Daniel Hellfeld

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OBJECTIVE

To conduct scientific research in the field of nuclear engineering, specifically in the areas of radiation detection and imaging with applications in nuclear security and safeguards.

EDUCATION

Doctor of Philosophy (PhD), Nuclear Engineering (4.0/4.0) **Aug 2015 - Present**
University of California, Berkeley *Berkeley, CA*
- Fellow at the Nuclear Science and Security Consortium (NSSC).
- Area of current research: Omnidirectional gamma-ray imaging with a hand-held free-moving CdZnTe-based spherical active coded aperture.
- Advisor: Prof. Kai Vetter.

Master of Science (MS), Nuclear Engineering (4.0/4.0) **Aug 2013 - May 2015**
Texas A&M University *College Station, TX*
- Member of the Nuclear Security Science and Policy Institute (NSSPI).
- Thesis: *Feasibility of Remote Nuclear Reactor Antineutrino Directionality via Elastic Electron Scattering in the WATer CHerenkov Monitor of ANtineutrinos (WATCHMAN).*
- Advisor: Prof. Craig Marianno.

Bachelor of Science (BS), Physics (3.89/4.0) **Sep 2009 - Jun 2013**
University of California, Santa Barbara *Santa Barbara, CA*

RESEARCH EXPERIENCE

NSSC Graduate Research Fellow **Aug 2015 - Present**
Nuclear Science and Security Consortium, UC Berkeley *Berkeley, CA*
- Analyzing the coded aperture imaging performance of a CdZnTe-based spherical active coded aperture gamma-ray imager.
- Optimized the coded configuration of detectors using simulations and iterative techniques.
- Currently investigating real-time free-moving 3D imaging with scene data fusion.

Graduate Student Intern **Jun 2015 - Jul 2015**
Rare Event Detection, NACS, Lawrence Livermore National Laboratory *Livermore, CA*
- Investigated the impact of cosmogenic radionuclide backgrounds as a function of detector overburden and the effects on directional sensitivity.
- Integrated reactor antineutrino-electron scattering event generator into the RAT-PAC Geant4 simulation package.

NSSC Graduate Research Fellow **Nov 2014 - May 2015**
Nuclear Science and Security Consortium, UC Berkeley *Berkeley, CA*
- Analyzed antineutrino directional reconstruction and background suppression techniques.
- Performed simulations and analysis of antineutrino scattering background sources in water.

Graduate Student Intern **Jun 2014 - Aug 2014**
Rare Event Detection, NACS, Lawrence Livermore National Laboratory *Livermore, CA*
- Conducted Geant4 simulations and data analysis in ROOT for the proposed WATer CHerenkov Monitor of AntiNeutrinos (WATCHMAN) detector.
- Studied the feasibility of nuclear reactor directionality using antineutrino-electron elastic scattering in WATCHMAN.

Graduate Research Assistant **Sep 2013 - Nov 2014**
Department of Nuclear Engineering, Texas A&M University *College Station, TX*
- Investigated the use of silicon photodiodes to enhance scintillation detection capabilities.

○ Designed and constructed a multi-detector (NaI) housing for a vehicle-mounted radiation detection system.

TEACHING EXPERIENCE	**Lab Instructor**	**Sep 2014 - Dec 2014**
	Department of Nuclear Engineering, Texas A&M University	*College Station, TX*

○ Responsible for the setup and teardown of weekly laboratory experiments for the graduate radiation detection course, NUEN 605.
○ Assisted students with lab procedures and answered any questions regarding experiments or course content.

	Math/Physics Tutor	**Jan 2013 - Mar 2013**
	Campus Learning and Assistance Services, UC Santa Barbara	*Santa Barbara, CA*

○ Tutored UCSB's Astronomy 1: Introduction to Astronomy.
○ Instructed four 50-minute sessions a week with 20 students each.
○ Reviewed confusing concepts, prepared example problems and study sheets, and answered any individual questions.

