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PHYSICS
NEWSLETTER
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BOREALIS team flies Cosmic Dust Capture Experiment on NASA's High Altitude Student Platform (HASP)

The Montana Space Grant Consortium's (MSGC) BOREALIS high-altitude ballooning team's proposal to NASA to fly a Cosmic Dust Capture experiment on HASP was selected for flight, and was successfully launched from the Ft. Sumner, NM NASA Scientific Ballooning facility on Sept. 2, just 24 hours after the peak of the Aurigid meteor shower, which is of particular interest in the study of the early solar system chemical and isotopic abundances (Scientists at NASA Ames flew the Google corporate jets across the country in an effort to capture particles from the shower at the same time as the HASP flight).

HASP ascended to an altitude of about 123,000 feet MSL, at which point the command was sent to open the doors of the Cosmic Dust Capture Experiment. The experiment remained open until just before cut-down, 17 hours later, by which time the balloon was approaching California.

Sophomore physics major Jayson Nissen spearheaded the original proposal, led the team constructing the experiment, and in October, traveled to Johnson Space Center to learn how to extract the micron-sized Cosmic Dust particles from the capture medium. Jayson subsequently gave an invited talk on the BOREALIS experiment at a meeting devoted to Aurigid shower capture experiments at the NASA Ames Research Center in May 2008.



Launch



**MSGC experiment
123,000 feet over
New Mexico**

The BOREALIS Cosmic Dust Capture Experiment has again been competitively selected to fly on the third flight of HASP, to take place at the end of summer 2008.

ICAL has provided superb support to the student team as they seek to isolate and study the extraterrestrial materials captured.

GENERAL NEWS

SSEL partners with local company to build model immune system

Exposure to microgravity in spaceflight has been demonstrated to cause alterations in immune responses and research suggests there is significant correlation of microgravity exposure with decreased resistance to infection and slow wound healing. The Space Science and Engineering Laboratory (SSEL), in cooperation with Bozeman pharmaceutical company LigoCyte, is designing and building a satellite experiment referred to as the Real-time Physiological Immune Recruitment system (RPIR) to observe the human immune response in microgravity conditions. The RPIR free-flying satellite based experiment will have an artificial blood vessel (a glass tube lined with endothelial cells) that is circulated with leukocytes. Interactions of the leukocytes with infectious agents will be monitored and provide insight into the impact of microgravity on normal host responses and immunity. Currently the SSEL is involved in designing a special microscope that will allow researchers to remotely observe the simulated immune system as it orbits the earth.

The finished experiment will last only 15 minutes in space! Currently the SSEL and LigoCyte are working on a demonstrator that is fully automatic but not for use in space. This experimental effort involves many multidisciplinary teams of students studying immunology, cell biology, microbiology, mechanical and electrical engineering, computer science and computer engineering.

MSU and Solar Satellite Operations

From November 30 to December 14, MSU served as the Hinode X-Ray Telescope (XRT) Chief Observer, in the person of Junho Shin, responsible for remotely planning and executing the observations of XRT. For the week of December 3, MSU also served as the TRACE Planner, in the person of Aki Takeda, with observation planning/commanding duties for the TRACE satellite. And for the week December 8-14, MSU served as the XRT Data Verifier ("the guy who checks *all* the data to monitor the health and performance of XRT"), in the person of Keiji Yoshimura.

So in terms of imaging the solar corona, MSU was the center of the world for a significant part of December. Go Team!

Loren Acton participated in the reconvened Solar Probe Science and Technology Definition team at Johns Hopkins Applied Physics Laboratory near Baltimore on 24/25 September and 29/30 November 2007. The object of these meetings was to pare the proposed SolarProbe mission from a \$1.3B to a \$0.75B cost. We were successful in doing so by changing the orbit from solar polar to equatorial and elevating the closest approach from 3 to 8.5 solar radii above the photosphere. NASA hopes to issue an Announcement of Opportunity for this mission next year for a launch in 2015.

Conference Organization

Randy Babbitt, Aleksander Rebane, and Rufus Cone organized the *Workshop on the Storage and Manipulation of Quantum Information in Optically-Addressed Solids*—"SMQIOAS", held in Bozeman, Montana, January 25-27, 2008. The meeting was supported by the Army Research Office, MSU Spectrum Lab, and S2 Corporation. Participants came from many countries.

