

Student/Faculty Activity Grant Application Summary

The Evergreen State College Foundation Application Form

Project Title: Student presentations at the American Physical Society Northwest Section Meeting 2006	Application Deadlines: 5 p.m., 2 nd Friday of Fall, Winter and Spring Quarters
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Project Director: Dr. E.J. Zita	Address: TESC, Lab II City: Olympia State: WA Zip: 98505 Campus phone: 360-867-6853 Email: zita@evergreen.edu (best way to reach me)	Project Dates: Begin: 18 May End: 20 May 2006

Faculty Advisor Or Budget Coordinator: Dr. E.J. Zita	Mail Stop: Lab II Email: zita@evergreen.edu	Other Participants: Jada Maxwell Paul Lessard Aman Dhillon Christopher Small Andrew Yu Michael Koohafken Chris Casasnovas Matthew Eggers Sarah Neal	Total Request: \$ \$1560.00
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Project Summary: (Attach additional pages to provide any relevant, but concise, information)

As a group, we are applying for this grant to cover expenses to attend the 8th Annual Meeting of the American Physical Society's Northwest Section. This is a 2 day conference which will be held at the University of Puget Sound in Tacoma this year. (We will drive up the night before in a college van, since meetings start early in the morning, stay in dorms, and eat in the cafeteria.) Undergraduate students are encouraged to present at this meeting and it is a great opportunity for us to become more involved in the scientific community, to meet and talk with scientists in all fields of physics and to gain experience presenting and discussing our work with other scientists. We will be presenting our individual and team research at this meeting, for work done in two quarters of Physics of Astronomy. Included are the abstracts for the research we will be presenting, as well as individual budgets.

No funds are requested to support Zita's participation, which is otherwise covered. Zita will attend this meeting, supervise student attendance, and advise student work. Meeting details at <http://www2.ups.edu/physics/NWAPS2006/home.htm>

Can magnetic waves in the auroral region transform into acoustic waves?

Jada Maxwell

E.J. Zita

Acoustic waves from the Sun's photosphere transform into magnetic waves in the chromosphere (Johnson et al., 2001; Bogdan et al., 2000, 2002, 2003). While there is no clear evidence of audible sound in aurorae (e.g. northern & southern lights), infrasound (acoustic waves below 20 Hertz) emanating from aurorae has been detected. How are these auroral acoustic waves created? Alfvén waves in the Earth's magnetosphere have been observed to arise from solar magnetic storms. Can these magnetic waves similarly transform into acoustic waves? On the Sun, this acoustic-to-magnetic wave transformation occurs where the atmospheric pressure and the magnetic pressure are comparable ($\beta = 1$), in the chromosphere. This wave transformation is crucial for transporting photospheric energy to the hot corona. We investigate evidence and mechanisms for magnetic-to-acoustic wave transformation in the Earth's ionosphere, where $\beta \sim 1$.

Budget:

Jada Maxwell:

Registration \$ 5.00

Lodging \$125.00

Banquet \$ 20.00

Ground transport \$25

Total \$175.00

Construction of The Evergreen State College Accelerator

Paul Lessard
Aman Dhillon
Christopher Small

We have designed a multipurpose cyclotron device, which may be used in a range of experiments. We are building our device in stages. Our first stage is a Fourier Transform Ion Cyclotron Resonance spectrometer, which uses an array of four induction plates to monitor the orbiting of charged particles in the chamber. We will Fourier Transform the signal from the array to find the cyclotron frequency of each species in the chamber. From these frequencies we will obtain the charge to mass ratio of the species and in turn the particle masses. This type of spectroscopy can distinguish between species of extremely similar mass. We will use the radio isotopic dating ladder, which requires higher and higher accuracies, beginning with carbon14 dating as a yardstick of our success. In final stages, we will design and construct an exit port for the chamber. At this point we will have a functioning cyclotron accelerator in the low MeV energy range, suitable for modern particle physics experiments.

Budget:

Paul Lessard:

Registration \$ 5.00
Lodging \$125.00
Banquet \$ 20.00
Ground transport \$25

Total \$175.00

Aman Dhillon:

Registration \$ 5.00
Lodging \$125.00
Banquet \$ 20.00
Ground transport \$25

Total \$175.00

Christopher Small

Registration \$ 5.00
Lodging \$125.00
Banquet \$ 20.00
Ground transport \$25

Total \$175.00

Spark Plugs

Andrew Yu

The quality and condition of spark plugs play a key role in achieving peak efficiency of a gasoline internal combustion engine. Since the inception of the first mass-produced spark plug, the design has remained stagnant, yet the materials used in making them has not. Examples of the materials that have changed since the original design are the use of platinum and iridium center and ground electrodes, from their original copper and nickel counterparts. The research that I will present will address the topic of what characteristic make up a good spark plug. The research is heavily based on current market offerings, and in the end an assessment of the popular offering will be presented.

Budget:

Andrew Yu:

Registration \$ 5.00

Lodging \$125.00

Banquet \$ 20.00

Ground transport \$25

Total \$175.00

Tidal Locking: The Gravitational Relationship Between the Earth and the Moon

Michael Koohafkan

The gravitational pull that the Earth exerts on the Moon is what keeps it locked in orbit around us. The Moon exerts a gravitational pull on the Earth as well, the most noticeable effect being the phenomenon of tides in the Earth's ocean. However, there are many other effects of the gravitational interactions between the Earth and Moon not immediately obvious to humankind. Both the Moon and the Earth are distorted into egg-like shapes, and the tidal friction that occurs as a result of these distortions causes changes in the orbital speeds, rotational speeds, and even axial tilts of the Moon and Earth.

The purpose of my research is to examine these various effects, and particularly how they contribute to the deceleration of the Earth's rotation. My goal is to determine the amount of time it would take for the Earth to decelerate in rotational speed to the point where the length of time of a single rotation matches the length of time it takes for the Moon to orbit once around the Earth—a phenomenon known as 'Tidal Locking'—and mathematically express the relationship between gravitational force and rotational deceleration.

Budget:

Michael Koohafkan:

Registration \$ 5.00

Lodging \$125.00

Banquet \$ 20.00

Ground transport \$25

Total \$175.00

Energy Transitions of Single Bubble SonoLuminescence

Sarah Neal
Matthew Eggers
Chris Casasnovas

Acoustic cavitation and collapse of a solitary gas bubble in an otherwise degassed liquid medium results in photon emissions. The mechanism triggered by this collapse, which leads to the emission is unknown. This photon emission lasts only pico-seconds and is often very faint. If the light emitting transition occurs on the surface of the bubble rather than the bubble cavity, then the polarity and surface tension properties of the medium will effect the emission. Light data will be collected via a photo-multiplier tube and a streak camera to mathematically isolate the effects for varying surface properties of bubbles in varying mediums. We intend to measure energy transitions of the medium via spectroscopy and temperature differentials.

Budgets:

Matthew Eggers:

Registration \$ 5.00
Lodging \$125.00
Banquet \$ 20.00
Gas \$10.00

Total \$160.00

Chris Casasnovas:

Registration \$ 5.00
Lodging \$125.00
Banquet \$ 20.00
Ground transport \$25

Total \$175.00

Sarah Neal:

Registration \$ 5.00
Lodging \$125.00
Banquet \$ 20.00
Ground transport \$25

Total \$175.00
