University of Rochester

Summer 2009 undergraduate research in Physics, Optics, and Astronomy
(Including a partial list of Journal articles and Conference Proceedings co-authored by the REU students, updated Dec. 15, 2011)

1. Laura Arnold (Class of 2010), "Insights into Protoplanetary Disk Evolution from a Spitzer IRS Survey of NGC1333," Advisor: Prof. Dan Watson (Physics senior Thesis, 2010).
1. Insights into protoplanetary disk evolution from a Spitzer IRS of NGC1333 (RSPS 2010) Laura Arnold, University of Rochester
2 2011arXiv1107.3261A Arnold, L. A.; Watson, Dan M.; Kim, K. H.; Manoj, P.; Remming, I.; Sheehan, P.; Adame, L.; Forrest, W.; Furlan, E.; Mamajek, E.; and 4 coauthors A Spitzer IRS Survey of NGC 1333: Insights into disk evolution from a very young cluster
3 2011ApJS..193...11M Manoj, P.; Kim, K. H.; Furlan, E.; McClure, M. K.; Luhman, K. L.; Watson, Dan M.; Espaillat, C.; Calvet, N.; Najita, J. R.; D'Alessio, P.; and 6 coauthors Spitzer Infrared Spectrograph Survey of Young Stars in the Chamaeleon I Star-Forming Region, The Astrophysical Journal Supplement, Volume 193, Issue 1, article id. 11 (2011)
4. Laura Arnold, "Insights into Protoplanetary Disk Evolution from a Spitzer IRS Survey of NGC1333," Advisor: Prof. Dan Watson (Physics senior Thesis, 2010).
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2. Deshpreet Bedi, class of 2011 at Cornell University, worked with Professor Quillen on the stability of multiple planet systems -- specifically, the effect of a planetesimal disk on the recently-detected HR8799 planetary system. He plans to attend graduate school for theoretical physics/astrophysics.
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3. Neil Butler, class of 2011 at Cornell University, worked with Professor Gao on the study of electronic properties of organic thin film transistors. He plans to attend graduate school for material science.
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4. Brian Chapp, Class of 2010 at Lehigh University, works with Professor Gao to develop data acquisition systems used in determining the electrons spin polarization resultant from electron emissions issuing from surfaces in ultra-high vacuum experiments.
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4. James Corsetti, class of '10, worked under Professor Robert W. Boyd studying highly efficient detection of the Laguerre-Gauss modes of a laser using volume holograms. He plans to apply to graduate school for optics.
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5. Austen Erickson, class of '10 at the University of Rochester, worked with the Paleomagnetic Research Group of Professor John Tarduno investigating the natural remanent magnetization of olivine crystals in pallasite meteorites.

1 2010LPI....41.2150T Tarduno, J. A.; Cottrell, R. D.; Hopkins, J.; Erickson, A., The Paleomagnetic Record of Pallasite Meteorites, 41st Lunar and Planetary Science Conference, held

March 1-5, 2010 in The Woodlands, Texas. LPI Contribution No. 1533, p.215

2**. Magnetic properties of the Esquel Pallasite** (RSPS 2010) Austen M. Erickson, J. A. Tarduno, R. D. Cottrell, Dept. of Earth and Environmental Sciences, Dept. of Physics and Astronomy, University of Rochester

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6. Sam Friedman, class of '11 at Lafayette College, worked with Professor Frank Wolfs to test and develop technology to analyze dark matter detectors used in the LUX project. He plans on applying to graduate school in either electrical engineering or computer science.

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7. Andrew Galkiewicz, class of 2010 at the University of Rochester, worked with Prof. Andrew Jordan on coupling/decoupling thermodynamics of Quantum Brownian Oscillator.

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8. Josh Geller, class of '11 at the University of Rochester, worked with Professor Joseph Eberly analyzing mixed qubit states for entanglement studies. He plans to apply to graduate school in physics.