<http://www.spectrum.montana.edu/SMQIOAS2008.html>

AWARDS, HONORS, AND NEW POSITIONS

Mario da Luz and his wife, Ariana de Campos, have joined the research team of John Neumeier.

Piet Martens has taken a position with the Center for Astrophysics at Harvard University. He will remain as a visiting Affiliate Professor here at MSU.

Yves Idzerda was named a fellow of the American Physical Society through the Division of Materials Physics.

Bill Hiscock was recognized as an "Outstanding Referee" by the American Physical Society: <http://publish.aps.org/OutstandingReferees>.

Adam Kobelski is the new graduate student manager of the Space Public Outreach Team (SPOT).

Dibyendu Nandi has been promoted to Assistant Research Professor.

Bill Hiscock has been elected to a two-year term on the Board of Directors of the National EPSCoR Coalition.

Bill Hiscock has been appointed to membership on the Technical Advisory Committees of the NASA EPSCoR programs for the states of Alaska and New Mexico.

PH.D. THESIS DEFENSE

Keith Gilmore successfully defended his Ph.D. dissertation "Spin-Orbit Precession Damping in Metallic Ferromagnets", on November 1; his advisor was Yves Idzerda.

Hector Calderon successfully defended his Ph.D. dissertation "Applications of Quantum Field Theory in Curved Spacetimes", on November 14; his advisor was Bill Hiscock.

Ezana Negusse successfully defended his Ph.D. dissertation "Interface Magnetism and Spin-Dependent Tunneling in EuO and MgO Barriers", on February 9; his advisor was Yves Idzerda.

PUBLICATIONS

Submitted

"A Flux Tube Fitting Technique for Determining Solar Active Region Twist without Recourse to the Force-Free-Field Equation: Quantifying the Critical Twist Threshold for Kink Instability", Nandy, D., Calhoun, A., Windschitl, J., & Linton, M.G. 2008. (Submitted to *Astrophysical Journal Letters*)

"Thermal stability and oxidation resistance of TiCrAlYO coatings on SS430 for solid oxide fuel cell interconnect applications", H. Chen, J. A. Lucas; W. Priyantha; M. Kopczyk; R. J. Smith; K. Lund; C. Key; M. Finsterbusch; P. E. Gannon; M. Deibert; V. I. Gorokhovsky; V. Shutthanandan; P. Nachimuthu. (Submitted to *Surface and Coatings Technology*)

"Nanotwins and Phases in High-Strain $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Ti}_x\text{O}_3$ Crystal," C.-S. Tu, C.-M. Hsieh, R.R. Chien, V.H. Schmidt, F.-T. Wang, and W.S. Chang. (Submitted to *Journal of Applied Physics*)

"Capacitive-Based Dilatometer Cell Constructed of Fused Quartz for Measuring the Thermal Expansion of Solids", J. J. Neumeier, R. K. Bollinger, G. E. Timmins, C. R. Lane, R. D. Krogstad, and J. Macaluso. (Submitted to Review of Scientific Instruments)

"Interface mixing of Al/Fe and Fe/Al bilayer systems and the role of Ti as a stabilizing interlayer using Rutherford backscattering spectrometry and x-ray reflectometry", W. Priyantha, H. Chen, M. Kopczyk, R. J. Smith, A. Kayani, A. Comouth, M. Finsterbusch, P. Nachimuthu and D. McCready. (Submitted to *Journal of Applied Physics*).

"Hinode XRT Observations of a Coronal Sigmoid", D.E. McKenzie & R.C. Canfield. (Submitted to *Astronomy & Astrophysics* (Letters)).

Published

"Enabling inexpensive metallic alloys as SOFC interconnects: An investigation into hybrid coating technologies to deposit nanocomposite functional coatings on ferritic stainless steels", P.E. Gannon, V.I. Gorokhovskiy, M.C. Deibert, R.J. Smith, A. Kayani, P.T. White, S. Sofie, Zhenguo Yang, D. McCready, S. Visco, C. Jacobson, H. Kurokawa, *International Journal of Hydrogen Energy*, 32 (2007) 3672-3681.

"Dynamic First-Principles Molecular-Scale Model for Solid Oxide Fuel Cells," V. Hugo Schmidt, Winter 2007 issue of *ECS Transactions – Chicago*, Volume 6, "Design of Electrode Structure."

"Relationship between macroscopic physical properties and local distortions of low-doping $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$: An EXAFS study", Y. Jiang, F. Bridges, L. Downard, and J. J. Neumeier, *Physical Review B* 76 (2007) 224428.

