

## Abstracts

**Name:** Matthew Johnson

**School:** Colorado Technical University/School of Mines

**Type:** poster

**Title of Presentation:** *High Performance Computing Applications for Material Physics*

**Abstract:** During the REU program with REMRSEC at CSM I worked on optimizing a program called Siesta, which is used to model the photo-electric properties of materials and molecules. By fixing some communication issues in the code, it was possible to reduce the overall runtime of the program by 10-30% depending on problem size

**Email:** [matjohns@mines.edu](mailto:matjohns@mines.edu)

**Name:** Lindsey Whitesides

**School:** Fruita Monument High School

**Type:** Poster and PowerPoint Presentation

**Title of Presentation:** *Observing the Mira Variable Star S Leo Using CCD Photometry*

**Abstract:** Many amateur astronomers observe variable stars and submit the information obtained to databases in order to expand the amount of data available to learn more about star mechanics. In this study, the Mira variable star S Leo was observed using CCD telescopes operated by Global Rent a Scope. By analyzing the results in VPhot, accurate data was obtained and a partial light curve was created. The results were submitted to AAVSO for further use by other astronomers.

**Email:** [lindzy.w@gmail.com](mailto:lindzy.w@gmail.com)

**Name:** Chuck Stone

**School:** Colorado School of Mines

**Type:** Talk

**Title of Presentation:** "To infinity ... and beyond!" Aligning SPS Zone 14 Pursuits with SPS National Council Goals

**Abstract:** The first half of this presentation will provide an overview of the SPS National Council Meeting that was held during September 22-25, 2011 at the American Institute of Physics in College Park, Maryland. The second half of this presentation will focus on short-term and long-term goals the National Council would like to achieve. After this presentation, Associate Zone Councilor Caitlin Heath will join me in a Session called "\"Meet Your New Zone Representatives\"" that will allow us to take questions and suggestions from Zone 14 members so that we can make our own Zone 14 plans for the 2011-2012 academic year and beyond.

**Email:** [cstone@mines.edu](mailto:cstone@mines.edu)

**Name:** Peter Schulze

**School:** Colorado Mesa University

**Type:** Poster/Talk

**Title of Presentation:** *Accurate Sample Manufacturing for Distance Raman and Explosive Detection*

**Abstract:** Instrumentation is developed to manufacture samples with highly accurate known areal concentrations of precursors and high explosives. Explosives or precursors are dissolved in an ethanol solution and deposited in a square array onto various different materials. Using a micro dropper capable of producing pL-scale drops, an xy scale moves the substrate while the drops are produced and cameras to monitor the drop production. The entire apparatus is controlled using LabVIEW virtual instruments. After drops are deposited on the substrate, the ethanol quickly evaporates and leaves a very consistent known areal concentration (10-100 ng/cm<sup>2</sup>) of the sample material. The samples are then used to test the long distance capability of explosive detection using Raman spectroscopy.

**Email:** [schulze505@gmail.com](mailto:schulze505@gmail.com)

**Name:** Garry Stewart

**School:** Colorado Mesa University

**Type:** Talk

**Title of Presentation:** *Glycerol as a precursor for anticancer applications*

**Abstract:** Glycerol is a low cost readily available byproduct of most petroleum processes. It already has widespread applications in cosmetics. What isn't well known is that glycerol derivatives can provide the precursors to synthesis of an ammonium salt that is believed to be able to safely transport a Gold(III) ion. Under an REU program I conducted synthesis of the compounds and gathered spectral data that would allow for characterization.

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**Name:** Rachael Smullen

**School:** University of Wyoming

**Type:** Poster

**Title of Presentation:** *Characterizing Companions of Massive Stars*

**Abstract:** I will be presenting preliminary results of a spectrographic survey of the Cygnus OB2 Association. We are searching for Doppler shifts indicative of binary companions for these massive stars.