1. **Measuring Entanglement in Multi-Qubit Systems** (RSPS 2010) Joshua S. Geller University of Rochester
2. **Search for an Entanglement Measure for N-Qubit States via Phase Symmetry** (RSPS 2011) Joshua S. Geller University of Rochester
3. Josh Geller's report (Action, Camera, Light!) on the Optical Society of America meeting posted on website for the Student Perspectives on Physics Meetings of the American Physical Society.
4. Josh Geller, presentation the March Meeting of the American Physical Society in Dallas, Texas (2011) titled "Search of an Entanglement Measure for N-Qubit States via Phase Symmetry".
5. Josh Geller, Abstract, published in Bulleting of March Meeting of the American Physical Society in Dallas, Texas (2011) "Search of an Entanglement Measure for N-Qubit States via Phase Symmetry".
6. Josh Geller's presentation at the National Conference on Undergraduate Research in Ithaca, NY in April 2010.

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9. Alexander Green, Class of '10, worked with Professor Rajeev on the Planar Circular Restricted 3-body Problem with Random Force, Path of Minimum Force in PCR3BP

1. **Planar Circular Restricted Three Body Problem (PCR3BP)** (RSPS 2010) Jonathan Kurvits, Alexander Green, Prof. S. Rajeev, University of Rochester

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10. **John Golden,** "A Brief History of Solitons with Applications," Advisor: Prof. Nicholas Bigelow (Physics Senior Thesis, 2010)

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11. Dan Gresh, class of '11 at the University of Rochester, worked with Professor Nicholas Bigelow, and is responsible for design and implementation of a Bose-Einstein Condensate (BEC) timing control system. He plans to apply to graduate school for physics.

1. *Implementing a Semantic Web Knowledge Database for Scientific Control and Diagnostic Systems (presented at RSPS 2007)* - Daniel Gresh and Prof. Richard Kidder, Laboratory for Laser Energetics, University of Rochester
2. **Effect of Thresholds on Noise and Jet Energy in ECAL (presented at RSPS 2009), Daniel Gresh and Prof. Regina Demina (Physics Dept. U of R).**
3. Design and Implementation of a Timing Control System for use in a Bose-Einstein Condensate (BEC) Experiment **(RSPS 2010)** Daniel N. Gresh and Nicholas P. Bigelow University of Rochester
4. **Design and Implementation of a Timing Control System for use in a Bose-Einstein Condensate (BEC) Experimen (RSPS 2011)** Daniel N. Gresh and Nicholas P. Bigelow University of Rochester
5. **Daniel Gresh, presentation at** Frontiers in Optics 2010/Laser Science XXVI and the 2010 Industrial Physics Forum) in Rochester, NY in October 2010
6. **Daniel Gresh ,** Presentation at the Annual Optical Society of America meeting in San Jose, California in October 2009

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12. Julieta Gruszko, class of '12 at University of Rochester, worked with Prof. Eric Mamajek on finding more accurate age estimates for nearby sun-like stars using their chromospheric activity levels. She plans to apply for graduate school in astrophysics.

1. A Compiled Catalogue of Ca II H & K Chromospheric Activity Measurements for FGK-type HD and HIP Stars (RSPS 2010). Eric E. Mamajek and Julieta Gruszko, Department of Physics & Astronomy, University of Rochester

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13. Jennifer Hansen, class of '11 at Grove City College, worked with Prof. Nicholas Bigelow on modulating the frequency profile of a broadband laser diode with a grating and mask for use in vibrational cooling of NaCs molecules. She plans to apply to graduate school in optics.

