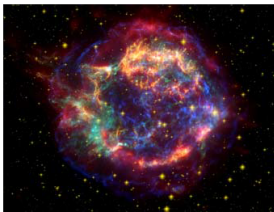




DEPARTMENT OF PHYSICS AND ASTRONOMY



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When Stars Attack! In Search of Near-Earth Supernova Explosions

Brian Fields

*University of Illinois,
Urbana-Champaign*

**Monday,
April 18, 2016
7:30 p.m.**

Woodruff Auditorium
Kansas Union
1301 Jayhawk Blvd.
Lawrence, KS 66045



The most massive stars are the celebrities of the cosmos: they are very rare, but live extravagantly and die in a spectacular and violent supernova explosions. While these events are awesome to observe, they can take a more sinister shade when they occur closer to home, because an explosion inside a certain "minimum safe distance" would pose a grave threat to Earthlings. We will discuss these cosmic insults to life, and ways to determine whether a supernova occurred nearby over the course of the Earth's existence. We will then present recent evidence that a star exploded near the Earth about 3 million years ago. Radioactive iron atoms have been found in ancient samples of deep-ocean material, and are likely to be debris from this explosion. These data the first time allow sea sediments to be used as a telescope, probing the nuclear fires that power exploding stars. Furthermore, an explosion so close to Earth was probably a "near-miss," which emitted intense and possibly harmful radiation.

About Professor Brian Fields:

Brian Fields is a professor of Astronomy and of Physics at the University of Illinois, and the Astronomy department Chair. His PhD is from the University of Chicago, and he has been at Illinois since 1998. Prof. Fields is fascinated by the "inner space/outer space" connections that link the science at the smallest and largest scales. His research focuses on the highest-energy sites in nature--the big bang, exploding stars (supernovae), and high-energy particles in space (cosmic rays).

Department of Physics and Astronomy Public Event

For more information: <http://physics.ku.edu> 785-864-4626 physics@ku.edu

OUT AND ABOUT

Prof. Kong gave two colloquium talks, entitled by "Search for New Physics at the LHC Run II", at the *Wichita State University* (March 2) and at *Yonsei University*, Korea (March 23). He gave a public talk on "Implication of Modern Physics and Future" at *Pusan National University* (March 17), and a series of lectures on collider physics at *Yonsei University* (March 21 - April 1).

Prof. Melott's *Nature* news article (cited below) generated more than 110 press/website/blog hits worldwide. He provided direct telephone interviews to *New Scientist*, *Discovery Channel*, *Atlantic magazine*, *PBS News Hour*, *Physics World (UK)*, and *Gizmodo*.

Prof. Kong's recent paper in *Physical Review Letters* is highlighted with an editor-written synopsis (Editorial: Theorists React to the CERN 750 GeV Diphoton Data). <http://physics.aps.org/synopsis-for/10.1103/PhysRevLett.116.151805>

Gopolang Mohlabeng gave a theory seminar on "Mixed Dark Matter in Left-Right Symmetric Models" at *Argonne National Laboratory* (March 8). He was one of invited students to 2016 HEP trip to Washington DC, where they met with members of Congress and their staff, key committees and representatives of the DOE and NSF, to talk about particle physics and his research. He visited 15 offices from both the *Senate* and *House of Representatives*.

On January 7 **John Ralston** presented an invited plenary talk, "The Puzzle Not About the Proton Size: And It Might Be New Physics" at the *6th International Workshop on High Energy Physics in the LHC Era*, held in Valparaiso Chile January 6-12. Ralston also visited the *Pontificia Universidad Católica de Chile* in Santiago after the meeting.

Gregory Rudnick has transitioned in his sabbatical from the *Max-Planck-Institute for Extraterrestrial Physics* in Garching, Germany to the *European Southern Observatory* in the same city, where he will be working until the end of June. Gregory gave an invited institute seminar at *CEA, Saclay* in the astrophysics division. The title of his seminar was "The lifecycle of galaxies in clusters over the last 10 billion years."