SCIENTIFIC COMPUTING SKILLS	**Languages:**	Python, C++, C, bash
	Mathematical/Analysis Software:	ROOT, Mathematica, Matlab
	Monte Carlo Particle Transport Software:	Geant4, MCNP5/MCNPX, Serpent
	Gamma Spectroscopy Software:	GENIE-2000, MAESTRO, GammaVision
	Nuclear Burnup Software:	ORIGEN2, CINDER-90, TransLAT
	Build Systems:	make, CMake
	Operating Systems:	Mac, Linux, MS Windows
	Documentation:	Doxygen, Sphinx
	Version Control:	git
	Other Software:	LaTeX, MS Office

PROFESSIONAL SOCIETY MEMBERSHIPS	IEEE Nuclear and Plasma Sciences Society	**2016 - Present**
	Institute of Nuclear Materials Management	**2014 - Present**
	American Nuclear Society	**2013 - Present**
	National Society of Collegiate Scholars	**2009 - 2013**
	Golden Key International Honor Society	**2009 - 2013**

AWARDS	**Runner-up NSS Student (Oral) Paper Competition**, IEEE NSS-MIC	**Oct 2017**
	Valentin T. Jordanov Rad. Instrum. Travel Grant, IEEE NSS-MIC	**Aug 2017**
	Best Oral Presentation, University Program Review Meeting	**Jun 2017**
	Nuclear Science and Security Consortium Fellowship, UC Berkeley	**Aug 2015**
	JD Williams Best Poster Award, INMM Annual Meeting	**Jul 2015**
	Nuclear Science and Security Consortium Fellowship, UC Berkeley	**Nov 2014**
	Graduate Enhancement Fellowship, Texas A&M University	**Aug 2013**
	Highest Academic Honor Award, UC Santa Barbara, Physics Dept.	**May 2013**
	Highest Honors, UC Santa Barbara	**May 2013**

WORKSHOPS & SEMINARS	**Image Quality and Statistical Analysis**	**Oct 2017**
	2017 IEEE NSS/MIC Short Course	*Atlanta, GA*
	Novel Technologies for Safeguards and Arms Control Verification	**Aug 2017**
	Institute for Nuclear Materials Management, Sandia National Laboratory	*Albuquerque, NM*
	Fundamentals of Nondestructive Assay Training Course	**Jun 2017**
	Los Alamos National Laboratory, NSSC	*Los Alamos, NM*
	Fukushima Fieldwork for Radiation Disaster Recovery	**Aug 2016**
	Phoenix Program, Hiroshima University	*Fukushima, Japan*

Python Boot Camp   **Aug 2016**
UC Berkeley, NSF, Berkeley Institute for Data Science   *Berkeley, CA*

Nuclear Safeguards Policy and Information Analysis Course   **Jun 2016**
Middlebury Institute for International Studies at Monterey   *Monterey, CA*

Next Generation Fukushima Workshop   **Apr 2016**
IRC, LBNL, FREA, Koriyama City   *Koriyama, Japan*

International Symposium for Resilient Communities   **Apr 2016**
IRC, LBNL, FREA, Koriyama City   *Koriyama, Japan*

Applied Antineutrino Physics Workshop   **Dec 2015**
Center for Neutrino Physics, Virginia Tech University   *Arlington, CA*

Public Policy and Nuclear Threats Summer Boot Camp   **Jun 2015**
Institute on Global Conflict and Cooperation, UC San Diego   *San Diego, CA*

Global Nuclear HR Development for Safety, Security & Safeguards   **Feb 2015**
Academy for Global Nuclear Safety and Security Agent, Tokyo Tech   *Tokyo, Japan*

NDA Fundamentals for Nuclear Safeguards   **Nov 2014**
Next Generation Safeguards Initiative, Oak Ridge National Laboratory   *Oak Ridge, TN*

TALKS

[1] "Omnidirectional 3D Gamma-ray Imaging with a Free-moving Spherical Active Coded Aperture", IEEE NSS-MIC, Atlanta, Georgia, Oct. 2017.