**Email:** [rsmullen@uwyo.edu](mailto:rsmullen@uwyo.edu)

**Name:** Amy Miller

**School:** University of Wyoming

**Type:** Poster

**Title of Presentation:** *“Obtaining Precise Dust Temperatures in Nearby Galaxies.”*

**Abstract:** I am working under Dr. Daniel Dale studying the images of 61 nearby galaxies at six different wavelengths (70um, 100um, 160um, 250um, 350um, 500um). We analyze data received from the Herschel Space Telescope to accurately measure the light output in each galaxy, with the ultimate goal of comparing the dust temperatures in nearby galaxies to those in distant galaxies observed when the universe was billions of years younger. This comparison will help to quantify galaxy evolution on a cosmic scale.

**Email:** [amille39@uwyo.edu](mailto:amille39@uwyo.edu)

**Name:** John Caleb Speirs

**School:** Colorado School of Mines

**Type:** Poster

**Title of Presentation:** *“Characterizing Single Quantum Dots with a Multiphoton Microscope”*

**Abstract:** A microscope capable of characterizing single quantum dots is presented. A design for a novel objective specific for multiphoton microscopy purposes is also presented. Applying existing microscopy techniques to a sample of quantum dots cooled to ~4 K by a cryostat, we obtain images and spectroscopic information about multiple and single quantum dots. This technique pushes the sensitivity limits of current microscopy. This method is rapid and non-invasive, and thus will allow us easy ways of imaging substances and dynamics on the single-molecule scale. This work benefits medical imaging technology in development around the world as a way to successfully image biological samples on the single-molecule while avoiding sample damage. It will also benefit the field of solar cell research, as many are investigating the use of quantum dots in solar cell design.

**Email:** [jspeirs@mines.edu](mailto:jspeirs@mines.edu)

**Name:** Charley Parker

**School:** Colorado School of Mines

**Type:** Poster

**Title of Presentation:** *Student use and perception of Tablet PCs; Are they helpful?*

**Abstract:** Research shows that learning is more effective when students are actively interacting with the professor and each other. To facilitate these interactions, the Technology in the Classroom Committee (TICC) at the Colorado School of Mines provides Tablet PCs to physics students in selected courses each semester. These Tablet PCs are used in conjunction with the InkSurvey tool,

which allows for real-time feedback in the classroom. The Tablet PCs also allow for sophisticated student collaboration using notetaking software, providing a means for note sharing. In our poster, we explore how the Tablet PCs have been used in the physics classrooms at CSM and present preliminary data on student perceptions of having the Tablet PCs.

**Email:** [cparker@mines.edu](mailto:cparker@mines.edu)

**Name:** Zachary Boerner

**School:** Colorado School of Mines

**Type:** Poster

**Title of Presentation:** *Open-source electronic education tools using Tablet PCs*

**Abstract:** The Technology in the Classroom Committee (TICC) at the Colorado School of Mines provides and manages a number of electronic education tools available for anyone to access. These include the InkSurvey tool, a wiki for information on the software used by TICC, and a forum for users to discuss Tablet PCs and the classes in which they are enrolled. InkSurvey, in a manner similar to clickers, provides instructors with means to pose open-format questions. Combined with the use of Tablet PCs, this allows the instructor to perform a real-time formative assessment of students' problem solving abilities. This poster will explore the utility of each of these tools and suggest how institutions outside of the Colorado School of Mines may use them to further their own educational programs.

**Email:** [zboerner@mines.edu](mailto:zboerner@mines.edu)

**Name:** Caitlin Heath

**School:** Colorado Mesa University

**Type:** Oral

**Title of Presentation:** *"High Harmonic Generation from Rotationally Excited Molecules"*

**Abstract:** High harmonic generation (HHG) is a process that allows us to take laser light of infrared wavelength and create a beam of coherent extreme ultraviolet (EUV) or x-ray light. The laser light is sent into a gas in vacuum where electrons in the gas are stripped off their parent ion. The electron is then returned to the ion as the laser field oscillates and its excess kinetic energy is given off as a photon of very high frequency. This experiment examines HHG from molecules to determine the effects of molecular structure and rotation on the resultant light.

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