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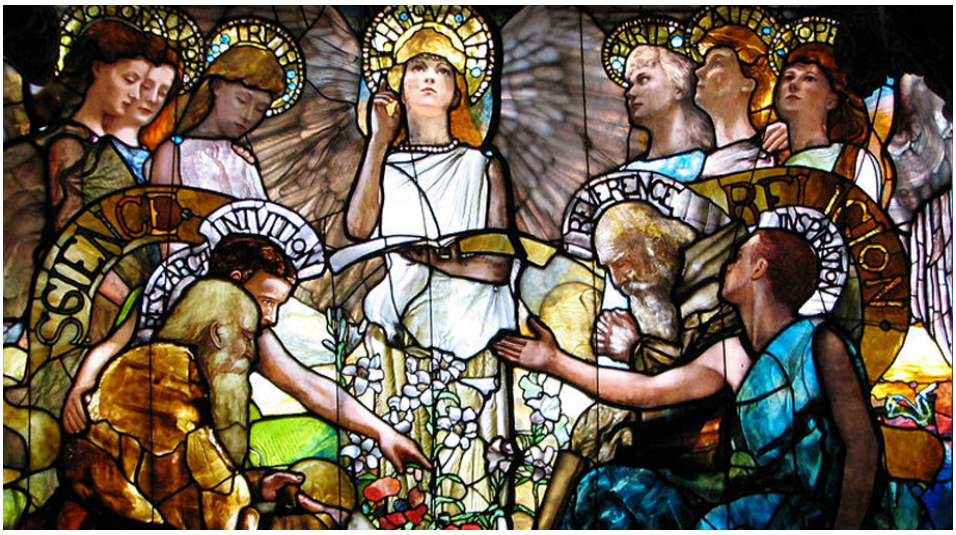
FACULTY newsletter

CPMS Physical and Mathematical Sciences

Religion and Science: A Love Story



ABOVE The relationship between science and religion Grandy described is shown in this stained-glass work.

Religion has been science's muse for centuries.

Philosophy professor David Grandy spoke September 21 on the connection that religion has with science. He called his speech, "Rethinking the Thoughts of God: How Belief in God Has Shaped Western Science."

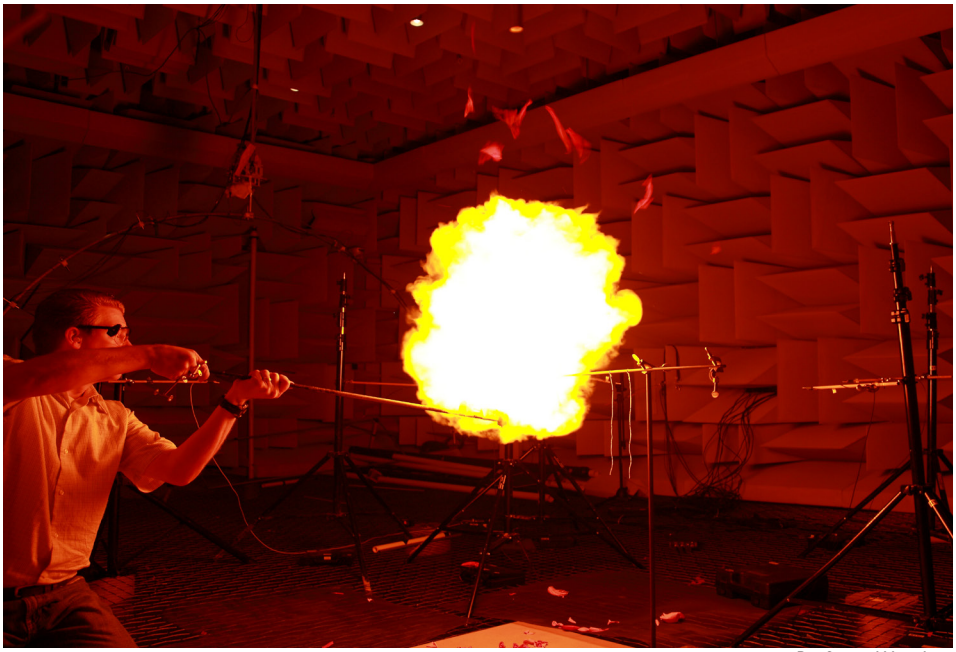
Dr. Grandy explained that, contrary to popular belief, science and religion are not always enemies. Scientists commonly have religious tendencies that inspire their research.