[2] "Radiological Source Localization with an Omnidirectional Spherical Active Coded Aperture", University Program Review Meeting, Walnut Creek, CA, Jun. 2017.

[3] "Optimization of a Spherical Active Coded Mask Imager", IEEE NSS-MIC, Strasbourg, France, Nov. 2016.

[4] "Reactor Antineutrino Directionality via Elastic Electron Scattering in Gd-Doped Water Cherenkov Detectors", Applied Antineutrino Physics Workshop, Arlington, VA, Dec. 2015.

POSTERS

[1] "3D Gamma-ray Imaging and Scene Data Fusion", Nuclear Science and Security Consortium (NSSC) Program Review, Berkeley, CA, Sep. 2017.

[2] "3D Handheld Mapping of Radioactive Sources for International Nuclear Safeguards", Novel Technologies, Techniques, and Methods for Safeguards and Arms Control Verification Workshop, Albuquerque, NM, Aug. 2017.

[3] "Directional Reconstruction of Reactor Antineutrinos via Electron Scattering in Gd-doped Water Cherenkov Detectors", IEEE NSS-MIC, Strasbourg, France, Nov. 2016.

[4] "Coded Aperture Gamma-Ray Imaging in Planar and Spherical Configurations", IEEE Symposium On Radiation Measurements and Applications (SORMA), Berkeley, CA, May 2016.

[5] "Towards 3D Gamma Ray Vision with HEMI and Looking Forward with PRISM", Next Generation Fukushima Workshop, Koriyama, Japan, Apr. 2016.

[6] "Nuclear Reactor Antineutrino Directionality via Elastic Electron Scattering in a Gd-Doped Water Cherenkov Detector", INMM Annual Meeting, Indian Wells, CA, Jul. 2015.

CONFERENCE PROCEEDINGS

[1] K. Vetter, A. Haefner, R. Barnowski, **D. Hellfeld**, P. Barton, L. Mihailescu, R. Pavlovsky "Gamma-Ray Imaging and Sensor Fusion: Gamma-Ray Vision in 3D and Color ", *in Proc. IEEE NSS-MIC*, Atlanta, GA, Oct. 2017.

[2] **D. Hellfeld**, P. Barton, R. Barnowski, A. Haefner, D. Gunter, L. Mihailescu, K. Vetter, "Omnidirectional 3D Gamma-ray Imaging with a Free-moving Spherical Active Coded Aperture", *in Proc. IEEE NSS-MIC*, Atlanta, GA, Oct. 2017.

[3] P. Barton, M. Turqueti, A. Haefner, R. Barnowski, **D. Hellfeld**, V. Negut, L. Mihailescu1, K. Vetter, "PRISM - A CZT-Based Portable Radiation Imaging Spectroscopy and Mapping System", *in Proc. IEEE NSS-MIC*, Atlanta, GA, Oct. 2017.

[4] S. Dazeley, A. Bernstein, T. Classen, E. Reedy, **D. Hellfeld**, M. Duvall, C. Marianno, "Antineutrino Detection based on ^{6}Li-doped Pulse Shape Sensitive Plastic Scintillator and Gd-doped Water", *in Proc. Int. Conf. on the App. of Nucl. Tech.*, Crete, Greece, Jun. 2017.

[5] **D. Hellfeld**, P. Barton, D. Gunter, L. Mihailescu, K. Vetter, "Optimization of a Spherical Active Coded Mask Imager", *in Proc. IEEE NSS-MIC*, Strasbourg, France, Nov. 2016.

[6] **D. Hellfeld**, A. Bernstein, S. Dazeley, C. Marianno, "Nuclear Reactor Antineutrino Directionality via Elastic Electron Scattering in a Gd-Doped Water Cherenkov Detector", *in Proc. INMM Annual Meeting*, Indian Wells, CA, Jul. 2015.