"Determination of Anode-Pore Tortuosity from Gas and Current Flow Rates in SOFC's," V. Hugo Schmidt, Chih-Long Tsai, and Laura M. Ledieva, *Advances in Solid Oxide Fuel Cells III: Ceramic Engineering and Science Proceedings*, Vol. 28, Is. 4, 129-140 (2007).

"Magnetic Characterization of CoFeB/MgO and CoFe/MgO Interfaces", E. Negusse, A. Lussier, J. Dvorak, Y.U. Idzerda, S. R. Shinde, Y. Nagamine, S. Furukawa, and D. D. Djayaprawira, *Applied Physics Letters* 90 (2007) 092502.

"Electric-Field-Induced Dielectric, Domain and Optical Phenomena in High-Strain $\text{Pb}(\text{In}_{1/2}\text{Nb}_{1/2})_{1-x}\text{Ti}_x\text{O}_3$ ($x=0.30$) Single Crystal," C.-S. Tu, C.-M. Hung, R. R. Chien, V. H. Schmidt, and F.-T. Wang, *Advances in Electronic Ceramics: Ceramic Engineering and Science Proceedings*, Vol. 28, Is. 8, 49-56 (2007).

"Anisotropic electrical resistivity of quasi-one-dimensional $\text{Li}_{0.9}\text{Mo}_{0.6}\text{O}_{17}$ determined by the Montgomery method, M. S. da Luz", C. A. M. dos Santos, J. Moreno, B. D. White, and J. J. Neumeier, *Physical Review B* 76 (2007) 233105.

"Electric-Field- and Temperature-Induced Phase Transitions in High-Strain Relaxor-Based Ferroelectric $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Ti}_x\text{O}_3$ Single Crystals," R. R. Chien, V. Hugo Schmidt, C.-S. Tu, F.-T. Wang, I.-C. Shih, L.-W. Hung, and H. Luo, *Ferroelectrics* **359**, 99-110 (2007). Text of Plenary Lecture given by Hugo Schmidt at 5th *International Seminar on Ferroelastic Physics*, Voronezh, Russia, Sept. 10-13, 2006.

"Capacitive-based dilatometer cell constructed of fused quartz for measuring the thermal expansion of solids", J.J. Neumeier, R.K. Bollinger, G.E. Timmins, C.R. Lane, R.D. Krogstad, and J. Macaluso, *Review of Scientific Instruments* 79, 033903 (2008).

"Magnetic g-tensors for the $^4I_{15/2}$ and $^4I_{13/2}$ states of $Er^{3+}:Y_2SiO_5$ ", Y. Sun, Thomas Böttger, C. W. Thiel, and R. L. Cone, *Phys. Rev. B* **77**, 085124 (2008).

"Anode-Pore Tortuosity in Solid Oxide Fuel Cells Found from Gas and Current Flow Rates," V. Hugo Schmidt and Chih-Long Tsai, *J. Power Sources* **180**, 253-264 (2008).

"Magnetic-polaron-driven magnetoresistance in the pyrochlore $Lu_2V_2O_7$ ", H.D. Zhou, E.S. Choi, J.A. Souza, J. Lu, Y. Xin, L.L. Lumata, B.S. Conner, L. Balicas, J.S. Brooks, J.J. Neumeier, C.R. Wiebe, *Physical Review B* **77**, 020411 (2008).

"Hydrostatic pressure effects on the electrical transport of $Pr_{0.5}Sr_{0.5}MnO_3$ ", F.J. Rueckert, M. Steiger, B.K. Davis, T. Huynh, J.J. Neumeier, M.S. Torikachvili, *Physical Review B* **77**, 064403 (2008).

"Interface Intermixing of Al/Fe and Fe/Al Multilayer Systems and the role of Ti as a Stabilizer Layer Using Rutherford Backscattering Spectrometry (RBS) and X-ray Reflectometry (XRR)", W. Priyantha, H. Chen, M. Kopczyk, R.J. Smith, A. Kayani, A. Comouth, M. Finsterbusch, P. Nachimuthu, D. McCready, *J. Appl. Phys.* **103**, 014508 (2008).

