

## 2006 Summer Student Symposium

- 10:00 am Scott Hagemeyer and Eric Ofstad (Tom Huber)
- 10:17 am Meghan Hogdal (Brandy Russell)
- 10:34 am Linda Kanne (Jeff Jeremiason)
- 10:51 am Refreshment break
- 11:05 am Jared Sieling (Chuck Niederriter)
- 11:22 am Laura Pierce (Mark Bjelland)
- 12:00 pm Lunch for presenters and their advisors at Godfather's Pizza

Our summer research activities are funded through various internal and external grants. Many thanks to the Dean's office for providing today's refreshments.

### Abstract List (alphabetical by author)

*Vibro-Acoustography: The Birth of a Scanning Vibrometer*  
Scott Hagemeyer\*, Eric Ofstad\*, and Tom Huber

The physics behind vibro-acoustic methods, as well as the joys and pitfalls of constructing a scanning vibrometer will be discussed. Also, a look at future goals pertaining to the detailed characterization of the ultrasound field and system calibration. A demonstration of the system will be available afterwards.

*Purification and Reconstitution Studies in a Myohemerythrin Mutant*  
Meghan Hodgal\* and Brandy Russell

Myohemerythrin is an oxygen transport protein found in *P. gouldii* that contains a di-iron active site. Protocols for the purification of a single amino acid mutant of the native protein were optimized primarily at the transformation and expression steps. Once purified, the iron was separated from the protein. Several studies were then done to ascertain how the metal is incorporated into the protein. Spectral analysis showed that Fe(III) was not incorporated into the protein when the metal was added to the folded apoprotein. The results for a second study in which the apoprotein was unfolded prior to the addition of Fe(III) are pending. Future plans include replication of the Fe(III) studies using Fe(II) or Cobalt and purification of native myohemerythrin.

*Title TBA*

Linda Kanne\* and Jeff Jeremiason

Water and air samples were collected from Lake Superior on two separate occasions in May and July 2006. Samples were collected from a total of eight sites across the lake. Surface water samples were analyzed for dissolved gaseous mercury (DGM), total mercury, and methylmercury. Air samples were measured for total gaseous mercury (TGM). In general, the highest DGM, total mercury, and methylmercury concentrations were found at locations in proximity to Thunder Bay and Duluth with concentrations from the May samples being slightly higher than the July samples. The open lake sites generally had the lowest concentrations of all mercury species. No significant trends were observed for TGM. Based on DGM and TGM measurements, volatile losses of mercury from Lake Superior were estimated and found to be a significant component of the overall mercury mass balance.

*Incorporating Watershed Analysis into an Environmental Studies Curriculum*

Laura Pierce\* and Mark Bjelland

This summer's work focused on using local water resources, such as the Seven Mile Creek Watershed, the Minnesota River, and surrounding lakes and ditch networks to draw interdisciplinary connections between courses in the Environmental Studies curriculum at GAC. Fieldwork consisted of groundwater monitoring and analysis to gain a better understanding of the systems contributing to Seven Mile Creek. Water quality parameters, such as fluoride, chloride, sulfate and nitrate levels were also monitored to analyze nutrient loading and pollution of local systems. Stream hydrology data, collected by the BNC Water Quality Board were used in analysis. Specific attention was given to storm events and resulting effects on water levels and quality. GIS tools were used to analyze land use history and other geographic factors. Collected information will contribute to the growing database on the Seven Mile Creek Watershed and used to develop strategies to improve the quality of the watershed. It has also been incorporated into the Environmental Studies curriculum through lab assignments and homework exercises for several classes across the major.

*Storing Wind Energy*

Jared Sieling\* and Chuck Niederriter

It is currently planned for Gustavus Adolphus College to install two 2.5 MW wind turbines on campus in 2007. The power generated will be used by the college to fill their consumption needs; however, the wind does not blow exactly when they need it. This means that sometimes the college needs to purchase extra power and sometimes they produce extra power. The question dealt with in this report is if it is cost beneficial to store the excess energy on campus to be used later. The report analyses six currently available systems: hydrogen energy storage, flywheels, pumped hydroelectric storage, battery storage, hydroelectric storage, and superconducting magnetic energy storage.