2016 -MID-AMERICA REGIONAL ASTROPHYSICS CONFERENCE

(MARAC) was held in Kansas City on the UMKC campus on Fri/Sat April 8/9. Included in a full schedule of research presentations and posters over the 1.5 day meeting were 10 from Departmental faculty, postdocs, and students, including:

Transformative Properties of Galaxy Environments

Desjardins, Tyler; Rudnick, Gregory

The Galaxy Age/Mass Relation in a z=1.62 Cluster

Lee-Brown, Donald; Rudnick, Gregory

Death from the Skies

Melott, Adrian

Merger Fractions in Intermediate Redshift EDisCS Clusters

Deger, Sinan; Rudnick, Gregory

Galaxy Evolution: Building the Passive Fraction of EDisCS Clusters

Mann, Justin

Title Pickup Ions in the Plasma Environments of Mars, Comets, and Enceladus

Cravens¹, T.E.; Rahmati¹², A.; Madanian¹, H.; Sakai⁴, S.; Larson³, D.; Halekas⁴, J.; Goldstein⁴, R.; Burch⁴, J.

University of Kansas¹; University of California Berkeley²; University of Iowa³; SWRI⁴

Electron energetics in the Martian dayside ionosphere: Model comparisons with MAVEN data

Sakai¹, Shotaro; Andersson², Laila; Cravens¹, Thomas E.; Mitchell³, David L.; Mazelle⁴, Christian; Rahmati³, Ali; Fowler², Christopher M.; Bougher⁵, Stephen W.; Eparvier², Francis G.; Fontenla⁶, Juan M.; Mahaffy⁷, Paul R.; Connerney⁷, John E. P.; Jakosky², Bruce M.

University of Kansas¹; LASP, University of Colorado Boulder², SSL, University of California³; IRAP, CNRS⁴, University of Michigan⁵; NorthWest Research Associates⁶; NASA Goddard Space Flight Center⁷

Observations of Titan's Ionospheric Densities over the 10 Year Time Period of the Cassini Mission

Madianian¹, Hadi; Cravens¹, Tom; Richard², Matthew; Waite³, Hunter; Edberg⁴, Niklas; Westlake⁵, Joe; Wahlund⁴, Jan-Eric

University of Kansas¹; Benedictine College²; Southwest Research Institute³; Swedish Institute of Space Physics⁴; Johns Hopkins University Applied Physics Lab⁵

Li Evolution Within the Old Open Cluster, NGC 6819

Deliyannis¹, Constantine P.; Anthony-Twarog², Barbara J.; Lee-Brown², Donald; Twarog², Bruce A.

University of Indiana¹; University of Kansas²

WIYN Open Cluster Study: Lithium in Red Giants of the Open Cluster NGC 2158

Krolikowski¹, Daniel M.; Steinhauer¹, Aaron J.; Deliyannis², Constantine P.;

Twarog³, Bruce A.; Anthony-Twarog³, Barbara J.

State University of New York, College at Geneseo¹, University of Indiana², University of Kansas³

Also presenting their research on **Death from the Skies? Or... Not so much?** and **VHS J125601.92-125723.9B: A Cloudy, Low-Mass Brown Dwarf in a Hierarchal Triple System** were Dr. Brian Thomas, (PhD 2005) now a professor at Washburn, and Evan Rich, undergraduate alumnus from 2013, now a graduate student in astronomy at the University of Oklahoma. respectively.

AWARDS

Congratulations to **David Gier**, who was awarded an *NSF Graduate Research Fellowship*, and to **Brent Cook**, who received Honorable Mention in this Program.

Undergrad physics majors **Bille Lubis** and **Mariana Sanchez Vasquez** have been selected for prestigious undergraduate research programs this summer. Lubis will travel to Geneva Switzerland to work with the *ATLAS group*. Sanchez Vasquez will travel to *Duke University* to do energy-related research. All expenses will be paid by the sponsors, who also provide a generous stipend.

Congratulations again to **Prof. Greg Rudnick**, who received KU's *University Scholarly Achievement Award* for outstanding research contributions.

Physics and astronomy graduate students **John Craig Martens** and **Donald Lee-Brown** have been chosen to attend the *66th Lindau Nobel Laureate Meeting* this summer in Lindau, Germany. The U.S. delegation will include about 55 young scientists. The award, sponsored by the *National Science Foundation*, includes travel expenses, registration and pre-event programming. The six-day meeting, dedicated to physics, features in-depth exchanges with more than 30 Nobel laureates.

