

ΣΠΣ UNDERGRADUATE RESEARCH AWARD RECIPIENTS

1997-98

COLORADO AT COLORADO SPRINGS, UNIVERSITY OF
Colorado Springs, CO
Tom Christensen, Faculty Advisor
"Thundercloud Electrodynamics"

CARTHAGE COLLEGE
Kenosha, WI
Elizabeth Murphy, Faculty Advisor
"An Astronomical Tour of Arizona and New Mexico"

WISCONSIN-RIVER FALLS, UNIVERSITY OF
River Falls, WI
Earl Blodgett, Faculty Advisor
"Binary Star Separation by Visible Light Interferometry"

NORTHWESTERN STATE UNIVERSITY OF LOUISIANA
Natchitoches, LA
Gary White, Faculty Advisor
"Characterization of Organic Optical Crystals Subjected to Ion Beam Irradiation"

WRIGHT STATE UNIVERSITY
Dayton, OH
Gust Bambakidis, Faculty Advisor
"Investigation and Analysis of Possible Weight Changes in a Mass Suspended Above a High Temperature Superconductor"

COLORADO SCHOOL OF MINES
Golden, CO
Tim Ohno, Faculty Advisor
"Design and Building of a 12.5" Newtonian Reflector for Undergraduate Research"

1998-99

NORTH CAROLINA-GREENSBORO, UNIVERSITY OF
Greensboro, NC
Robert Muir, Faculty Advisor
"Measuring Instabilities of Wave Propagation in Excitable Media: Application to Action Potentials in Nerves"

NORTHWESTERN STATE UNIVERSITY OF LOUISIANA
Natchitoches, LA
Gary White, Faculty Advisor
"Study of Variable Stars and Star Clusters Using a Charge-Coupled Device Camera"

WISCONSIN-MADISON, UNIVERSITY OF
Madison, WI
Don Cox, Faculty Advisor
"Boundary Phenomena and the Jet Formation Theory of Sonoluminescence"

2000-2001

GEORGIAN COURT COLLEGE, LAKEWOOD, NJ
Anne Tabor-Morris, Faculty Advisor
"The Presence of Pollutants in the Air at the Ground Level Atmospheric Boundary Layer"

SAN DIEGO STATE UNIVERSITY, SAN DIEGO, CA
Matthew E. Anderson, Faculty Advisor
"Beam Alignment Guide for Laser Experiments (BAGLE)"

WESTERN KENTUCKY UNIVERSITY, BOWLING GREEN, KY
Doug Harper, Faculty Advisor
"Investigation of Transport Properties of High- T_c Superconducting Materials"

2001-2002

COE COLLEGE, CEDAR RAPIDS, IA
Steve Feller, Faculty Advisor
"Atomic Structural Analysis of Sodium Borosilicate, Bismuth Borate, Alkali Borate, and Mixed Alkali Borate Glasses by Neutron Scattering"

NORTHWESTERN STATE UNIVERSITY, NATCHITOCHEs, LA
Paul Withey, Faculty Advisor
"Upgrading a Manual Acquisition Telescope to an Astrometric Advanced Control System"

ROWAN UNIVERSITY, GLASSBORO, NJ
Sam Lofland, Faculty Advisor
"Second Harmonic Generation in Non-Linear Optical Materials"

SEATTLE UNIVERSITY, SEATTLE, WA
Mary Alberg, Faculty Advisor
"Construction of Seattle University Beowulf Cluster (SUBC) for Use in Solving Computation Physics Problems"

UNIVERSITY OF TEXAS-EL PASO, EL PASO, TX
Phillip L. Cole, Faculty Advisor
"A Facility for Measuring the Thickness of Foils with Alpha Particles"

2002-2003

JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD
Petar Maksimovic, Faculty Advisor
"STILLMix: Surface Tension Impelled Low-gravity Liquid Mixing Experiment"

UNIVERSITY OF MISSOURI-KANSAS CITY, KANSAS CITY, MO
Michael Kruger, Faculty Advisor
"Construction of a Micro-Raman and the Analysis of HfV_2O_7 "

NORTHERN VIRGINIA COMMUNITY COLLEGE, ANNANDALE, VA
Walerian Majewski, Faculty Advisor
"Cosmic Ray Muons: Detection and Muon Mean Lifetime Measurement"