"Nanotwins and phases in high-strain $Pb(Mg_{1/3}Nb_{2/3})_{1-x}Ti_xO_3$ crystal," C.-S. Tu, C.-M. Hsieh, R.R. Chien, V.H. Schmidt, F.-T. Wang, and W.S. Chang, *Journal of Applied Physics* **103**, 074117/1-8 (2008).

"Oxidation behavior of stainless steel 430 and 441 at 800°C in single (air-only) and dual atmosphere (air/hydrogen) exposures", J. Rufner, P. Gannon, P. White, M.C. Deibert, S. Teintze, R.J. Smith, H. Chen, *International Journal of Hydrogen Energy* **33** (2008) 1392-1398.

"Electric-field-induced domain structures and phase transitions in PMN-PT single crystals," V H Schmidt, R R Chien, and C.-S. Tu, PART 2 FIELD-INDUCED EFFECTS AND DOMAIN ENGINEERING, *Handbook of Advanced Dielectric Piezoelectric and Ferroelectric Materials: Synthesis, Characterisation and Applications*, edited by Z.-G. Ye, Woodhead Publishing Limited, Abington Hall, Abington, Cambridge, CB1 6AH, England, ISBN 1 84569 186 5, March 2008.

"Efficient Immobilization and Patterning of Live Bacterial Cells", Zhiyong Suo, R. Avci, Xinghong Yang and D.W. Pascual, *Langmuir* **2008**, *24*, 4161-4167.

PROPOSALS SUBMITTED

"Resident Archive Services and Maintenance of the Yohkoh Legacy data Archive", submitted to NASA by Aki Takeda (PI), Loren Acton (Co-I), Keiji Yoshimura (Co-I), David McKenzie (Co-I), and Sam Freeland (LMSAL, Co-I), for \$149,680.

"Rocket Scientists", Charles Kankelborg, PI, with Scott Wiessinger (Science and Natural History Filmmaking). Partners: Angela DesJardins (MSGC), Ivy Merriott (Abaetern Academy), Marty Stuart (Bozeman High School). 1 year, \$10,304.

"Selection Criteria for Interlayer Materials to Stabilize Metal-Metal Interfaces" Submitted to NSF 11/2/2007 for 36 months support starting 8/1/2008, \$444,399.

"All-Ceramic Electrode Development for Robust, Regenerative SOFC Technology," submitted March 14, 2008 to the NASA EPSCoR Program, William A. Hiscock (PI), Stephen W. Sofie (Science PI), Yves Idzerda (Co-I), Hugo Schmidt (Co-I), Steve Shaw (Co-I), and Dick Smith (Co-I); \$750,000.

"Development of a Novel High Spectral Resolution Lidar for Studies of the Effects of Aerosols on the Earth's Climate", submitted to the NASA EPSCoR FY 2008 CAN. William A. Hiscock, PI; Kevin Repasky, Science PI; John L. Carlsten (Co-I), John A. Reagan (U. AZ)(Co-I), and Joseph A. Shaw (Co-I). \$ 750,000.

Proposals Funded

NASA Supplemental Education/Public Outreach award for a film called "Rocket Scientists", to be produced by Science and Natural History Filmmaking student Scott Wiessinger. PI: Charles Kankelborg, \$10,304.

"Biomolecular Substrates for Extraterrestrial Life: Revealing the Secrets of Extremophilic Archaea and their Viruses". NASA EPSCoR FY 2007 CAN. William A. Hiscock (PI); Michael Ceballos (UM)(Science PI); Martin Lawrence (MSU, Co-I); Kenneth Stedman (Portland State U., Co-I). \$ 750,000.

"Exploration Systems Mission Directorate Higher Education Award", NASA, William A. Hiscock, PI, \$ 46,000; 2007-2009.

PRESENTATIONS

Invited Talks

"The Sun's Magnetic Cycle: Current State of our Understanding", Dibyendu Nandi, Mathematical Institute Colloquium, University of St Andrews, UK, October 5th, 2007.

"Nano- and Microscopic Polar Clusters in High-Strain Ferroelectric $\text{Pb}(\text{B}'\text{B}'')_{1-x}\text{Ti}_x\text{O}_3$ Crystals," **V. Hugo Schmidt**, R. R. Chien, C.M. Hung, W.S. Chang, C.S. Tu, and L.C. Lim, Symposium 7, The XVI International Materials Research Congress-2007, Cancun, Mexico October 28-November 1, 2007.

