



# DEPARTMENT OF PHYSICS AND ASTRONOMY



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## OUT AND ABOUT

**Alice Bean** has returned from her yearlong *Jefferson Science Fellowship* in Washington, DC where she worked on issues of climate change, in interactions with religious organizations and the State Department. Alice runs a blog at <http://www.huffingtonpost.com/alice-bean/>

Graduate student **Samuel Boren** participated in the *WE-Heraeus Physics School: Diffractive and Electromagnetic Processes at High Energies* in Bad Honnef, Germany from August 17-21.

**Gopolang Mohlabeng** gave several talks on his research entitled by "Boosted Dark Matter enhanced with Self-Interactions", at *Princeton University* (May 12), *Technische Universitet Munich*, Munich, Germany (June 30), *Universite Catholique de Louvain*, Louvain la neuve, Belgium (July 7) and *Fermilab* (August 27).

**Prof. Kong** gave two talks on "Model-Independent Production of a Top-Philic Resonance at the LHC" and "MadDM: A Novel Dark Matter Tool in the LHC Era", at the Meeting of the *Division of Particles and Fields of the American Physical Society* (August 4-8, 2015), University of Michigan, Ann Arbor, MI and *IX International Conference on Interconnections between Particle Physics and Cosmology*, Deadwood, SD, respectively.

**Michael Murray and James Bowen** (Lieutenant Commander US Navy) in collaboration with *The Commons* hosted a showing of the film "The Man who Saved the World". This film tells the story of a Russian Missile officer who refused to launch nuclear missiles at the US when Russian satellite data indicated (falsely) that American missiles were headed towards Russia. There was a very interesting discussion afterwards.

**Michael Murray** working with Michael Lemon and Alice Dale of the Health Physics group organized a class for the *Boy Scout Nuclear Science Merit Badge*. Twenty two scouts had a great time learning about the nucleus and radioactivity. They even got to play with cloud chambers. A great time was had by all.

A busy summer: **Prof. Steve Hawley** spoke at the 180th commencement at *Wheaton College* in Norton, MA on May 16. On May 30 Prof. Hawley presented Dr. John Grunsfeld (NASA Associate Administrator for the Science Mission Directorate) for induction into the *US Astronaut Hall of Fame* at the Kennedy Space Center, FL. Prof. Hawley was an invited participant in several meetings on NASA's future plans held in Washington, D.C. from June 7 - 9. The schedule included discussions with Administrator Charlie Bolden and a short meeting with President Obama and Science Advisor John Holdren. On July 16, Prof. Hawley gave the keynote address at the *Youth Civic Leadership Institute* sponsored by the *Dole Institute of Politics*.

**Doug McKay** gave the talk "Non-standard interactions, light sterile neutrinos and the LSND anomaly" and was Discussion Leader for the session "Sterile Neutrinos" at the *CETUP\* Workshop on Neutrinos and Beyond the Standard Model Physics* at Lead, S.D., July 5 - 17, 2015. \*Center for Experimental and Theoretical Underground Physics, associated with the Homestake Mine neutrino and geophysics experimental facilities.

The paper "A link between solar events and congenital malformations: Is ionizing radiation enough to explain it?" (Andrew Overholt, KU Ph.D. 2013, and **Adrian Melott**), previously reported here, was one of three papers in the field of geophysics selected (Editor's Choice) in *Space Weather* to be highlighted for the first quarter of 2015. This was followed by a KU press release on July 20, and international news coverage, for example by *Daily Mail.com* <http://www.dailymail.co.uk/sciencetech/article-3168594/Can-sun-cause-birth-defects-Earth-Study-finds-strange-link-cosmic-rays-mutant-cell-changes-humans.html>

**Prof. Melott** was one of the proposers and organizers of what grew to be three sessions on Radiation and Habitability for the *ABSCICON 2015* meeting in Chicago, June 15-20. He presented the opening introductory talk at one of the sessions entitled "Ionizing Radiation Episodes and the Evolution of Complex Life".

**Michael Murray** gave a presentation entitled "Eve in the Mind of God", at the *Genius of Women* festival at the Kansas Union in April. The presentation was a reflection on Michelangelo's "Creation" in the Sistine Chapel. In a closely related activity, he presented CMS results on photon-nucleus collisions at the *Conference on Hard Probes* in Montreal in July.

**Gregory Rudnick** Spent the month of June working at *the Max-Planck-Institute for Astronomy* in Heidelberg, Germany. He spent the month of July working at the *Hamburg Observatory* in Hamburg, Germany. He gave a colloquium there entitled, "The Transformation of Galaxies in Dense Environments over Cosmic Time". Both of these visits were to work with colleagues on understanding the gas content of high redshift galaxies. Gregory is now on his sabbatical in Munich. He will be working at

both *the Max-Planck-Institute for Extraterrestrial Physics* in Garching and at the *European Southern Observatory*.

**Prof. S. Shanadarin** attended an International meeting *1st Roman Juskiewicz Symposium: 'Non-linear Universe'*, Warsaw Poland, Aug. 24-28, 2015 as an invited speaker with a talk "Multi-stream portrait of the cosmic web".

**Prof Tapia Takaki** gave three invited plenary talks: "AA collisions at the LHC " at *New Directions in Nuclear Deep Inelastic Scattering in at the European Centre for Theoretical Studies in Nuclear Physics and Related Areas* in Trento, Italy from June 8-12; "Heavy Ion Physics in AA(pA) and eA in high energies" at the *LHeC workshop* at CERN and Chavannes-de-Bogis, Switzerland from 25-26 June; and "Review on experimental heavy-ion physics" at the *16th Conference on Elastic and Diffractive Scattering* (EDS Blois) in Borgo, Corscia from 29 June to 4 July.