OHIO NORTHERN UNIVERSITY, ADA, OH
Mellita Caragiu, Faculty Advisor
"Setting Up of an Advanced Lab"

ROWAN UNIVERSITY, GLASSBORO, NJ
Sam Lofland, Faculty Advisor
"Investigation of Electronic Instabilities in Quasi-Low-Dimensional Materials With Optical Reflectance Spectroscopy"

UNIVERSITY OF SOUTH ALABAMA, MOBILE, AL
R. Kent Clark, Faculty Advisor
"Investigating "Neglected" Binary Stars"

TENNESSEE, UNIVERSITY OF, KNOXVILLE, TN
James Parks, Faculty Advisor
"Construction of a Scintillator Detector for High Energy Cosmic Ray Showers"

TRUMAN STATE UNIVERSITY, KIRKSVILLE, MO
Taner Edis, Faculty Advisor
"Building a Scanning Tunneling Microscope to Study Surface Properties of Thin Films"

2003-2004

CYPRESS COLLEGE, CYPRESS, CA

Ron Armale, Faculty Advisor*"Constructing a Cosmic Ray Detector and Investigating the Nature of Secondary Cosmic Rays"*

DRAKE UNIVERSITY, DES MOINES, IA

Athanasios Petridis, Faculty Advisor*"Assembly and Initial Operation of a Transmission Electron Microscope"*

FLORIDA INSTITUTE OF TECHNOLOGY, MELBOURNE, FL

Rong-Sheng Jin, Faculty Advisor*"Electrochemical Deposition Experiment (EDEP)"*

OLD DOMINION UNIVERSITY

Norfolk, VA

Charles Wright-Hyde, Faculty Advisor*"Laser Cooling and Trapping Apparatus for Undergraduate Study"*

PITTSBURG STATE UNIVERSITY, PITTSBURG, KS

R. S. Wijesinghe, Faculty Advisor**Jim Lookadoo, Project Advisor***"Analysis of Acceleration Sensitivity on Crystal Oscillators by Measurement of Frequency Shift Effects"*

ROWAN UNIVERSITY, GLASSBORO, NJ

Sam Lofland, Faculty Advisor*"Construction of an Apparatus to Study Fast Atomic Recombination in Ultracold Plasmas"*

2004-2005

ARIZONA STATE UNIVERSITY

Richard Lebed, Faculty Advisor**Prepared & Submitted by: Christopher Anderson, Mark Drabant, Wayne****Kinsey, Mike O'Toole, Bruce J.A. Nourish***"Analysis of the Crystal Structure of Oxalate Kidney Stones"*

PITTSBURG STATE UNIVERSITY, PITTSBURG, KS

SPS Advisor: Serif Uran**Project Advisor: James Lookadoo****Prepared & Submitted by: Jeremy Burnison, Cassandra Stuckey, Jacob****Stich and Emily Pentola***"Crystal Oscillator Acceleration Sensitivity Testing (COAST)"*

SAGINAW VALLEY STATE UNIVERSITY, UNIVERSITY CENTER, MI

Ming-Tie Huang, Faculty Advisor**Prepared & Submitted by: Christopher S. Hopper***"Laser Cooling & Trapping of Rubidium Atoms"*

STATE UNIVERSITY OF NEW YORK-BROCKPORT, BROCKPORT, NY

Mohammad Z. Tahar, Faculty Advisor**Prepared & Submitted by: Joseph Murphy, Jeremy Hewitt, Nicholas Lefort,****Justin Brown and Kristina Fuller***"Chaos in a Sinusoidally Driven Resistor-Inductor-Diode Circuit and in a Driven, Damped Torsion Pendulum"*

UNIVERSITY OF WISCONSIN-LA CROSSE, LA CROSSE, WI

Michael Jackson, Faculty Advisor**Prepared & Submitted by: Brooke Chuzles, Matthew Spurr, Michael****Theisen and Sarah Petersen***"Measurement and Application of Far-Infrared Laser Emissions"*

2005-2006

UNIVERSITY OF CENTRAL FLORIDA

Faculty Advisor: Costas Efthimiou**Principal Proposer: Sohag C. Gandhi***"The Ascending Double Cone: Verifying & Demonstrating the Motion of the Double Cone V-rail System"*