"Thermal Stability and Oxidation Resistance of Protective Metal Oxide Coatings on Steel SOFC Interconnects", **R.J. Smith**, H. Chen, W. Priyantha, M. Kopczyk, J. Lucas, C. Key, M. Finsterbusch, P.E. Gannon, P. White, M.C. Deibert, V. Gorokhovsky, V. Shutthanandan, P. Nachimuthu, presented at TMS 2008 137th Annual Meeting and Exhibition in New Orleans, LA, March 9, 2008.

Contributed Talks

"Thermal stability and oxidation resistance of protective coating on stainless steel interconnect for solid oxide fuel cells" H. Chen, J. A. Lucas, W. Priyantha, M. Kopczyk, R. J. Smith, P. E. Gannon, V. I. Gorokhovsky, M. Deibert, V. Shutthanandan, P. Nachimuthu, given at the 54th AVS International Symposium and Exhibition, Seattle, WA October 15-19, 2007.

"Structure of the $\text{Al}(100)\text{-c}(2\times 2)\text{Ti}$ Surface", M. Kopczyk, W. Priyantha, D. Tonn, R. J. Smith, and G. Bozzolo, given at the 54th AVS International Symposium and Exhibition, Seattle, WA October 15-19, 2007.

"Ti as an Interface Stabilizer for Fe-Al Interfaces", W. Priyantha, A. Comouth, A. Kayani, M. Finsterbusch, H. Chen, M. Kopczyk, D. Tonn, R.J. Smith, D. McCready, P. Nachimuthu, given at the 54th AVS International Symposium and Exhibition, Seattle, WA October 15-19, 2007.

"Investigation of bulk and grain boundary diffusion of oxygen in yttrium stabilized zirconia via nuclear reaction analysis", M. Finsterbusch, H. Chen, R.J. Smith, J.A. Schaefer, given at the 54th AVS International Symposium and Exhibition, Seattle, WA October 15-19, 2007.

“Overview of Rare Earth Materials for SHB, SSH, EIT, and Quantum Information”, R. L. Cone, C. W. Thiel, R. M. Macfarlane, Thomas Böttger, and Y. Sun, Workshop on the Storage and Manipulation of Quantum Information in Optically-Addressed Solids, Bozeman, Montana, January 25-27, 2008.

“Spectroscopy and Dynamics of $\text{Tm}^{3+}:\text{LiNbO}_3$ for Quantum Information and Signal Processing Applications”, C. W. Thiel, Y. Sun, Thomas Böttger, W. R. Babbitt, and R. L. Cone, Workshop on the Storage and Manipulation of Quantum Information in Optically-Addressed Solids, Bozeman, Montana, January 25-27, 2008.

“Dynamics and Spectroscopy of Rare Earths in Solids: Y_2O_3 , YVO_4 , and CaWO_4 ”, Y. Sun, R. W. Equall, T. L. Harris, G. Reinemer, C. W. Thiel, R.M. Macfarlane, and R. L. Cone, Workshop on the Storage and Manipulation of Quantum Information in Optically-Addressed Solids, Bozeman, Montana, January 25-27, 2008.

“Spectroscopy and Dynamics of $\text{Er}^{3+}:\text{LiNbO}_3$ for Quantum Information and Signal Processing Applications”, C. W. Thiel, R. L. Cone, Thomas Böttger, Y. Sun, W. R. Babbitt, and K. D. Merkel, Workshop on the Storage and Manipulation of Quantum Information in Optically-Addressed Solids, Bozeman, Montana, January 25-27, 2008.

“Optical High Density Sintering of High Temperature Proton Conducting Ceramics,” Nicholas Santorsola, V. Hugo Schmidt, and Chih-Long Tsai, 32nd International Conference on Advanced Ceramics and Composites, Daytona Beach, Florida, January 27-February 1, 2008.

“Minimizing Optical Decoherence in $\text{Er}^{3+}:\text{Y}_2\text{SiO}_5$ at $1.5\text{ }\mu\text{m}$ ”, C. W. Thiel, Thomas Böttger, Y. Sun, and R. L. Cone, Workshop on the Storage and Manipulation of Quantum Information in Optically-Addressed Solids, Bozeman, Montana, January 25-27, 2008.

“Electric-field poling effect and nanotwins in $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})_{0.70}\text{Ti}_{0.30}\text{O}_3$ crystal,” V. Hugo Schmidt, R. R. Chien, C.-S. Tu, C.-M. Hsieh, F.-T. Wang, W. S. Chang, and H. Luo, Workshop on Fundamental Physics of Ferroelectrics, Williamsburg, Virginia, February 10-13, 2008.

