

## Physics Senior Research Oral Presentations (continued)

Time of Presentation 3:50

### Quartz-Enhanced Photoacoustic Spectroscopy (QEPAS) for Determining the Optical Properties of Aerosols

**Nick Black**

**Advisor: Dr. Claudio Mazzoleni**

**Abstract:** Using Quartz-Enhanced Photoacoustic Spectroscopy (QEPAS), a new instrument is being designed to analyze harmful aerosols such as black carbon. Using a high power, frequency-modulated laser, the aerosols are excited at the resonant frequency of a nearby tuning fork. The acoustic signal created by the tuning fork correlates with the absorption of the sample.

Time of Presentation 4:03

### Paleointensity Analysis of Proterozoic Dikes in the Dharwar Craton, India

**Renee Batzloff**

**Advisor: Dr. Aleksey Smirnov**

**Abstract:** Using a variation of the Thellier-Thellier paleointensity technique, we determined the ancient magnetic field intensity and direction in Precambrian rocks collected from the Dharwar craton in India. The resulting data will allow for an updated reconstruction of the Indian plate, as well as provide insight on the long-term evolution of the Earth's magnetic field

Time of Presentation 4:16

### Monitoring Light Scattering from an Evaporating Cloud Droplet

**Karl Meingast**

**Advisor: Dr. Will Cantrell**

**Abstract:** Information was obtained about the sensitivity of light scattering by a large (radius 100um) water droplet. This sensitivity was probed using Mieplot, a software package which utilizes Mie Theory of Scattering by small particles to probe scattering dependencies. Parameters including, diameter of droplet, refractive index, and scattering angle were probed. These results may provide significant evidence supporting a monitoring process for the size and refractive index of the droplet.

Time of Presentation: 4:29

### Anthropogenic Aerosols

**Kyle Gorkowski**

**Advisor: Dr. Claudio Mazzoleni**

**Abstract:** Data analysis for the Carbonaceous Aerosol and Radiative Effects Study (CARES) was conducted on gas concentrations, and aerosol optical properties. From these measurements and retroplume simulations the air pollution was traced to its likely origin. The derived history is essential when trying to improve atmospheric modeling.

Time of Presentation 4:42

### Intrinsic Quantum Correlations of Weak Coherent States for Quantum Communication

**Erin Scanlon**

**Advisor: Kim Fook Lee**

**Abstract:** In lieu of entanglement techniques, we present a coherent state source (1550nm diode laser) which, using a post-selection technique, yields correlation functions with similar properties to those of entangled photons. We implemented this procedure to simulate long distances using a 10 km fiber optic cable and found a high correlation of the polarizations.

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