CURRICULUM VITAE
Jesse Goldman

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Department of Physics
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Education

- Ph.D. Physics, Kansas State University, December 2000.

  Thesis title: "A Next-To-Leading Order QCD Analysis of Charged Current Event Rates From νN Deep Inelastic Scattering at the Fermilab Tevatron" (Fermilab E815/NuTeV collaboration)

- B.A Physics, Columbia University, May 1995.

Academic and Professional Experience

- **Fall 2021 - Present**: Assistant Teaching Professor, Dept. of Physics, Drexel University, Philadelphia, PA
- **Fall 2019 - Fall 2021**: Teaching Faculty, Kohelet Yeshiva High School, Merion Station, PA
- **Fall 2016 -Spring 2019**: Visiting Assistant Professor, Dept. of Physics, Saint Josephs University, Philadelphia PA
- **Fall 2015 -Spring 2016**: Visiting Assistant Professor, Dept. of Physics, Haverford College, Haverford PA
- **Spring 2011 -Spring 2015**: Assistant Professor, Dept. of Physics and Astronomy, University of Hawaii at Hilo
- **Fall 2007 -Fall 2010**: Lecturer, Dept. of Physics, Faculty of Science, National University of Singapore, Singapore
- **Fall 2005 -Spring 2007**: Lecturer, Physics Department, California Polytech. State Univ., San Luis Obispo CA
- **March 2003 -May 2004**: Post-doctoral Researcher, Lawrence Berkeley National Lab, Berkeley CA
- **April 2002 -March 2003**: Post-doctoral Fellow, Research Center for Neutrino Science, Tohoku Univ., Sendai JP
- **January 2001 -April 2002**: Japan Society for the Promotion of Science (JSPS) Post-doc, RCNS, Tohoku Univ.

Courses Taught

Drexel University

- PHYS 102 (Fundamentals of Physics II) Lecture with integrated Lab. Second of a four course sequence teaching fundamental physics to engineering and science majors. Topics include: electrostatics, capacitors, charges in motion, insulators, semiconductors, conductors, superconductors, voltage and current measurements, magnetism, electromagnetic induction, magnetic materials, quantum dots, magnetic resonance phenomenon. **(F21)**
- PHYS 201 (Fundamentals of Physics III) Lecture. Third of a four course sequence teaching fundamental physics to engineering and science majors. Topics include: oscillations, EM waves, interference, diffraction, wave-particle duality, energy-matter equivalence, uncertainty relations, Schrodinger's equation, Hydrogen atom, laser, and nuclear physics. **(F21)**

Kohelet Yeshiva High School

- Advanced Placement Physics I – Algebra Based **(F20, S21)**
- Introduction to Calculus – Honors/Expedited Track **(F19, S20, F20, S21)**
- Advanced Placement Calculus BC **(F19, S20, F20, S21)**
- Physics – College Preparatory Track **(F20, S21)**
- Physics – Expedited Track **(F19, S20)**
- Precalculus – Honors Track **(F19, S20)**
- Python Programming – $9^{th}/10^{th}$-grade elective sequence**(F19, S20)**

Saint Joseph's University

- PHY 252 (Modern Physics II) lecture with integrated laboratory. 4 hours/week, 15 weeks. This course is an analytical survey of the experiments, theories, and principles that led to the modern view of physical reality. Topics include: an introduction to atomic structure, statistical physics, molecular structure, solid state, nuclear structure and nuclear physics applications, and elementary particles. Laboratory experiments included studies of electron diffraction, radioactive decay, Hydrogen spectroscopy, and the muon lifetime. **(S17, S18, S19)**
- PHY 251 (Modern Physics I) lecture with integrated laboratory. 4 hours/week, 15 weeks. This course is the pre-requisite for PHYS 252 and covers introductory special relativity, wave-particle duality, uncertainty relations, the Bohr theory of Hydrogen, quantum mechanics in one dimension, and the Hydrogen atom. Laboratory work included the measurement of the speed of light, the Millikan oil-drop experiment, the electron's charge-to-mass ratio, and the Franck-Hertz experiment. **(F16, F17, F18)**
- PHY 115 (Investigations in Astronomy) lecture. 3 hours/week, 15 weeks. This course, designed for the non-science major, provides an introduction to the science of astronomy. Topics include the roles of observation, theory, philosophy, and technology in the development of the modern conception of the Universe. The Copernican Revolution, the birth and death of stars, our Milky Way Galaxy, time, and our ancestral heritage in the cosmos will be discussed and explored. No previous science, or mathematics beyond the level of high school algebra, is required. In this course, we will examine our place in the Universe and study the bizarre but beautiful worlds it contains. **(F16, S17, F17, S18, F18, S19)**
- PHY 115L (Investigations in Astronomy Laboratory) laboratory. 3 hours/week, 15 weeks. Laboratory course accompanying PHY 115. Students investigate lunar phases, properties of electromagnetic spectra, planetary orbits, star life and death, constellations, and the laws of gravitation along with other selected experiments in astronomy. **(F16, S17, F17, S18, F18, S19)**

