Closing Report on Faculty Research Grant Entitled, "**Mantle Generation of Heavy Hydrocarbons**"

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1) Description of Grant Supported Activity

My primary goal for the FRG was to conduct follow up experiments to my 2004 paper which documented the formation of methane from calcite, a common carbon-bearing mineral, at the pressures and temperatures of Earth's mantle. The highlight of the experimental work was a trip that I took to Brookhaven National Laboratory (BNL) with Andrew Ratkiewicz, an undergraduate in the physics department. We applied for and received an entire week of experimental time using the synchrotron infrared light source at BNL; we were there from 7/8 until 7/15/2005. This type of analysis can be used to detect the formation of methane and other hydrocarbons.

A portion of the summer was spent writing an external grant proposal to the Petroleum Research Fund (PRF) of the American Chemical Society. This proposal was similar to the work described in my FRG, but included funding for additional experimental equipment.

I also continued to construct a high-pressure experimental lab at IUSB. I worked with Ed Behnke, a physics student heavily involved with Ilan Levine's lab, to build a low cost electric discharge machine (EDM) for producing the sample chambers used in my experimental work.

2) Were you able to complete the project? Describe any difficulty you had.

The experiments at BNL proved more difficult than I anticipated. In order for the instrument to work properly it turned out that my samples needed to be extremely thin. Although that was not particularly difficult to accommodate, it changed the manner in which the device I use to generate high pressures and temperatures, a Diamond Anvil Cell (DAC), behaved. We found that with such a thin sample it was very difficult to control both pressure and temperature: the pressure increased rapidly with increasing temperature. As a result, by the time we could reach a desired temperature, the sample pressure was beyond our range of interest. By the end of the week we became much more proficient in using thin samples with DACs, but we did not collect enough usable data for a publication.

The grant proposal went smoothly (for once!) and was successfully submitted.

Ed and I completed a working circuit for the EDM. He has quite a bit of electronics expertise, and thanks to him there weren't any difficulties with this project.

3) Did, or will, the project result in a specific product -- a manuscript, composition, syllabus, etc? If so, please describe and indicate state of development.

Unfortunately, the data collected during the summer were not suitable for publication, but I believe that Andrew and I gained valuable experience and will be better prepared next time. On the bright side, the PRF proposal was funded, and we are now able to purchase more laboratory equipment. We have ordered additional DACs and the necessary equipment to work out the experiment's technical "bugs" before traveling to national facilities. I am optimistic that the combination of additional equipment and experience will lead to more successful trips in the future.