“Electrical, Thermal, and Magnetic Properties of Single Crystal CaMn_2O_4 Marokite”, B.D. White, J.J. Neumeier, J.A. Souza, C. Chiorescu, J.L. Cohn, APS March Meeting, New Orleans, Louisiana, March 10-14, 2008.

“Powder Neutron Diffraction Study of Quasi-One-Dimensional $\text{Li}_{0.9}\text{Mo}_6\text{O}_{17}$ ”, M.S. da Luz, C.A.M. dos Santos, B.D. White, J.J. Neumeier, Q. Huang, J.B. Leao, J.W. Lynn, APS March Meeting, New Orleans, Louisiana, March 10-14, 2008.

“Electrical Transport and Thermodynamic Properties of $\text{SrNbO}_{3.41}$ ”, A. de Campos, A. Deml, B.D. White, C.A.M. dos Santos, M.S. da Luz, J.J. Neumeier, APS March Meeting, New Orleans, Louisiana, March 10-14, 2008.

“Electrical Resistance of Quasi-1D $\text{Li}_{0.9}\text{Mo}_6\text{O}_{17}$ at Very High Magnetic Field”, C.A.M. dos Santos, J. Moreno, B.D. White, J.J. Neumeier, L. Balicas, APS March Meeting, New Orleans, Louisiana, March 10-14, 2008.

“Thermal Expansion, Heat Capacity and Magnetization Measurements of $\text{La}_{1.2}\text{Sr}_{1.8}\text{Mn}_2\text{O}_7$ ”, R.K. Bollinger, J.J. Neumeier, H. Zheng, J.F. Mitchell, APS March Meeting, New Orleans, Louisiana, March 10-14, 2008.

“Large Area Filtered Arc Deposited Coatings for SOFC Metallic Interconnects”, P. Gannon, V. Gorokhovskiy, M. Deibert, P. White, R. J. Smith, H. Chen, and W. Priyantha, presented at TMS 2008 137th Annual Meeting and Exhibition in New Orleans, LA, March 9, 2008.

"Stability of V and Ti on Al surfaces: Searching for suitable interlayer materials to stabilize the Fe-Al interface", W. Priyantha, H. Chen, M. Kopczyk, K. Lund, D. Tonn, R.J. Smith, P. Nachimuthu, V. Shutthanandan, presented at the March Meeting of the APS, New Orleans, LA, March 19, 2008.

"Electrical conductivity relaxation dynamics in nanoscale YSZ thin films", H. Chen, W. Priyantha, A. Kreitingner, R. J. Smith, C. -L. Tsai, H. Schmidt, presented at the 2008 MRS Spring Meeting in San Francisco, CA, March 24-28, 2008.

Posters

"Three Dimensional Structure and Time Evolution of a Transition Region Explosive Event Observed in He II", **J. L. Fox**, C. C. Kankelborg, R. J. Thomas, D. W. Longcope, AGU Meeting, San Francisco, CA, December 10-14, 2007.

"Extensions of a Molecular-Scale Model for Solid Oxide Fuel Cells and Electrolyzers," V. Hugo Schmidt and Laura Lediaev, 32nd International Conference on Advanced Ceramics and Composites, Daytona Beach, Florida, January 27-February 1, 2008.

"Crystal Growth of Quasi-One Dimensional $\text{SrNbO}_{3.41}$ and $\text{LaTiO}_{3.41}$ ", A. Deml, C.A.M. dos Santos, J.J. Neumeier, B.D. White, APS March Meeting, New Orleans, Louisiana, March 10-14, 2008.

"Sintering and Conductivity Study of $\text{Ba}(\text{Zr}_{0.8-x}\text{Ce}_x\text{Y}_{0.2})\text{O}_{3-\delta}$ Ceramics," Chih-Long Tsai, J. Han, N.P. Santorsola, V.Hugo Schmidt, R. R. Chien, A. Keith, and S. Hall, 32nd International Conference on Advanced Ceramics and Composites, Daytona Beach, Florida, January 27-February 1, 2008.

"Thermal Stability and Oxidation Resistance of Protective Metal Oxide Coatings on Steel SOFC Interconnects", R.J. Smith, H. Chen, W. Priyantha, M. Kopczyk, J. Lucas, M. Finsterbusch, P.E. Gannon, P. White, M.C. Deibert, V. Gorokhovskiy, V. Shutthanandan, P. Nachimuthu, poster presented at the 32nd International Conference & Exhibition on Advanced Ceramics & Composites, January 27, 2008.