Haverford College

- PHYS 214 (Intro to Quantum Mechanics) lecture. 3 hours/week, 15 weeks. An introduction to the principles governing systems on the atomic scale. Topics include the experimental basis of quantum mechanics, wave-particle duality, Schrödinger's equation and solutions in one dimension, time dependence of quantum states, angular momentum, and single-electron atoms. Recent developments, such as paradoxes calling attention to the remarkable behavior of quantum systems will be discussed. Multi-electron atoms and nuclei will be discussed if time allows. **(S16)**
- PHYS 115 (Modern Introductory Physics Beyond Newton) lecture. 3 hours/week, 15 weeks. Calculus-based honors-level course in mechanics designed for advanced entering students with a strong background in introductory physics. Topics include an introduction to the Lagrangian formulation of mechanics, the inertia tensor, coupled oscillators, accelerating reference frames, conservation laws, and special relativity. **(F15)**
- PHYS 101/105/115 (Introductory Physics) laboratory. 3 hours/alternating weeks, 7 experiments. Shared laboratory course for students enrolled in PHYS 101, 105, and 115. Includes a selection of experiments related to lecture topics. **(F15)**
- PHYS 309 (Advanced Electromagnetism) lecture. 3 hours/week, 15 weeks. The course covers classical electrostatics and electrodynamics at the intermediate level. Topics include electro- and magneto-statics in ponderable media, boundary value problems, the Laplace Equation, multipole moments, electromagnetic waves, and radiation. (**S16**)
- PHYS 303 (Statistical Physics) lecture. 3 hours/week, 15 weeks. Classical thermodynamics, thermodynamic potentials, entropy, heat engines, mixing, phase transitions, micro-canonical, canonical, and grand-canonical ensemble approaches to statistical mechanics. (**F15**)

University of Hawaii, Hilo

- PHYS 170 (General Physics I) lecture. 4 hours/week, 16 weeks. Calculus-based first-semester course in mechanics, oscillations, and thermodynamics for students in the physical sciences. **(S12, S13, S15)**
- PHYS 170L (College Physics I Lab). 2 hours/week, 11 labs. Laboratory course accompanying both the calculus and algebra-based first-semester physics lectures. **(S12, S13)**
- PHYS 171 (General Physics II) lecture. 4 hours/week, 16 weeks. Calculus-based second-semester course in electricity, magnetism, waves, and optics for students in the physical sciences. **(F12, F14)**
- PHYS 171L (College Physics II Lab). Laboratory course accompanying both the calculus and algebra-based second-semester physics lectures. **(F11, F12, S14)**
- PHYS 107 (College Physics II) lecture. 3 hours/week, 16 weeks. Algebra-based second-semester course in electricity and magnetism with an introduction to modern physics. Designed for students in the life-sciences. **(F11)**