1. Optical Pumping for Vibrational Cooling of NaCs Molecules (RSPS 2010) Jennifer L. Hansen*, Patrick Zabawa, Amy Wakim, Nicholas P. Bigelow, University of Rochester and *Grove City College

2. **Jennifer Hansen, presentation at** Frontiers in Optics 2010/Laser Science XXVI and the 2010 Industrial Physics Forum) in Rochester, NY in October 2010

3. **Jennifer Hansen,** Presentation at the Annual Optical Society of America meeting in San Jose, California in October 2009

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14. Julianna Hopkins, class of 2010, at the University of Rochester, worked under Professor John Tarduno studying the natural remanent magnetization held by olivine crystals in Pallasite meteorites.
1 2010LPI....41.2150T Tarduno, J. A.; Cottrell, R. D.; Hopkins, J.; Erickson, A., The Paleomagnetic Record of Pallasite Meteorites,
41st Lunar and Planetary Science Conference, held March 1-5, 2010 in The Woodlands, Texas. LPI Contribution No. 1533, p.2150

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15. **Tom Kern, class of '11 at** Boston University, worked with Prof. Emil Wolf studying the bases and

implications of coherence theory and polarization.

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16. Dev Ashish Khaitan, Class of '11 at University of Rochester, worked with Prof. Forrest on analyzing the 2008 outburst of the ExOr star Ex Lup(i). We are attempting to build a physical model of the outburst by looking at the mineralogy and various stellar and disk parameters.

1. Dev Ashish Khaitan, "Neutron Induced Noise Removal Image Processing CIDs used in Inertial Confinement Fusion Experiments," Advisor: Prof. Frederic Marshall Physics BS Thesis, 2011)

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17. Colin Kinz-Thompson, class of '10 at the University of Rochester, worked on performing molecular dynamics simulations of charge migration in DNA with Prof. Esther Conwell. He plans to attend graduate school for chemistry.

1. Title: Localization of a Hole on an Adenine-Thymine Radical Cation in B-Form DNA in Water Author(s): Kravec S. M.; Kinz-Thompson C. D.; Conwell E. M.
Source: JOURNAL OF PHYSICAL CHEMISTRY B Volume: 115 Issue: 19 Pages: 6166-6171 DOI: 10.1021/jp110062y Published: MAY 19 2011
2. Title: Proton Transfer in Adenine-Thymine Radical Cation Embedded in B-Form DNA Author(s): Kinz-Thompson Colin; Conwell Esther
Source: JOURNAL OF PHYSICAL CHEMISTRY LETTERS Volume: 1 Issue: 9 Pages: 1403-1407 DOI: 10.1021/jz100214h Published: MAY 6 2010
3. Title: Polarons in DNA Oligomers Author(s): Kucherov Victor M.; Kinz-Thompson Colin D.; Conwell Esther M.
Source: JOURNAL OF PHYSICAL CHEMISTRY C Volume: 114 Issue: 3 Pages: 1663-1666 DOI: 10.1021/jp908809t Published: JAN 28 2010

4. Polarons in DNA Oligomers (RSPS 2010) Victor Kucherov, Colin Kinz-Thompson, Professor Esther Conwell, University of Rochester

5. Localization of a Hole on an Adenine-Thymine Radical Cation in B-Form DNA in Water (RSPS 2011) S. M. Kravec, C. D. Kinz-Thompson, and E. M. Conwell University of Rochester

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18. Kyle Lynch-Klarup, class of '10 at Grinnell College, worked with Steve Bloch and Dr. John Howell to design and build several components of a magneto-optical trap, including magnetic coils for producing linear magnetic fields, a locking mechanism to stabilize the laser beam, and an external cavity diode laser. He plans to apply to graduate school in physics.

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19. Victor Kucherov, class of '10 at the University of Rochester, worked with Professor Esther Conwell on calculating wave functions for electron-hole polarons on short DNA sequences. He plans to attend medical school.

1. Polarons in DNA Oligomers (RSPS 2010), Victor Kucherov, University of Rochester

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20. Kyle Kulpinski, class of '10 at Case Western Reserve University worked with Prof. Cindy Ebinger analyzing thermal stresses induced by dike injection. He plans to attend graduate school for Materials Science and Engineering.

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21. Jon Kurvits, class of '10, worked with Professor Rajeev on a number of problems in the circular restricted three body problem such as; finding the equations of motion under random forces, paths of minimal force, and linear stability of orbits in the presence of different forms of drag.