"These tendencies may be variously regarded as aesthetic, religious, metaphysical, and so on. But whatever we call them, they are the human matrix from which scientific theories ultimately emerge," Dr. Grandy said.

Dr. Grandy has opened students' minds to the long-term romance between religion and science. The students who attended the event found a new and deeper understanding regarding the relationship between religion and science.

by: Curtis Penfold

Bursting onto the Research Scene



ABOVE Explosions are a blast in the anechoic chamber.

Drs Gee and Macedone

BYU science classes might blow you away—literally.

Although exploding balloons might seem like just another distraction to keep students awake in science classes, they can also be used in serious scientific research. Recently, two BYU professors used exploding balloons to better understand how sounds like those created by other loud sources—rockets, military jets, bombs, and shotguns–travel around us.

"It's fun science. You get to blow things up, and I don't know how things get better than that," Professor Kent Gee said with a smile. "But it's also real science. There are questions there that no one's ever explored before, which makes it even better."

This is a common classroom demonstration done throughout the world. When Gee and Macedone first did the experiment, they were shocked by how loud the explosions were. Gee, who studies acoustics, became worried about the auditory risks.

"With every single [blast], you are

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Dates to Note

Rank and Status Files Due
Thursday, Nov. 1
Dean's Office, N-181 ESC

Univ. Admin. Staff Award Nominations Due
Friday, Nov. 30

College Christmas Social
Friday, Dec. 7
11:30a.m., ESC Pendulum Court

College Award Nominations Due
Wednesday, Jan. 9

College Grants

Computer Science

Goodrich, Mike
Sponsor: NSF
Title: AFRL Munitions Directorate C-UAS Membership

Goodrich, Mike
Sponsor: NSF
Title: NASA Dryden C-UAS Membership

Geological Sciences

Bickmore, Barry
Sponsor: NSF
Title: Structure and Reactivity at the Mineral-Water Interface

Mathematics

Humpherys, Jeffrey
Sponsor: NSF
Title: Structure and Reactivity at the Mineral-Water Interface

Physics Alum Honored with Pres. Award

It's not everyday that a cougar shakes hands with the President of the United States.

Recently, President Obama honored 96 exceptional scientists with the Presidential Early Career Award for Scientists and Engineers. Physics alum, Dr. Matthew Squires, represented both the Department of Defense and his alma mater BYU in his acceptance of the award.

A scientist working for the Air Force Research Laboratory, Space Vehicles Directorate, Kirtland Air Force Base, N.M., Squires toured The White House and even shook hands with President Obama while on his trip to Washington, D.C., to receive the award. "Discoveries in science and technology not only strengthen our economy, they inspire us as a people," President Obama said to the award recipients, according to a news release on The White House website. "The impressive accomplishments of today's awardees so early in their careers promise even greater advances in the years ahead."

Squires researched the use of lasers to cool atoms to near absolute zero and then trap cold atoms to more accurately measure motion and time. Through this research, he came up with a much cheaper and faster way to perform cold atom experiments, also called an atom chip.

Squires' supervisor nominated him for the award, which was based on both scientific achievements and community service.

"It has been very humbling to be singled out to get this award," Squires said. "There are lots of people doing great work out there."

by: Alysa Kleinman

Bursting continued from page 1

running some risk of suffering permanent hearing damage," Gee said. Gee and Macedone were surprised at how little information was available on the auditory danger of these explosions and decided to study them more. Their results helped to change the way some classroom experiments were done.

However, the duo did not stop with their study of classroom demonstrations. During their experiments, Gee noticed that these explosions were acoustically similar to bomb explosions and other very loud noises. They realized that exploding balloons could be used as a new, safer way of studying these big booms.

The study of explosions is very important for the safety of soldiers and civilians around military jets, bombs, and shotguns. For example, hard body armor protects soldiers from the shrapnel of an explosion, but it isn't doing such a great job protecting them from the intense shockwaves that may cause brain and lung damage.

Most research on the acoustics of explosions traditionally used dangerous and expensive explosive material. Gee and Macedone decided to try using acetylene in oxygen, a safer and cheaper chemical alternative that welders use.

"What's exciting about it is that we've pushed back some boundaries in a specific area of research," Macedone said.

And has it been fun to explode these balloons?