PUBLICATIONS & PAPERS

[1] **D. Hellfeld**, P. Barton, D. Gunter, L. Mihailescu, K. Vetter, "A Spherical Active Coded Aperture for 4π Gamma-ray Imaging", *IEEE Trans. Nucl. Sci.*, vol. 64, no. 11, pp. 1-6, 2017.

[2] **D. Hellfeld**, S. Dazeley, A. Bernstein, C. Marianno, "Reconstructing the Direction of Reactor Antineutrinos via Electron Scattering in Gd-Doped Water Cherenkov Detectors", *Nucl. Instrum. Methods A*, vol. 841, pp. 130-138, 2017.

[3] N. S. Bowden, K. M. Heeger, P. Huber, C. Mariani, R. B. Vogelaar. "Applied Antineutrino Physics 2015 - Conference Summary". arXiv:1602.04759, 2015.

[4] **D. Hellfeld**, C. Marianno, W. Charlton, R. Webb, "Feasibility of Nuclear Reactor Antineutrino Directionality via Elastic Electron Scattering in the WATer CHerenkov Monitor of ANtineutrinos (WATCHMAN)", *Master's Thesis*, Texas A&M University, 2015.

[5] M. Askins, M. Bergevin, A. Bernstein, S. Dazeley, S. T. Dye, T. Handler, A. Hatzikoutelis, **D. Hellfeld**, P. Jaffke, Y. Kamyshkov, B. J. Land, J. G. Learned, P. Marleau, C. Mauger, G. D. Orebi Gann, C. Roecker, S. D. Rountree, T. M. Shokair, M. B. Smy, R. Svoboda, M. Sweany, M. R. Vagins, K. A. van Bibber, R. B. Vogelaar, M. J. Wetstein, M. Yeh, "The Physics and Nuclear Nonproliferation Goals of WATCHMAN: A WATer CHerenkov Monitor for ANtineutrinos", arXiv:1502.01132, 2015.

RELEVANT COURSEWORK

University of California, Berkeley
- Nuclear Security: The Nexus Between Policy and Technology (NE 285)
- Numerical Simulation in Radiation Transport (NE 255)
- Medical Imaging Signals and Systems (BIOENG/ELENG 261)
- Teaching Techniques in Nuclear Engineering (NE 375)
- Analytical Methods for Nonproliferation (NE 230)
- Nuclear Physics (NE 201)
- Nuclear Reactor Theory (NE 250)
- Nuclear Reactions and Radiation (NE 101)
- Nuclear Materials (NE 120)

Texas A&M University
- Radiation Interactions and Shielding (NUEN 604)
- Radiation Detection and Nuclear Materials Measurement (NUEN 605)
- Reactor Theory (NUEN 601)
- Nuclear Fuel Cycles and Nuclear Materials Safeguards (NUEN 651)
- Nuclear Reactor Analysis and Experimentation (NUEN 606)
- Nuclear Nonproliferation and Arms Control (NUEN 650)
- Monte Carlo Computational Particle Transport (NUEN 630)
- Special Topics: Introduction to Geant4 Monte Carlo Transport (NUEN 689)
- Statistical Analysis (STAT 601)

University of California, Santa Barbara
- Classical Mechanics (PHYS 105A/B)
- Electromagnetism (PHYS 110A/B)

- Quantum Mechanics (PHYS 115A/B/C)
- Nuclear Physics (PHYS 150)
- Mathematical Methods for Theoretical Physics (PHYS 100A/B)
- Thermodynamic and Statistical Physics (PHYS 119A)
- Particle Physics (PHYS 125)
- Astronomy/Cosmology (ASTRO1/2)
- Analog Electronics (PHYS 127AL)
- Advanced Physics Laboratory (PHYS 128AL/BL)
- California Physics (PHYS 120)
- Differential Equations and Linear Algebra (MATH 3C/5A)
- Vector Calculus (MATH 5B/C)

REFERENCES   *Available upon request.*