- PHYS 106 (College Physics I) lecture. 3 hours/week, 16 weeks. Algebra-based first-semester course in mechanics, oscillations, and thermodynamics. Designed for students in the life-sciences. **(S11)**
- PHYS 270 (Modern Physics) lecture. 3 hours/week, 16 weeks. Sophomore-level course covering special relativity, blackbody radiation and normal modes, and an introduction to quantum theory and solutions to Schrödinger's Equation. **(S13)**
- PHYS 371 (Classical Mechanics) lecture. 3 hours/week, 16 weeks. Variational methods, central-force motion, oscillations, Lagrangian and Hamiltonian formulations of mechanics. (**F12, S14, S15**)
- PHYS 330 (Electromagnetism I) lecture. 4 hours/week, 16 weeks. Junior level course in electromagnetism covering electrostatics and magnetostatics, electric and magnetic fields in matter, multipole expansion, vector and scalar potentials, the method of images, Laplace's Equation, electromagnetic induction, and Maxwell's Equations (**S12, F14**)
- PHYS 341 (Thermodynamics) lecture. 3 hours/week, 16 weeks. Classical thermodynamics, thermodynamic potentials, entropy, mixing, phase transitions, micro-canonical, canonical, and grand-canonical ensemble approaches to statistical mechanics (**F11, S14**)
- PHYS 394 (Modern Physics Laboratory). 4 or more hours/week, 16 weeks. Junior/Senior level laboratory course including Millikan Oil Drop, e/m ratio of the electron, Photoelectric Effect, Zeeman Effect, Franck-Hertz, and Michelson interferometry experiments. (**F13**)
- PHYS 430 (Quantum Mechanics I) lecture. 4 hours/week, 16 weeks. Wave and matrix formulations of quantum mechanics, Schrödinger Equation in several dimensions, harmonic oscillator and ladder operators, spin and orbital angular momentum, hydrogen atom, quantum statistical mechanics, fermions and bosons. (**S11, F13**)
- PHYS 499V (Particle Physics Seminar) seminar. 1 hour/week, 16 weeks. An overview of particle physics ranging from the discovery of the electron to formulation of the Standard Model. Covers mathematical aspects of the theory including the special relativistic treatment of momentum and energy, collisions, tensor algebra, and an introduction to Feynman Diagrams. (**F11**)

National University of Singapore

- PC1432 (Engineering Physics II) lecture. 4 hours/week, 13 weeks. Calculus-based second-semester course in electricity and magnetism for physics and engineering majors. **(F07, F08, S08)**
- PC1432L (Engineering Physics II Laboratory). Attached to PC1432. 3 hours/experiment, 2 experiments. Lab course associated with the calculus-based second-semester introductory lectures on electricity and magnetism for physics and engineering majors. **(F07, F08, F09, S09, S10)**
- SP1201P (Freshman Seminar – "Matter and Interaction") seminar. Seminar course designed to introduce incoming students from a range of majors to physics topics including action-at-a-distance, radiation, energy transfer, and scattering. The module emphasized active discussion between instructor and students, group work, class projects, and active learning in place of an instructor-centric, lecture-heavy experience. **(F09)**
- GEK1510/PC1323 (Great Ideas in Contemporary Physics) lecture. 4 hours/week, 13 weeks. Non-mathematical general education module covering topics in modern physics including special and general relativity, the photo-electric effect, wave-particle duality, cosmology, nuclear physics, astrophysics, quantum mechanics, particle physics, and lasers. **(F08, F09)**
- PC1431L (Engineering Physics I Laboratory). Attached to PC1431. 3 hours/experiment, 2 experiments. Lab course associated with the calculus-based first-semester introductory lectures on mechanics and heat for physics and engineering majors. **(F07)**
- PC3232 (Nuclear and Particle Physics) lecture. 4 hours/week, 13 weeks. Shell and collective model of the nucleus, alpha/beta/gamma decay, scattering, detectors and accelerators, Standard Model of particle physics, anti-particles and symmetries of nature. (**S08**)
- PC2131 (Electricity and Magnetism I) lecture. 4 hours/week, 13 weeks. Sophomore-level course in electromagnetism designed for physics majors. Roughly equivalent to PHYS 330 above. (**S10**)

California Polytechnic State University, San Luis Obispo

- Physics 132 (General Physics II) lecture. 4 hours/week, 10 weeks. Calculus-based second-quarter course in waves, oscillations, and hydrostatics designed for scientists and engineers. **(W05, S06, S07)**
- Physics 133 (General Physics III) lecture. 4 hours/week, 10 weeks. Calculus-based third-quarter course in electricity and magnetism designed for scientists and engineers. **(W07)**
- Physics 123 (College Physics III) laboratory. Laboratory course accompanying algebra-based third quarter electricity and magnetism for life-science majors. **(F06, W07)**

- Physics 123 (College Physics III) lecture. 4 hours/week, 10 weeks. Algebra-based lecture course covering electricity, magnetism, and modern physics designed for life-science majors. **(F06)**
- Physics 132 (General Physics II) laboratory. Laboratory course accompanying calculus-based second-quarter waves, oscillations, and hydrostatics for life-science majors **(W05)**
- Physics 121 (College Physics I) lecture. 4 hours/week, 10 weeks. Algebra-based first-quarter course in mechanics and heat designed for life-science majors. **(F05)**
- Physics 211 (Modern Physics I) lecture. 4 hours/week, 10 weeks. Sophomore course in modern physics designed for physics majors. Equivalent to UHH PHYS 270 above. **(S06, W07)**