"It's an amazing experience to be there when an acetylene-oxygen balloon explodes. Imagine you're just standing there and somebody just punches you square in the chest," Macedone said.

by: Curtis Penfold

College Publications

Chemistry and Biochemistry

D.S. Jensen, T. Teutenberg, J. Clark, M.R. Linford, "Elevated Temperatures in Liquid Chromatography, Part I: Benefits and Practical Considerations", LC/GC North America, 2012, volume 30, pp. 850-862

P.N. Nge, J.V. Pagaduan, M. Yu, A.T. Woolley, "Microfluidic chips with reversed-phase monoliths for solid phase extraction and on-chip labeling", Journal of Chromatography A, 2012, volume 1261, pp. 129-135

A.C. Pearson, J. Liu, E. Pound, B. Uprety, A.T. Woolley, R.C. Davis, J.N. Harb, "DNA Origami Metallized Site Specifically to Form Electrically Conductive Nanowires", Journal of Physical Chemistry B, 2012, volume 116/issue 35, pp. 10551-10560

L. Almeida e Sousa, A.E. Beezer, L.D. Hansen, D. Clapham, J.A. Connor, S. Gaisford, "Calorimetric Determination of Rate Constants and Enthalpy Changes for Zero-Order Reactions", Journal of Physical Chemistry B, 2012, volume 116/issue 22, pp. 6356-6360

M.H. Mayo, A.D. Nicholson, L.D. Hansen, J.C. Hansen, "Chemical Treatment of Algae to Facilitate Biogas Production by Anaerobic Digestion", Transactions of the ASABE, 2011, volume 54/no. 4, pp. 1547-1550

J. R. Shelton, C. E. Cutler, M. S. Browning, J. Balzarini, M. A. Peterson, "Synthesis and SAR of 2',3'-bis-O Substituted-N6,5'-Bis-Ureidoadenosine Derivatives: Implications for Prodrug Delivery and Mechanism of Action", Bioorganic & Medicinal Chemistry Letters, 2012, volume 22/issue 19, pp. 6067–6071

J. Balzarini, F. Gago, W. Kulik, A.B.P. van Kuilenburg, A. Karlsson, M.A. Peterson, M. J. Robins, "Introduction of a Fluorine Atom at C3 of 3-Deazauridine Shifts Its Antimetabolic Activity from Inhibition of CTP Synthetase to Inhibition of Orotidylate Decarboxylase, an Early Event in the de Novo Pyrimidine Nucleotide Biosynthesis Pathway", Journal of Biological Chemistry, 2012, volume 287/issue 36, pp. 30444–30454

B. Vabre, M.L. Lambert, A. Petit, D.H. Ess, D. Zargarian, "Nickelation of PCP- and POCOP–Type Pincer Ligands: Kinetics and Mechanism", Organometallics, 2012, volume 31/issue 17, pp. 6041-6053

A.Wang, H.D. Tolley, M.L. Lee, "Gas Chromatography Using Resistive Heating Technology", Journal of Chromatography A, 2012, volume 1261, pp. 46-57

D. Peng, Z. Hu, D. Devarajan, D.H. Ess, E.R. Johnson, W. Yang, "Variational Fractional-Spin Density-Functional Theory for Diradicals", Journal of Chemical Physics, 2012, volume 137/issue 11, 114112 pp 1-9

N. Li, F. Yang, H.A. Stock, D.V. Dearden, J.D. Lamb, R.G. Harrison, "Resorcinarene-based cavitands with chiral amino acid substituents for chiral amine recognition", Organic & Biomolecular Chemistry, 2012, volume 10/issue 36, pp. 7392-7401

A.J. Edmund, S.D. Bergeson, M. Lyon, N. Taylor, I. Kalinitchenko, P.B. Farnsworth, "Evaluation of Space Charge Effects in the Second Vacuum Stage of a Commercial Inductively Coupled Plasma Mass Spectrometer by Planar Laser-Induced Fluorescence Imaging", Spectrochimica Acta Part B, 2012, volume 76, pp. 109-118

D. Chatterjee, D.S. Mansfield, N.G. Anderson, S. Subedi, A.T. Woolley, "Flow Valve" Microfluidic Devices for Simple, Detectorless, and Label-Free Analyte Quantitation", Analytical Chemistry, 2012, volume 84/issue 16, pp. 7057-7063

G.R. Dahal, J. Rawson, B. Gassaway, B. Kwok, Y. Tong, L.J. Ptacek, E.A. Bates, "An Inwardly Rectifying K+ Channel is Required for Patterning", Development, 2012, volume 139/issue 19, pp. 3653-3664