"*In-Situ* Temperature-Dependent X-Ray Diffraction Study of $\text{Ba}(\text{Zr}_{0.8-x}\text{Ce}_x\text{Y}_{0.2})\text{O}_{3-\delta}$ Ceramics," C.-S. Tu, R. Chien, S.-C. Lee, C.-C. Huang, C.-L. Tsai, V. H. Schmidt, A. Keith, S. A. Hall, and N. P. Santorsola, 32nd International Conference on Advanced Ceramics and Composites, Daytona Beach, Florida, January 27-February 1, 2008.

TRAVEL

Dibyendu Nandi traveled to the University of St Andrews, UK on a British Council Researcher's Exchange Program Award to work with collaborator Dr. Duncan Mackay between September 15th--October 15th, 2007.

Piet Martens traveled to Cambridge MA to participate in proposal preparation for X-ray telescope on solar orbiter, October 24-30, 2007.

David McKenzie attended the Hinode EIS/XRT meeting in Fairfax MA, October 30-November 2, 2007.

Keiji Yoshimura traveled to Kyoto, Japan for seminar and collaboration on HINODE data, November 8-26, 2007.

Ron Hellings did an ATFP-related site visit to Jet Propulsion Laboratory in Pasadena, CA, October 31-November 5, 2007.

Yves Idzerda, Hongyan Li, and Harsh Bhatkar attended the Magnetism and Magnetic Materials Conference in Tampa FL, November 4-10, 2007.

Maria Kazachenko attended the Living with a Star Workshop in San Diego, CA, November 10-15, 2007.

David McKenzie traveled to Fuchinobe, Tokyo, Japan for Hinode/XRT operations, November 28-December 15, 2007.

Tyson Littenberg attended the Gravitational Wave Data AW Conference in Boston MA, December 8-18, 2007.

Paul Baker & Neil Cornish traveled to Milwaukee, WI to visit the Gravitational Wave group for discussion about black hole ringdown searches, November 25-30, 2007.

Dave Klumppar, John Carlsten, Jiong Qiu and Lewis Fox attended the Annual Fall meeting of the American Geophysical Union (AGU) in San Francisco, CA, December 9-14, 2007.

David McKenzie co-convened a special session at the Fall AGU meeting in San Francisco along with fellow co-conveners, Kathy Reeves, Ed Deluca and George Doschek. The session was titled "Observational and Theoretical Analyses of Coronal Structures and Dynamics in the Hinode Era". December 10-14, 2007.

Dibyendu Nandi traveled to Kasnataka, India to deliver an invited tutorial on Solar Dynamos at the International Heliophysical Year Asia-Pacific School held in Kodaikanal Observatory, December 10-22, 2007.

Neil Cornish attended the Gravitational Wave Data Analysis Workshop in Boston MA and also collaborated with Scott Hughes, December 10-16, 2007.

Cameron Chen visited NASA AMES in Palo Alto, CA to discuss payload issues, December 12-31, 2007.

Yves Idzerda collaborated with researchers at the University of Nebraska, Lincoln, NE January 6-9, 2008.

Mikhail Drobijev attended the SPIE Photonics West Conference in San Jose, CA, January 20-23, 2008.

Yves Idzerda gave invited talks at the Workshop for Hard Condensed Matter and the Workshop for NSLS-II in Upton, NY, February 3-7, 2008.

Charles Kankelborg attended the PXRMS 2008 Conference in Big Sky, MT, February 3-7, 2008.

Zhiyong (Jahson) Suo conducted experiments and collaborated with Mary Schweitzer in Minneapolis MN, February 12-14, 2008.

Bill Hiscock, Angela Des Jardins, and Glenda Winslow attended the Spring meeting of the National Council of Space Grant Directors in Washington, DC, Feb. 26 – March 1, at which Bill chaired the meeting of the NASA EPSCoR Caucus.

Yves Idzerda traveled to Berkeley CA to attend the Proposal Study Panel meeting and to conduct experiments at the Advanced Light Source, February 24-March 3, 2008. Johnathan Holroyd participated in the experiments at Advanced Light Source.

