

# **ABSTRACT:**

## Applications of Supercomputers in the field of Geological Sciences

For:  
NSF/DoD Research Experience for Undergraduates (REU)  
Supercomputing Undergraduate Program in Maine

Advisors:  
Dr. Peter Koons  
Benjamin P. Hooks

By:  
Donald Lewis

### **Project Description:**

The primary goal of this project to help with the 3D modeling of the interaction between the Pacific oceanic plate and the Mt. St. Elias region of Alaska. The modeling will be done on the University of Maine supercomputers using Gale. Gale is a 2D and 3D finite element model used to model subduction, rifting, and other variables of interest. It requires the PETSc, MPI, and libxml2 libraries to run. Work will include installing the packages, running the test programs on the supercomputer, and then determining how to manipulate the input files so that numerical models can be run. The numerical models will be developed according to the data required by Benjamin Hooks.

Along with this, a couple of other tasks have been outlined for when Gale is operational. These tasks involve using MATLAB to visualize output data from FLAC3D and the World Stress Map. Ideally, the data from the World Stress Map, which is mostly topographic data in a Lat/Long coordinate system, would be converted to a X-Y-Z coordinate system and output in files compatible with Google Earth for visualization. Time permitting, the Abaqus program will also be worked with to some extent.