A. Petit, J. Flygare, A.T. Miller, G. Winkel, D.H. Ess, "Transition-State Metal Aryl Bond Stability Determines Regioselectivity in Palladium Acetate Mediated C-H Bond Activation of Heteroarenes", Organic Letters, 2012, volume 14/issue 14, pp. 3680-3683

N. Li, F. Yang, H. Stock, D.V. Dearden, J.D. Lamb, R.G. Harrison, "Resorcinarene-based cavitands with chiral amino acid substituents for chiral amine recognition", Organic Biomolecular Chemistry, 2012, volume 10/issue 36, pp. 7392-7401

D.S. Jensen, S.S. Kanyal, V. Gupta, M.A. Vail, A.E. Dadson, M. Engelhard, R. Vanfleet, R.C. Davis, M.R. Linford, "Stable, Microfabricated Thin Layer Chromatography Plates without Volume Distortion on Patterned, Carbon and Al2O3-Primed Carbon Nanotube Forests", Journal of Chromatography A, 2012, volume 1257, pp. 195-203

L.A. e Sousa, A.E. Beezer, L.D. Hansen, D. Clapham, J.A. Connor, S. Gaisford, "Calorimetric Determination of Rate Constants and Enthalpy Changes for Zero-Order Reactions," Journal of Physical Chemistry B, 2012,volume 116/ issue 22, pp. 6356-6360

L.D. Hansen, J.B. Nielson, "Lactose Chemistry", chapter in Dietary Sugars: Chemistry, Analysis, Function and Effects, V.R. Preedy, ed, Royal Society of Chemistry, United Kingdom, 2012

T. Ghebreghiorgis, B. Biannic, B.H. Kirk, D.H. Ess, A. Aponick, "The Importance of Hydrogen Bonding to Stereoselectivity and Catalyst Turnover in Gold-Catalyzed Cyclization of Monoallylic Diols", Journal of the American Chemical Society, 2012, volume 134/issue 39, pp. 16307-16318

Geological Sciences

J. H. McBride, S. B. Rupper, S. M. Ritter, D. G. Tingey, M. R. Koutnik, A. M. Quick, T. H. Morris, R. W. Keach, II, L. K. Burgener, A. P. McKean, J. Williams, J. M. Maurer, D. G. Keeler, R. Windell, "Radar Scattering in an Alpine Glacier: Evidence of Seasonal Development of Temperate Ice Beneath Ogives", Geosphere, 2012, volume 8/no. 5, pp. 1054-1077

J. H. McBride, B. C. Pykles, E. Utt, R. W. Keach, II, "Rediscovering Provo's First Tabernacle with Ground-Penetrating Radar", BYU Studies Quarterly, 2012, volume 51/ no. 2, pp. 61–77

W. J. Stephenson, J. K. Odum, R. A. Williams, J. H. McBride, I. Tomlinson, "Characterization of Intrabasin Faulting and Deformation for Earthquake Hazards in Southern Utah Valley, Utah, from High-Resolution Seismic Imaging", Bulletin of the Seismological Society of America, 2012, volume 102/no. 2, pp. 524-540

J. H. McBride, W. S. Guthrie, D. L. Faust, S. T. Nelson, "A Structural Study of Thermal Tufas Using Ground-Penetrating Radar", Journal of Applied Geophysics, 2012, volume 81, pp. 38-47

Mathematical Sciences

T. J. Jarvis, W. E. Lang, J. R. Ricks, "Integral Models of Extremal Rational Elliptic Surfaces", Communications in Algebra, 2012, volume 40/issue 10, pp. 3867–3883

S. Humphries, E. Rode, "Weak Cayley Tables and Generalized Centralizer Rings of Finite Groups", Mathematical Proceedings of the Cambridge Philosophical Society 2012, volume 153/issue 2, pp. 281-318

Physics and Astronomy

A.J. Edmund, S.D. Bergeson, M. Lyon, N. Taylor, I. Kalinitchenko, P.B. Farnsworth, "Evaluation of Space Charge Effects in the Second Vacuum Stage of a Commercial Inductively Coupled Plasma Mass Spectrometer by Planar Laser-Induced Fluorescence Imaging", Spectrochimica Acta Part B, 2012, volume 76, pp. 109-118

Statistics

A.Wang, H.D. Tolley, M.L. Lee, "Gas Chromatography Using Resistive Heating Technology", Journal of Chromatography A, 2012, volume 1261, pp. 46-57