Yves Idzerda, John Neumeier, Mario da Luz, Ariana de Campos, Rick Bollinger, and Ben White attended the APS March Meeting in New Orleans, Louisiana March 9-14, 2008.

Dana Longcope & David McKenzie attended the SDO-HMI Science Teams meeting in Napa, CA March 24-29, 2008.

Hui Chen attended the MRS Spring Conference in San Francisco, CA, March 23-30, 2008.

Todd Gelbord attended the Yang-Simons Symposium at SUNY-Stony Brook in New York, NY, March 27-April 1, 2008.

OUTREACH

This fall semester SPOT presenters traveled to all corners of the state to give free presentations about current NASA missions. The SPOT presentations this year are The Sun-Earth Connection and Astronauts & Aliens. Schools visited by SPOT so far this year include Westby, Valier, Hays, Boulder, Anaconda, Wibaux, Scobey, West Glacier & East Glacier, Divide, Swan Lake, Goldcreek, and Trout Creek.

Visitors

Carlos dos Santos of Lorena, Brazil visited the Neumeier group for almost two weeks the end of March to conduct experiments and collaborate.

Rufus Cone, Charles Thiel, and Randy Babbitt have new collaborations with a number of groups in Quantum Information Science.

- Professor Wolfgang Tittel of the Institute for Quantum Information Science (QIS) at the University of Calgary, Calgary, Alberta, and iCORE/GDC Industrial Research Chair (General Dynamics, Canada), is carrying out projects encompassing quantum cryptography, long-distance photonic quantum communication, and quantum memory. Tittel first visited MSU in September 2006 and presented a Physics Colloquium and an invited talk at the OpTeC Annual Meeting. Rare earth ions and materials studied at MSU and grown at Scientific Materials are promising for realizing quantum memories.
- Ivan Lorgère, and Thierry Chanelière from the Laboratoire Aimé Cotton-CNRS at Université Paris Sud, Orsay, France, visited Charles Thiel and Rufus Cone for experiments, January 23 to February 10, 2008. This collaboration also includes Jean-Louis Le Gouët, also in Orsay.
- Since December 2007, Charles Thiel and Rufus Cone have been collaborating with Mikael Afzelius, a senior experimental researcher in the group of Nicolas Gisin in Geneva. Anisotropic optical and magnetic properties of the material $\text{Er}^{3+}:\text{Y}_2\text{SiO}_5$ crystals have been explored to optimize quantum memories. Afzelius visited January 21-27, 2008, for discussions of experimental results, and the experiments were continued by Charles Thiel in February.

Matt Sellars and Neil Manson from Australian National University in Canberra also spent extra time here visiting Rufus Cone, Charles Thiel, and Randy Babbitt, January 23-29, 2008, in connection with the Bozeman *SMQ/OAS* meeting.

Thomas Böttger, Assistant Professor in the Physics Department of the University of San Francisco visited Charles Thiel and Rufus Cone March 14-24, 2008, for research collaboration.

Alumni News

Steve Ferguson retired from Western Michigan University in Kalamazoo, MI where he had been the Accelerator Physicist for 31 years. His replacement at that position is Asghar Kayani, a former MSU postdoc. For the past 20 years, Mike Sinclair, MSU grad, has been bringing the first year Physics students from the Kalamazoo Area Math and Science Center to the accelerator lab at Western Michigan to perform a Rutherford scattering experiment.

Physics News

Dr. Bernard Jacquier, with whom Rufus Cone has collaborated for over 20 years, was awarded the Grand Prix France Telecom by the French Academy of Sciences. The award, jointly to Emmanuel Desurvire and Bernard Jacquier, was presented February 5, 2008, along with 30,500 Euros. Jacquier is a director of research at the CNRS Laboratory of Luminescent Materials (PCML) at the University Claude Bernard in Lyon, and Desurvire is director of the Physics Research Group at Thalès in Saint-Escobille. According to the Academy web site, "Emmanuel Desurvire and Bernard Jacquier contributed to the discovery and development of a major invention in the field of telecommunications which relates to the regeneration of the optical signals propagated in a glass fibre. This discovery comprised the design and the realization of an amplifier based on an emitter of light, manufactured industrially, which is a key element of the optical communication networks covering planet. Their theoretical and industrial results will make it possible to exploit to the maximum in the future the extraordinary potential of communications using optics."

http://www.academie-sciences.fr/conferences/seances_solennelles/pdf/palmares_prix_JS_05_02_08.pdf