1. Planar Circular Restricted Three Body Problem (PCR3BP) (RSPS 2010) Jonathan Kurvits, Alexander Green, Prof. S. Rajeev, University of Rochester

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22. Daniel Lum, class of 2011 at Louisiana State University, is working under Dr. Boyd in experimentally characterizing laser gain media utilizing local field effects from embedded nanoparticles.

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23. Shauna Marquess, class of '10 at U. Maryland Baltimore County, worked in Prof. Nicholas Bigelow's group on redesigning the imaging system for a camera that is used to take pictures of a Bose-Einstein Condensate. She also works on building a servolock circuit for a laser.

1. Shauna Marquess, Presentation at the Annual Optical Society of America meeting in San Jose, California in October 2009

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24. Emily May, class of '10 at the University of Wyoming, worked with Prof. Bill Forrest on looking for a correlation between the crystalline mass fraction in protoplanetary disks and X-ray luminosity for a sample of T Tauri stars in the Taurus-Auriga star-forming region.

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25. Dale McElhone, class of '10 at the University of Rochester, worked with Professor Bocko on creating physical models of the vocal tract and the saxophone family in order to synthesize the instruments' normal playing range, in addition to multiphonics and the altissimo range.

1. **Empirical Physical Modeling of the Saxophone** (RSPS 2010), Dale McElhone, Mark Sterling, Mark Bocko, Department of Electrical and Computer Engineering, University of Rocheste

26. Randy Mehlenbacher. Worked on *Theoretical Analysis of Anharmonic Coupling and Cascading Raman Signals Observed with Femtosecond Stimulated Raman Spectroscopy,* with Assistant Professor of Chemistry David W. McCamant. He received the Stoddard Prize for Best Senior Thesis 2010.

1. T*heoretical Analysis of Anharmonic Coupling and Cascading Raman Signals Observed with Femtosecond Stimulated Raman Spectroscopy,* Senior Thesis (Assistant Professor of Chemistry David W. McCamant.) (Stoddard Prize for Best Senior Thesis 2010.

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27. Kieran O'Dea, class of '11 at SUNYGeneseo, worked with Professor Alice Quillen on studying the star formation rates of brightest cluster galaxies.

1 2010ApJ...719.1619O O'Dea, Kieran P.; Quillen, Alice C.; O'Dea, Christopher P.; Tremblay, Grant R.; Snios, Bradford T.; Baum, Stefi A.; Christiansen, Kevin; Noel-Storr, Jacob; Edge, Alastair C.; Donahue, Megan; Voit, G. Mark, Hubble Space Telescope Far-ultraviolet Observations of Brightest Cluster Galaxies: The Role of Star Formation in Cooling Flows and BCG Evolution, The Astrophysical Journal, Volume 719, Issue 2, pp. 1619-1632 (2010).

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2 2010AAS...21543627O O'Dea, Kieran; Quillen, A.; Snios, B.; O'Dea, C.; Tremblay, G.; Baum, S.; Edge, A.; Donahue, M.; Voit, M.

HST Ultraviolet Observations of Star Formation in Seven Brightest Cluster Galaxies in Cooling Flows, American Astronomical Society, AAS Meeting #215, #436.27; Bulletin of the American Astronomical Society, Vol. 42, p.388

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28. Susan Pratt, class of '12 at the University of Rochester, worked with Steven Manly to organize and run the Pre-College Experience in Physics (PREP) program, a summer outreach program for high school girls which aims to encourage women in science. She is a physics major and plans to apply to law school for patent law.

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29. Roshita Ramkhalawon, class of '10 at University of Rochester, worked in Prof. Nicholas Bigelow's group on a Monte Carlo simulation of a time of flight mass spectrometer for molecular and atomic ion detection. She plans to apply to graduate school in physics.

