Phys, Astro, Math (PSU)
- Kamaljeet Dhiman: Ardith & Norman Frisbey Award
- Sylvia Biscovenau: Goldwater Scholar, Astronaut Scholarship
- Grant Smith: Goldwater Scholarship (honorable mention)
Thanks to all staff!

- Amy Homan (2014 ECoS staff excellence award)
- Jennifer Callahan, Melissa Diamanti, Kaylee Harter, Darlene Miceli, Mary McMonagle, Juli Mortimore, Denise Patton, Randi Neshteruk, Karin Straw, Jerie Ann Zitek.
- Randy Penn, Paul Lucas, Ryan Jabco, Tim Treaster.
Reaching out to alumni

- **Physics Affiliate Program Group:** Dr. Jim Kadtke, Prof. Danielle Bassett, Dr. Steve Shope, Walt Dunkle, Joel Dobson
- **Purpose:**
  - Promote fellowship and communication among the alumni, faculty and students.
  - Promote the professional development of all graduates of the Physics Program.
  - Promote the continued support of these graduates for both the Physics Program and the Eberly College of Science.
  - Provide advice and support to the leadership of the Dept. of Physics, as requested.
  - Conduct outreach to the public, industry, and other organizations to promote the Physics Dept., as requested by Dept. leadership.
Looking Ahead

- External review of department on October 31 & November 1. We will be contacting graduate students, postdocs and undergraduate students to meet with committee.
- How do we further enhance the excellence of our overall educational mission?
- How do we further improve the experience of our graduate and undergraduate students, and postdocs, and help them in their future careers?
- How do keep improving our diversity?
- How do we take the next “quantum jump” in our research presence and reputation? [NRC: #11, USNews: #23]