**Professor Hui Zhao** presented an invited talk, "Ultrafast Electron Transport in and between Two-Dimensional Materials", on *International Conference on Materials for Advanced Technologies* (June 29 - July 3, Singapore) and two lectures on *Summer School of Physics and Device Applications of Two-Dimensional Materials* organized by Peking University (Beijing, July 6-10).

## AWARDS

Physics major **Peter Bradshaw**, Wichita has been inducted into the honorary *Phi Beta Kappa* here at KU.

**Prof. Hawley** was awarded an honorary Doctor of Science degree by *Wheaton College*. He has also been selected to receive the 2015 Communication and Leadership Award from District 22 of *Toastmasters International*. Also, Prof. Hawley was awarded a *Commendation by NASA* for innovative contributions as a member of the *Hubble Space Telescope Astronaut Team*.

High-energy physics graduate student **Gopolang Mohlabeng** has been awarded a *Fermilab Graduate Research Fellowship*. Each year only 2-5 students nationwide are selected for this \$30,000 a year stipend. He will be staying at Fermilab for one year 2015-2016, working in the Theoretical Astrophysics and Theoretical Physics Departments.

Welcome to **Christophe Royon**, who joins the department as a *Foundation Distinguished Professor*, and **Samuel Lane**, a new graduate student and *Self Fellow*. This KU fellowship has a four-year value of \$165,000.

## RECENT PUBLICATIONS

Boosted dark matter signals uplifted with self-interaction, **Kyoungchul Kong, Gopolang Mohlabeng, Jong-Chul Park**, *Physics Letters B* 743 (2015) 256-266

Model-independent production of a top-philic resonance at the LHC, Nicolas Greiner, **Kyoungchul Kong, Jong-Chul Park**, Seong Chan Park, Jan-Christopher Winter, *Journal of High Energy Physics* 1504 (2015) 029

Dark Matter Directionality Revisited with a High Pressure Xenon Gas Detector, **Gopolang Mohlabeng, Kyoungchul Kong**, Jin Li, Adam Para, Jonghee Yoo, *Journal of High Energy Physics* 1507 (2015) 092

A Review on Non-Minimal Universal Extra Dimensions, Thomas Flacke, **Kyoungchul Kong**, Seong Chan Park, *Modern Physics Letters A*, Vol. 30, No. 5 (2015) 1530003

New Physics with ultra-high energy neutrinos, D. Marfatia, **D.W. McKay** and T.J. Weiler, *Physics Letters B* 784, 113 (2015).

Haines, McIntosh, Sánchez, Tremonti, and **Rudnick**, "Testing the modern merger hypothesis via the assembly of massive blue elliptical galaxies in the local Universe", 2015, *MNRAS*, 451, 433

**Prof. S. Shandarin** and **Nesar Ramachandra** (2015) Multi-stream portrait of the cosmic web, *Monthly Notices of the Royal Astronomical Society* 452, 1643

**Prof. S. Shandarin** (2015) The Phase-Space Structure of Cold Dark Matter in the Universe, in *Proceedings of the Marcel Grossmann Meeting on General Relativity*, Stockholm University, Stockholm, Sweden, Eds. R.T. Jantzen, K. Rosquist, R. Ruffini, World Scientific, 2015, Part C, p. 2133.

**Matthew Z. Bellus, Frank Ceballos, Hsin-Ying Chiu, and Hui Zhao**, Tightly Bound Trions in Transition Metal Dichalcogenide Heterostructures, *ACS Nano* 9, 6459-6464 (2015).

**Jiaqi He, Dawei He, Yongsheng Wang, Qiannan Cui, Matthew Z. Bellus, Hsin-Ying Chiu, and Hui Zhao**, Exceptional and Anisotropic Transport Properties of Photocarriers in Black Phosphorus, *ACS Nano* 9, 6436-6442 (2015).

**Jiaqi He, Dawei He, Yongsheng Wang, Qiannan Cui, Frank Ceballos, and Hui Zhao**, Spatiotemporal Dynamics of Excitons in Monolayer and Bulk WS<sub>2</sub>, *Nanoscale* 7, 9526-9531 (2015).

## PROPOSALS FUNDED

**Gregory Rudnick** (co-PI) at NSF Astronomy "Collaborative Research: The GOGREEN Survey - Caring about the Environment". With UC Riverside and UC Irvine. The KU portion of this 3-year grant is \$347,556.

**Gregory Rudnick** (Co-I), Hubble Space Telescope proposal "Direct Imaging of Galactic Winds in Extreme Starburst Galaxies".

## ALUMNI NEWS

*ABSCICON 2015* featured three talks by departmental alumni on June 17 in Chicago.

**Brian Thomas** (Ph.D. 2005): "Solar Irradiance Changes and Photobiological Effects at Earth's Surface Following Astrophysical Ionizing Radiation Events". **Dimitra Atri** (Ph.D. 2011): "Biological Radiation Dose from Astrophysical Sources". **Drew Overholt** (Ph.D. 2013): "A Link between Solar Events and Congenital Malformations: Is Ionizing Radiation Enough to Explain It?"

A former theory postdoc, **Dr. Jong-Chul Park**, is now a faculty member in *Chungnam University*, Korea.

**DEPARTMENT NEWSLETTER--CALL FOR ITEMS:** Please send your items to Adrian Melott (melott@ku.edu). It's a lot easier to use them if you make them editor-ready: Group them according to the kind of item. Use plain text or Word. Don't number them. Don't say "I visited the Sheboygan Zoo." Use your name (third person). Etc....

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