Gopolong Mohlabeng received 2016-2017 Department of Physics and Astronomy and KU Graduate Studies *Dissertation Fellowship* to fund the completion of his dissertation research. The title of his proposal was "A Hunt for New Physics Beyond the Electro-Weak Scale".

RECENT PUBLICATIONS

H. K. Xu, C. Song, W. Y. Liu, G. M. Xue, F. F. Su, H. Deng, Ye Tian, D. N. Zheng, **Siyuan Han**, Y. P. Zhong, H. Wang, Yu-xi Liu, and S. P. Zhao, Coherent population transfer between un- or weakly-coupled states in ladder-type superconducting Qutrits, *Nat. Comm.* 7, 11018 (2016)

Ming Gong, Xueda Wen, Guozhu Sun, Dan-Wei Zhang, Dong Lan, Yu Zhou, Yunyi Fan, Yuhao Liu, Xinsheng Tan, Haifeng Yu, Yang Yu, Shi-Liang Zhu, **Siyuan Han**, and Peiheng Wu, Simulating the Kibble-Zurek mechanism of the Ising model with a superconducting qubit system, *Sci. Rep.* 6, 22667 (2016).

Ming Gong, Yu Zhou, Dong Lan, Yunyi Fan, Jiazheng Pan, Haifeng Yu, Chen, Guozhu Sun, Yang Yu, **Siyuan Han**, and Peiheng Wu, Landau-Zener-Stuckelberg-Majorana interference in a 3D transmon driven by a chirping microwave, *Appl. Phys. Lett.* 108, 112602 (2016).

D. V. Averin, K. Xu, Y. P. Zhong, C. Song, H. Wang, and **Siyuan Han**, Suppression of dephasing by qubit motion in superconducting circuits, *Phys. Rev. Lett.* 116, 010501 (2016).

750 GeV Diphoton Excess May Not Imply a 750 GeV Resonance. W. Cho, D. Kim, **K. Kong**, S. Lim, K. Matchev, J. Park, and M. Park, *Phys. Rev. Lett.* 116, 151805 (2016).

Melott, A. L., B. C. Thomas (Ph.D. 2005), C. M. Laird, **B. Neuenswander**, and D. Atri (Ph.D. 2011) (2016), Atmospheric ionization by high-fluence, hard spectrum solar proton events and their probable appearance in the ice core archive, *J. Geophys. Res. Atmospheres*, 121, doi:10.1002/2015JD024064.

Smart, D. F., M. A. Shea, **A. L. Melott**, and C. M. Laird (2016), Reply to comment by E. W. Wolff et al. on "Low time resolution analysis of polar ice cores cannot detect impulsive nitrate events", *J. Geophys. Res. Space Physics*, 121, doi:10.1002/2015JA021913

A.L. Melott, Supernovae in the Neighborhood. (A. L. Melott) *Nature* 532, 41 (2016).

The Gamma-Ray Luminosity Function of Millisecond Pulsars and Implications for the GeV Excess, Dan Hooper, **Gopolang Mohlabeng** *Journal of Cosmology and Astroparticle Physics* 1603 (2016) no.03, 049

ALUMNI NEWS

Mihailo Backovic (PhD 2011) went from KU to a 3-year postdoctoral position at Weizmann Institute. He won a Marie Curie Fellowship in open European competition. He was featured recently in Wired Magazine for his innovative mode of tantalizing new events at the Large Hadron Collider. <http://www.wired.com/2016/03/tantalizing-data-lhc->

[physicists-hopped/](#) He was also recognized for novel data analysis of the sociology of a field developing hundreds of times more new models than new events. He is now with the theory group of CP3 in Brussels, where he lives with his wife and former KU physics student, **Nataly Ozak** (PhD 2012).

Former KU High Energy Theory student **Soebur Razzaque** (PhD 2002) will give his "Professorial Inaugural Lecture" at the *University of Johannesburg*, South Africa, May 18. The Inaugural Lectures are a tradition of highly formal academic presentations to the assembled university. Razzaque has been a Professor of Physics at Johannesburg since 2013.

Brian Thomas (PhD 2005) was recently promoted to Full Professor at *Washburn University*. He is currently the PI on a NASA research grant.

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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