Outreach Activities

- Planned and hosted semesterly astronomy nights at Saint Joseph's University. These events were designed both for students and other members of the university community and allowed them the opportunity to view stars, planets, and meteor showers through the physics department's eight inch Celestron telescopes. **(SJU – S17, F18)**
- Volunteered as a departmental representative at the Physics/Astronomy table during Onizuka day community outreach activities. The festivities, in honor of Hawaiian astronaut Ellison Onizuka, are an opportunity for faculty and students talk with local children and parents about astronomy. We also demonstrate solar telescopes and observing techniques. **(UHH – S13, S12)**
- Participated in the Journey Through The University (JTTU) program organized through the Gemini Observatory in Hilo Hawaii. Faculty participants give presentations in local elementary, middle, and high-schools to students interested in the sciences. My presentations were at the elementary school level and introduced the students to the night sky and optical instruments for observing the stars including telescopes, lasers, prisms, and optical filters. **(UHH – S12, S11)**
- Gave an invited talk on cosmology at Hwa Chong Institution in Singapore. HCI is a top ranked, highly selective junior-college level preparatory academy. The students in the science stream who attended my lecture were chosen for the interest in science and their intention to major in science at the university level following graduation. **(NUS – S10)**
- Contributed a particle physics lecture to the NUS Special Program in Science. The lecture was part of a series of laboratories and lectures offered in the NUS science faculty to incoming high-school and junior college students with special interest in physics or astronomy. **(NUS – S09)**
- Lectured to the general-public on cosmology and cosmic strings as part of the NUS Year in Astronomy festivities. **(NUS – S09)**
- Contributed a lecture on special relativity to NUS Science Focus 2008, a program aimed at talented junior college students run jointly by NUS and the Singapore Ministry of Education s Gifted Education Branch. Students completing 12 units of lecture-related work in this program receive a certificate. **(NUS – F08)**
- Joined the NUS Physics Department Outreach Committee. The committee s mandate is to build connections with local primary and secondary schools in order to encourage students to pursue their interests in physics and to provide them with guidance and the opportunity to take part in physics research at the university level. **(NUS – F07)**

Service

- Served as course and laboratory coordinator for the introductory calculus and algebra-based physics sequences (PHYS 106-107 and PHYS 170-171). **(UHH – S15)**
- Served on departmental search committee for a tenure-track observational astronomer position. Search successfully concluded in Spring 2013. **(UHH – S13)**
- Served as Physics/Astronomy department representative to university-wide Science, Technology, Engineering, and Math (STEM) honors certificate advisory committee. The job of the committee is to determine academic entry requirements for students interested in the STEM honors research program in the natural sciences ultimately leading to an honors certificate upon graduation. The committee s work was successfully completed in 2014. **(UHH – F14, S13, F12)**
- Served on departmental search committee for an observatory directory for the UHH 0.9 m telescope facility. Search successfully concluded in Spring 2012. **(UHH – S12)**
- Oversaw the NUS departmental Student Exchange Program (SEP) committee charged with determining course credit and transfer issues for student participating in a proposed astrophysics study-exchange program with the Australian National University and the University of North Carolina at Charlotte. **(NUS – F09)**

- Course coordinator for Physics 123 at Cal Poly, San Luis Obispo. Responsibilities included selection of laboratory experiments and assigning problem sets for all lecture sections. **(SLO – F06)**

Students Supervised

- Derek Hand (UHH - Seed Grant), "Using Shapelets to Identify Gravitationally Lensed Galaxy Pairs" **[F13-S14]**
- Andrew McNichols (UHH - NASA Space Grant Fellow), "Energy Dependence of Cosmic Ray Muons as a Function of Altitude on the Slopes of Mauna Kea" **[F13-S14]**
- Robert Pipes (UHH - NASA Space Grant Fellow), "Angular Dependence of Cosmic Ray Muons as a Function of Altitude on the Slopes of Mauna Kea" **[F13-S14]**
- Ivan Teng (NUS - M. Sc., Physics), "Search for Cosmic Strings in the COSMOS Survey" **[AY 2011-2012]**
- Peng Kian Tan (NUS - B. A. Honours, Physics), "Habitable Zones of Planetary Systems" **[AY 2009]**
- Ivan Teng (NUS - B. A. Honours, Physics), "Search for Cosmic Strings in Space Telescope Data" **[AY 2009]**

