

## **Research Alliance in Math and Science**

<http://www.computing.ornl.gov/Internships/RAMS.html>

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### **Summary**

The Research Alliance in Math and Science (RAMS) program is carried out through the Computing and Computational Sciences Directorate at the Oak Ridge National Laboratory (ORNL) for the U. S. Department of Energy's Office of Advanced Scientific Computing Research. The RAMS program continues to provide unique, hands-on educational experience through innovative approaches to underrepresented students majoring in mathematics, computer science, engineering technology, and the computational sciences.

### **ORNL RAMS intern, Jessica Traverso, wins first place in poster competition at the TeraGrid '08 Student Competition.**

**Jessica Traverso**, a senior at Austin Peay State University, won first place in the undergraduate category for her poster, Spallation Neutron Source Data Analysis. The research poster was completed under the Research Alliance in Math and Science program at Oak Ridge National Laboratory in the summer of 2007. Jessica's mentor is Vickie Lynch in the Computational Sciences and Engineering Division, Computing and Computational Sciences Directorate.

Jessica says, "When my mentor told me about the competition, I was a little hesitant because I get nervous when I have to speak in front of people, but I submitted anyway thinking there was no chance I would be selected as a finalist. When I was selected as a finalist, I was shocked and nervous. Even when I was attending the seminars at the conference the nerves were building, and I couldn't get the poster session out of my mind. In the meeting with all of the other students, I quickly realized that I was the

only female in the group. I should be used to it because I am a physics major, but for some reason it made me uncomfortable.



When I saw my mentor present her paper, my way of thinking started to change. I realized that this wasn't just about me. My mentors had enough confidence in me that they entered me in the competition. They thought I would represent them well. That meant a lot to me. I realized that I was not only representing myself, but I was also representing my mentors, the RAMS program, the ORNL, DOE, and Austin Peay

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State University. For some, all this added pressure would make their nerves even worse, but it gave me the confidence I needed to do a good job. I knew I needed to do my best so that all the people and all the institutions I was representing would be proud and honored. I put my nerves and fears aside, and it paid off.



When my name was announced as first place, I was shocked and very happy. I couldn't stop smiling. I had only taken one computer science class when I first came to ORNL, and now I've won first place in a competition for research using supercomputing! This experience has given me more confidence as a female scientist. For some reason being a female in a male dominated field has always made me feel uncomfortable and even inferior at times. Winning this competition has made me realize that I can be successful in this field."

The TeraGrid '08 Conference was held at the Riviera Hotel and Casino in Las Vegas, Nevada, June 9-13, 2008 (see [http://www.tacc.utexas.edu/tg08/index.php?m\\_b\\_c=teraGridHome](http://www.tacc.utexas.edu/tg08/index.php?m_b_c=teraGridHome)). The conference attendees as well as four judges viewed the posters and listened to summaries of the students' work. Three categories for the poster competition were high school, undergraduate, and graduate student.

Trophies were awarded for first, second, and third place in each of the three categories.

**Spallation Neutron Source Data Analysis**  
**Jessica Traverso**  
**Austin Peay State University**  
 Research Alliance in Math and Science  
 Computational Sciences and Engineering Division  
 Mentor: Vickie E. Lynch  
[http://www.csm.ornl.gov/Internships/rams\\_07/abstracts/tl\\_traverso.pdf](http://www.csm.ornl.gov/Internships/rams_07/abstracts/tl_traverso.pdf)

**Introduction**

The Spallation Neutron Source (SNS) is a state of the art accelerator-based neutron source at Oak Ridge National Laboratory (ORNL) that was officially completed in May of 2006. When at full power, the SNS will produce the most intense pulsed neutron beams in the world which will make it the best facility for conducting neutron scattering research. With neutron scattering, scientists are able to study the arrangement, motion, and interaction of atoms in materials. Neutron scattering research has led to improvements in medicine, food, electronics, cars, airplanes, and improvements in materials used in high temperature superconductors, powerful light weight magnets, aluminum bridge decks, and stronger, lighter plastic products. These types of improvements would not be possible without a means to analyze the data obtained. The purpose of this project is to make a graphical user interface (GUI) for the instrument scientists to use to analyze their data. The GUI is for the NS-250L fitting code which is being tested to fit experimental backscattering data from the SNS.

**The Fitting GUI**

Fig. 1. User Input Page

Fig. 2. Parameters Page

- Built from scratch using NetBeans IDE 6.0
- Code generated for each component
- Made functional with custom Java code
- Figure 1- User inputs information about data and fit
- Figure 2- User can adjust parameters

**SNS Portal**

- GUI will be added to simulation lab in SNS Portal
- Experimental data will come from instrument to SNS portal

Fig. 3. Data path

- Scientist at portal will choose and submit program
- Instrument scientists can fit data without having to know anything about NS-250L, the TeraGrid, or parallel computing
- Input sent to TeraGrid via community account
- Sent back to portal for visualization of fitted data

**The TeraGrid**

- Input sent to the TeraGrid, a network of supercomputers, from SNS portal
- NS-250L, run on parallel processors

Fig. 3. TeraGrid Facility Map

- San Diego Supercomputer Center
- National Center for Atmospheric Research
- Texas Advanced Computing Center
- National Center for Supercomputing Applications
- University of Chicago Argonne National Laboratory
- Purdue University
- Pittsburgh Supercomputing Center
- Indiana University
- Oak Ridge National Laboratory

**Future Work**

- Make program available for more instruments
- Make more fitting types available
- Make more components available
- Allow for more convenient fitting

Fig. 3. Backscattering Spectrometer (BSS)

Fig. 4. High Resolution Front-End Chopper Spectrometer (HRFCS)

Fig. 5. Hybrid Spectrometer (HYBRIC)

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Jessica is currently at the Oak Ridge National Laboratory continuing her research with her mentor, Vickie Lynch in the 2008 RAMS summer internship program.

Additional information on the RAMS program, student projects, and photographs from tours and events by year can be accessed at:

<http://www.csm.ornl.gov/Internships/RAMS/>.

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