UNIVERSITY OF COLORADO-COLORADO SPRINGS

Faculty Advisor: Anatoliy Glushchenko**Principal Proposer: Diana Haskins****Additional Proposers: Tim Fal, Mike Steinman, Diana Qiu, & Audra Tadevich Lee***"Stressed Liquid Crystals for Large Phase Shift Modulation"*

EASTERN MICHIGAN UNIVERSITY

SPS Advisor: Diane Jacobs**Research Advisor: James Carroll****Principal Proposers: Stephanie Sears & Jeremy McMinis***"Investigating Experimental Parameters in a New Plasma Source"*

NORTH DAKOTA STATE UNIVERSITY

Faculty Advisor: Alexander Wagner**Principal Proposer: Adam Jones***"Morphologies of Polymeric Membranes Formed by Immersion Precipitation"*

NORTHERN VIRGINIA COMMUNITY COLLEGE

Faculty Advisor: Walerian Majewski**Principal Proposers: John Jones, Pooya Azar, Daniel Gordon, Aziza Dang,****Taha Ferozpuri, Adam Reed, & Steven Hendrickson***"Applications of the Superconducting Meissner Effect"*

UNIVERSITY OF TEXAS-ARLINGTON

Faculty Advisor: Jaehoon Yu**Principal Proposers: Kenneth Crawford, James Creel, Priya Mydur, Jacob****Smith, Shane Spivey, & Sabine Sudduth***"Large Cloud Chamber Prototype at UT-Arlington"*

2006-2007

CENTRAL WASHINGTON UNIVERSITY

Principal Proposers: Taylor Kendall, David Cross, James Mullen and Eric Kangas**Chapter Advisor: Dr. Sharron L. Rosell****Faculty Advisor: Dr. Michael R. Braunstein***"Electronic Realization of Chaotic Systems"*

IDAHO STATE UNIVERSITY

Principal Proposers: Zeb Graham, David Coneff and Andrew Saylor**Faculty Advisors: Dr. Dan Dale and Dr. Steven Shropshire***"A Measurement of the Atmospheric Optical Thickness Using Photovoltaic Cells"*

INDIANA UNIVERSITY

Principal Proposers: Greg Pauley and Andrew Ferguson**Chapter Advisor: Dr. Mike Snow****Faculty Advisor: Dr. Rick Van Kooten***"Studies of a Pyroelectric Crystal to Develop a Tabletop Neutron Source"*

UNIVERSITY OF LOUISVILLE

Principal Proposers: Timothy Allen, Brett Batchelor, Albert Bolander,**Blakesley Burkhart and Benjamin Snook****Faculty Advisor: Dr. David Brown***"Two Panel Cosmic Ray Telescope"*

UNIVERSITY OF SOUTHERN MISSISSIPPI

Principal Proposers: Dwana J. King, Gregory Carson, Tyler McCleery and Randall Dannemann**Faculty Advisor: Dr. Alina Gearba***"Characterization of a Rubidium Magneto-Optical Trap"*

2007-2008

CALIFORNIA STATE UNIVERSITY-CHICO, CHICO, CA

Principal Proposers: Justin Dhooghe and Tiara Norris**SPS Advisor: Dr. David Kagan****Research Advisor: Dr. Eric Ayars**Interim Project Report: *"Investigation of Viscosity Transitions in Non-Newtonian Fluids"*

We will build a sensitive variable-speed coaxial-cylinder viscometer, then use the viscometer to characterize the transition between liquid and solid behavior or dilatant non-Newtonian fluids. Previous work in this department has indicated that the transition has interesting "discontinuous" characteristics not predicted by simple descriptions of dilatant fluids.

UNIVERSITY OF COLORADO-COLORADO SPRINGS, COLORADO SPRINGS, CO

Principal Proposers: James Vedral, Evangelos Economou, C. Travis Hunter, Christopher Bull, Hoshang Almemar, Sara Goldman and Robert Webber**Faculty Advisor: Dr. Anatoliy Glushchenko***"Ferroelectric Nanoparticles Suspended in Liquid Crystals"*

From wristwatches to the most advanced computer systems on earth, liquid crystals have made their way into every aspect of our lives. Since liquid crystals have been introduced to the industry there has been a great demand to reduce their energy consumption. That is the great problem, making a stable liquid crystal display that uses less energy. There is a possible solution, mixing liquid crystals with material that possesses a higher sensitivity to electric fields. There are preliminary results which suggest the feasibility of creating such materials.