Recent Publications

- J.Goldman, A. McNichols, R. Pipes, "*Cosmic Ray Muons on the Slopes of Mauna Kea*", The Physics Teacher **58**, 38, 2020
- J. L. Christiansen, E. Albin, T. Fletcher, M. Foley (California Polytechnic University, San Luis Obispo), J. Goldman, I. P. .W. Teng (National University of Singapore), G. F. Smoot (University of California, Berkeley), "*Search for Cosmic Strings in the COSMOS Survey*", Phys. Rev. D **83**, 122004, 2011
- J. L. Christiansen, E. Albin, K. A. James (California Polytechnic University, San Luis Obispo), J. Goldman (National University of Singapore), D. Maruyama, G. F. Smoot (University of California, Berkley) "*Search for Cosmic Strings in the Great Observatories Origins Deep Survey*", Phys. Rev. D **77**, 123509, 2008
- (The NuTeV Collaboration) D. Mason J. Brau, R. B. Drucker, R. Frey (Oregon U.), P. Spentzouris, J. Conrad, B. T. Fleming, J. Formaggio, J. H. Kim, S. Koutsoliotas, C. McNulty, A. Romosan, M. H. Shaevitz, E. G. Stern, A. Vaitaitis, E. D. Zimmerman (Columbia U.), R. A. Johnson, N. Suwonjandee, M. Vakili (Cincinnati U.), R. H. Bernstein, L. Bugel, M. J. Lamm, William L. Marsh, P. Nienaber, N. Tobien, J. Yu (Fermilab), T. Adams, A. Alton, T. Bolton, J. Goldman, M. Goncharov (Kansas State U.), L. de Barbaro, D. Buchholz, H. Schellman, G. P. Zeller (Northwestern U.), S. Boyd, J. McDonald, D. Naples, V. Radescu, M. Tzanov (Pittsburgh U.), S. Avvakumov, P. de Barbaro, A. Bodek, Howard Scott Budd, D. A. Harris, Kevin Scott McFarland, W. K. Sakumoto, U. K. Yang (Rochester U.), "*Measurement of the Nucleon Strange-Antistrange Asymmetry at Next-to-Leading Order in QCD from NuTeV Dimuon Data*", Phys. Rev. Lett.**99**, 192001, 2007
- (T. Araki *et al.*, The KamLAND Collaboration) T. Araki, S. Enomoto, K. Furuno, Y. Gando, K. Ichimura, H. Ikeda, K. Inoue, Y. Kishimoto, M. Koga, Y. Koseki, T. Maeda, T. Mitsui, M. Motoki, K. Nakajima, K. Nakamura, H. Ogawa, M. Ogawa, K. Owada, J. -S. Ricol, I. Shimizu, J. Shirai, F. Suekane, A. Suzuki, K. Tada, S. Takeuchi, K. Tamae, Y. Tsuda, H. Watanabe (RCNS, Sendai), J. Busenitz, T. Classen, Z. Djurcic, G. Keefer, D. S. Leonard, A. Piepke, E. Yakushev (Alabama U.), B. E. Berger, Y. D. Chan, M. P. Decowski, D. A. Dwyer, S. J. Freedman, B. K. Fujikawa, J. Goldman, F. Gray, K. M. Heeger, L. Hsu, K. T. Lesko, K. -B. Luk, H. Murayama, T. O'Donnell, Alan W. P. Poon, H. M. Steiner, L. A. Winslow (UC, Berkeley & LBL, Berkeley), C. Jillings, C. Mauger, R. D. McKeown, P. Vogel, C. Zhang (Caltech, Kellogg Lab), C. E. Lane, T. Miletic (Drexel U.), G. Guillian, J. G. Learned, J. Maricic, S. Matsuno, S. Pakvasa (Hawaii U.), G. A. Horton-Smith (Kansas State U.), S. Dazeley, S. Hatakeyama, A. Rojas, R. Svoboda (Louisiana State U.), B. D. Dieterle (New Mexico U.), J. Detwiler, G. Gratta, K. Ishii, N. Tolich, Y. Uchida (Stanford U., Phys. Dept.), M. Batygov, W. Bugg, Y. Efremenko, Y. Kamyshkov, A. Kozlov, Y. Nakamura (Tennessee U.), H. J. Karwowski, D. M. Markoff, R. M. Rohm, W. Tornow, R. Wendell (TUNL, Durham & Duke U. North Carolina U.), M. -J. Chen, Y. -F. Wang (Beijing, Inst. High Energy Phys.), F. Piquemal (CENBG, Gradignan), "*Search for the invisible decay of neutrons with KamLAND*", Phys. Rev. Lett. **96**, 101802, 2006
- T. Araki *et al.* (The KamLAND Collaboration), "*Experimental Investigation of geologically produced antineutrinos with KamLAND*", Nature **436**, 499-503, 2005
- T. Araki *et al.* (The KamLAND Collaboration), "*Measurement of Neutrino Oscillation with KamLAND: Evidence of Spectral Distortion*", Phys. Rev. Lett. **94**, 081801, 2005
- (K. Eguchi *et al.*, The KamLAND Collaboration) K. Eguchi, S. Enomoto, K. Furuno, H. Hanada, H. Ikeda, K. Ikeda, K. Inoue, K. Ishihara, T. Iwamoto, T. Kawashima, Y. Kishimoto, M. Koga, Y. Koseki, T. Maeda, T. Mitsui, M. Motoki, K. Nakajima, T. Nakajima, H. Ogawa, K. Owada, F. Piquemal, I. Shimizu, J. Shirai, F. Suekane, A. Suzuki, K. Tada, O. Tajima, T. Takayama, K. Tamae, H. Watanabe (Tohoku U.), J. Busenitz, Z. Djurcic, K. McKinny, D. M. Mei, A. Piepke, E. Yakushev (Alabama U.),