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30. Valerie Rapson, class of '10 at the University of Rochester, works with Prof. Judith Pipher on analyzing the Spitzer Space Telescope data obtained on the clustering of forming stars in NGC 2264. She plans to get her Ph.D. in astrophysics. ()

1. Analysis of an aerosol-based geo-engineering proposal (presented at RSPS 2010), Valerie A. Rapson, Prof. Robert S. Knox, Department of Physics and Astronomy, University of Rochester. ()

2. Valerie Rapson, *A Spitzer View of NGC 2264*, Senior Thesis, Advisor: Prof. Judith Pipher (Physics Senior Thesis 2010) ()

3. Val Rapson poster presentation at the Syracuse University Undergraduate Research Day and Open House in November, 2009.

4. Val Rapson, presentation at the National Conference on Undergraduate Research. Montana in April 2010.

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31. Ian Remming, class of '12 at the University of Rochester, worked with Prof. Dan Watson analyzing mid-infrared spectra of protoplanetary disks observed with the Spitzer Space Telescope. Specifically, he analyzed what are known as Class 0 objects, thought to be the youngest protostars, looking to find a relationship between their accretion rate and outflow rate.

1 ☐ 2011arXiv1107.3261A Arnold, L. A.; Watson, Dan M.; Kim, K. H.; Manoj, P.; Remming, I.; Sheehan, P.; Adame, L.; Forrest, W.; Furlan, E.; Mamajek, E.; and 4 coauthors, A Spitzer IRS Survey of NGC 1333: Insights into disk evolution from a very young cluster

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2 2011ApJ...733L..32P Poteet, Charles A.; Megeath, S. Thomas; Watson, Dan M.; Calvet, Nuria; Remming, Ian S.; McClure, Melissa K.; Sargent, Benjamin A.; Fischer, William J.; Furlan, Elise; Allen, Lori E.; and 5 coauthors,
The Astrophysical Journal Letters, Volume 733, Issue 2, article id. L32 (2011)

3. **Ian Remming,**, presentation at the National Conference on Undergraduate Research. Montana in April 2010.

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3**2.Adi Robinson, class of '10 at** the University of Rochester, worked with Prof. Frank Wolfs on the development of the advanced nuclear science education laboratory. He plans to apply to medical school.

1. Modernizing the Mossbauer Experiment. (presented at RSPS 2009) , Adi Robinson, Prof. Frank Wolfs, Department of Physics and Astronomy, U. of Rochester.

2. Analyzing Ge Detector Pulses Using a Moving Window Deconvolution Algorithm (RSPS 2010) Adi Robinson, University of Rochester

3. **Adi Robinson**, *Analyzing Ge Detector Pulses Using a Moving Window Deconvolution Algorithm*, Advisor: Prof. Frank Wolfs (Senior Thesis 2010)

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33. Edward Schroeder, class of '11 at the University of Rochester, worked with Prof. Adam Frank on Computational Astrophysics on the study of hydrodynamic and magneto-hydrodynamic evolution of matter ejected from stars that interacts with an inhomogeneous interstellar medium. He plans to attend graduate school for astrophysics.

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34. Patrick Sheehan, class of '11 at the University of Rochester, worked with Professor Dan Watson on modeling the water emission in the protostar DC303.8-14.2-J130736.9-770010. He plans on applying to graduate school in astrophysics.

1 2011arXiv1110.4172L Lisse, C. M.; Wyatt, M. C.; Chen, C. H.; Morlok, A.; Watson, D. M.; Manoj, P.; Sheehan, P.; Currie, T. M.; Thebault, P.; Sitko, M. L.
Spitzer Evidence for a Late Heavy Bombardment and the Formation of Urelites in {eta} Corvi at ~1 Gyr

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2 2011arXiv1107.3261A Arnold, L. A.; Watson, Dan M.; Kim, K. H.; Manoj, P.; Remming, I.; Sheehan, P.; Adame, L.; Forrest, W.; Furlan, E.; Mamajek, E.; and 4 coauthors A Spitzer IRS Survey of NGC 1333: Insights into disk evolution from a very young cluster