Although this solution may sound simple, there are major problems that need to be overcome in order to make this not only "a lab sample," but a practical reality. Through the support of the SPS and the use of the UCSS Liquid Crystal Research Lab, we look forward to becoming engaged in this project. Particularly, by creating a stable "liquid crystal enriched with ferroelectric nanoparticles," we will have successfully lowered the energy consumption of all liquid crystal devices. This would not only mean longer battery life for cell phones and laptops, it would mean a great leap in the science of liquid crystals and a new frontier in the industry.

RHODES COLLEGE, MEMPHIS, TN

Principal Proposers: Brad Atkins, Gavin Franks, Josh Fuchs, Lulu Li, Chase Sliger and Jennifer Thompson**Faculty Advisor: Dr. Brent K. Hoffmeister**Interim Project Report: *"Binary Orbital Motion of Electrically Charged Spheres"*

Coulomb's Law of Electrostatics and Newton's Law of Gravitation suggest that two oppositely charged spheres should be able to move in binary orbit about their center of mass using only the electric force as the force of attraction. The Rhodes College Chapter of SPS will attempt to achieve a binary orbit between oppositely charged graphite coated styrofoam spheres in a near-zero gravity environment as part of NASA's Microgravity University.

UTAH STATE UNIVERSITY, LOGAN UT

Principal Proposers: Jennifer Albretsen and Christian Wohlwend**Chapter Advisor: Dr. David Peak**Interim Project Report: *"Investigating the Effects of Atmospheric Composition on Sound Emitted by a Tesla Coil Speaker"*

Plasma speakers (a.k.a. tesla coil speakers) have gained popularity over the past few years, but little scientific work has been performed on them as most are built by hobbyists. The USU Chapter of the Society of Physics Students will build a small tesla coil modeled after the coronaphone developed at Villanova University. Chapter members will record the sound propagating through four gases: Nitrogen (N₂), Carbon Dioxide (CO₂), and Argon (Ar). These spectra will be compared with one another and with data taken in air, to see if changes in sonic spectra reflect properties of the gases.

SUFFOLK UNIVERSITY, BOSTON, MA

Principal Proposers: Nat Steinsultz, James Porter and Nick Hennigar**Faculty Advisor: Prashant Sharma**Interim Project Report: *"Scanning Probe Study of Viral Nanowire"*

Viruses that coat themselves in selected inorganic substances can self-assemble into various devices including nanowires. We propose a Scanning Tunneling Microscope study of the electronic structure of such an array of nanowires formed by coating gold nanoparticles on M13 virus.

DREXEL UNIVERSITY, PHILADELPHIA, PA

Principal Proposers: Alexander Bolesta, Sajjan Singh Mehta, Jerome Mlack and Anna Petrone**Faculty Advisor: Roberto Ramos**Interim Project Report: *"Variable Star Observation and Search"*

The purpose of this project is to locate, observe, and classify variable stars. Variable stars are stars that vary in their light output. The Drexel SPS chapter will use the observatory facility on campus, as well as supplies purchased with the grant money, to observe and collect data on these stars.

OREGON STATE UNIVERSITY, CORVALLIS, OR

Principal Proposer: Daniel Schwartz**Faculty Advisor: William Hetherington***"Developing Reduced Noise Electronics for a Gigahertz Radio Telescope and Implementing a Real Time Web Interface"*

There exists, at Oregon State University, a continuing undergraduate research project which is attempting to construct and operate a radio telescope. The proposed research program will improve this telescope to scientific standards and integrate it with a web interface, which would allow students and the public to view the status of the telescope in real time.

TOWSON UNIVERSITY, TOWSON, MD

Principal Proposers: Michael Davis and Amanda Haapala**Faculty Advisor: Dr. Rajeswari Kolagani**Interim Project Report: *"Ground Effect Vehicles: Exploring the Possibilities of Wing Design to Maximize Vehicle Lift"*

We will identify the characteristics that maximize the efficiency of ground effect aircraft. We will explore the effects of airfoil shape, wing classification, and wing planform design on aircraft lift. We will then produce a model that combines the most favorable wing characteristics in order to maximize vehicle lift.