B. E. Berger, Y. D. Chan, M. P. Decowski, D. A. Dwyer, S. J. Freedman, Y. Fu, B. K. Fujikawa, J. Goldman, K. M. Heeger, K. T. Lesko, K. B. Luk, H. Murayama, D. R. Nygren, C. E. Okada, Alan W. P. Poon, H. M. Steiner, L. A. Winslow (UC, Berkeley & LBL, Berkeley), G. A. Horton-Smith, C. Mauger, R. D. McKeown, B. Tipton, P. Vogel (Caltech, Kellogg Lab), Charles E. Lane, T. Miletic (Drexel U.), P. W. Gorham, G. Guillian, J. G. Learned, J. Maricic, S. fMatsuno, S. Pakvasa (Hawaii U.), S. Dazeley, S. Hatakeyama, R. Svoboda (Louisiana State U.), B. D. Dieterle, M. DiMauro (New Mexico U.), Jason A. Detwiler, G. Gratta, K. Ishii, N. Tolich, Y. Uchida (Stanford U., Phys. Dept.), M. Batygov, W. Bugg, Y. Efremenko, Yuri A. Kamyshkov, A. Kozlov, Y. Nakamura (Tennessee U.), C. R. Gould, H. J. Karwowski, D. M. Markoff, J. A. Messimore, K. Nakamura, R. M. Rohm, W. Tornow, A. R. Young (TUNL, Durham & Duke U. & North Carolina U.), M. J. Chen, Y. F. Wang (Beijing, Inst. High Energy Phys.), "*A High Sensitivity Search for $\bar{\nu}_e$'s from the Sun and Other Sources at KamLAND*", Phys. Rev. Lett. **92**, 071301 2004

- K. Eguchi *et al.* (The KamLAND Collaboration), "*First Results from KamLAND: Evidence for Reactor Antineutrino Disappearance*", Phys. Rev. Lett. **90**, 021802, 2003

Research in preparation

- J. Goldman, A. McNichols, R. Pipes (U. of Hawaii) "*Energy and Angular Dependence of Cosmic Ray Muons at High Altitudes Using a Table-top Detector*"

Grants

- University of Hawaii Seed Grant, $8600. Research proposal, "*A Search for Evidence of Cosmic String Signature in Sloan Digital Sky Survey Data*". (Sept. 2013)

Other Funds Granted

- University of Hawaii, Department of Physics and Astronomy, Departmental funds, $2500. Funds were used to purchase a Tektronix digital oscilloscope for use with the cosmic ray instrumentation project. (Feb. 2014)
- University of Hawaii, Department of Physics and Astronomy startup funds, $10,000. Funds were used to purchase a desktop workstation, CCD camera, small telescope, and mass storage for computational shapelet decomposition and digital image analysis project. (Jan. 2011)