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3 2011LPI....42.2438L Lisse, C. M.; Chen, C. H.; Wyatt, M. C.; Morlok, A.; Thebault, P.; Bryden, G.; Watson, D. M.; Manoj, P.; Sheehan, P.; Sloan, G.; Currie, T. M.
Spitzer Observations of η Corvi: Evidence at ~1 Gyr for an LHB-Like Delivery of Organics and Water-Rich Material to the THZ of a Sun-Like Star,
42nd Lunar and Planetary Science Conference, held March 7–11, 2011 at The Woodlands, Texas. LPI Contribution No. 1608, p.2438

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4 2009ApJ...701.1367C Chen, Christine H.; Sheehan, Patrick; Watson, Dan M.; Manoj, P.; Najita, Joan R.
Solar System Analogs Around IRAS-Discovered Debris Disks,
The Astrophysical Journal, Volume 701, Issue 2, pp. 1367-1372 (2009).

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5. **Accretion Processes in Class 0/I Protostars** (RSPS 2011) P.D. Sheehan, P. Manoj, and D.M. Watson University of Rochester

6. Patrick Sheehan, "Accretion Processes in the Protostar MMS 6 North," Advisor: Prof. Dan Watson (Physics Senior Thesis, 2011, Stoddard Prize, Best Physics Senior Thesis)

7. C.M. Lisse, C.H. Chen, M.C. Wyatt, A. Morlok, I. Song, G. Bryden and P. Sheehan, "Abundant Circumstellar Silica Dust and SiO Gas Created
by a Giant Hypervelocity Collision in the ~12 Myr HD172555 System", Astrophys. J, p. 2019, vol. 701, (2009).

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35. Robert Siller, class of class of '12 at the University of Rochester, worked with Prof. Stephen Teitel on a granular systems problem. The project is to place the code on the GPU to allow for faster calculations of the physical aspects of the modeled system.

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36. **Marek Slipski, class of '11,** worked with Prof. Eric Mamajek age dating extrasolar planet host stars. He plans to apply to graduate school for astronomy.
1 ▢ 2010AAS...21542301S Slipski, Marek; Mamajek, E. E. , Improved Ages Estimates for Extrasolar Planet Host Stars, American Astronomical Society, AAS Meeting #215, #423.01; Bulletin of the American Astronomical Society, Vol. 42, p.326, 1/2010.
2. Marek Slipski. poster at the American Astronomical Society Meeting in Washington, DC in January 2010 (advisor E. Mamajek) titled "Improved Ages Estimates for Extrasolar Planet Host Stars".

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37. **Jozal Waroich, class of '10** at the University of Rochester, worked with Steven Manly to organize and run the Pre-College Experience in Physics (PREP) program, a summer outreach program for high school girls which aims to encourage women in science. She plans to attend medical school.

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38. **Benjamin Weinert, class of '11** at University of Rochester, worked with Prof. Steve Manly on maximizing the efficiency of the Muon sub-detector reconstruction code for the International Linear Collider. He plans to apply to graduate school for physics.

1. Study of Muon Reconstruction in a High Energy Electron-Positron Collider (RSPS 2010) Benjamin Weinert, Professor Steven Manly, University of Rochester

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39. Peter Wills, class of 2010 at Reed College, worked with Prof. Robert Boyd on the transition between slow and fast light in a nonlinear fiber with a double-peaked Brillouin gain spectrum. He plans to apply to graduate school for physics.

1. Peter Willis, Presentation at the Annual Optical Society of America meeting in San Jose, California in October 2009

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40. Bill Wolf, class of '10 at Eastern Illinois University, worked under Professor Eric Blackman on investigating the under-appreciated subtle similarities between the "bead on a wire" mechanics problem and the launching mechanisms in magnetohydrodynamic jets arising from accretion disks. He plans to apply to graduate school for theoretical astrophysics.

41. **Krista Lombardo,** presentation at the National Conference on Undergraduate Research in

Montana in April 2010

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