



The Newsletter of the Nuclear Engineering Program

# Gamma Gazette<sup>®</sup>

University of Missouri-Rolla • Missouri's Technological University

Vol. 9

September 2004

No. 1

## NANT Scholarships

The National Academy for Nuclear Training (NANT) Scholarship Program awards scholarships to college students who are interested in pursuing careers in the nuclear power industry. The scholarships are funded by all U.S. utilities that operate nuclear power plants and by companies that offer services to the nuclear industry.

For the 2004-05 academic year, 41 new NANT undergraduate scholarships of \$2,500 have been awarded nationwide to nuclear engineering students. Four (4) undergraduate students (10% of the total awards) in the Nuclear Engineering department at UMR are recipients of new NANT scholarships. These students are sophomores Aaron E. Craft, Reanea D. Hunter, Thomas M. Oakes, and Beth J. Swafford. Congratulations to all of our outstanding students!

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## Summer Camp 2004

Nuclear Engineering hosted its fifth annual summer camp. A total of 59 students nationwide came to the two sessions, July 18-23 and July 22-28. The recruiting efforts of the members of the Nuclear Engineering Development Board and alumni were greatly appreciated.

During the camp, students were exposed to a variety of activities that included: Callaway nuclear power plant tour, making power changes at the UMR reactor, half-life experiments, along with many others. The Career Fair was held on July 23 for both sessions. A number of representatives from different companies from the nuclear industry and national labs were present. During the career fair, campers were able to speak with the representatives to find out what types of opportunities are available for nuclear engineers. This year's focus groups included: Reactor Operations, Space Nuclear Power, Generation IV Reactors, and Nuclear Medicine. During the group meetings campers interacted with experts to help prepare a presentation on their focus group's area.

The primary camp counselors were sophomores Reanea Hunter, Justin Talley, Billy Peach, and junior Stephanie Fessenmeyer. The counselors led activities that incorporated nuclear engineering information that the students had learned during the week. Overall the summer camp was a great success. Many high school students who attended the camp indicated that they would like to be contacted in the future about entering UMR's Nuclear Engineering program. Many thanks for those who were involved with the different aspects of the camp. We look forward to next year and hope, with your help, to make next year's camp the best yet.



## Annual Phonathon October 18 - 21, 2004

This year's Phonathon is scheduled for October 18 - 21, 2004. Nuclear Engineering students will be contacting you during this four day period. Your generous contributions allow us to help our students with the costs of attending UMR and greatly aid our recruitment efforts. In addition, we can upgrade our labs by providing matching funds for equipment purchases. We look forward to talking to you again!

MORE TO COME 

## Letter from the Chairman

Greetings from the Nuclear Engineering Program! I am writing to share with you some of our accomplishments and challenges for the past year.

One important addition to our faculty, is Dr. Shoab Usman who received his Ph.D. in Nuclear Engineering from University of Cincinnati. Dr. Usman replaces Dr. Tsoulfanidis who retired in May 2004. Dr. Usman will teach Reactor Physics and Radiation & Measurements Laboratory.

I am pleased to announce that Nuclear Engineering Summer Camp 2004 was as successful as last year. There were 59 attendees from high schools in 15 different states. There were 23 campers from Missouri; 8 from Idaho; 5 from Illinois; 4 students each from Iowa, Nebraska, and Virginia; 3 students from Arkansas; and 1 student each from California, Colorado, Florida, Kansas, New York, Oklahoma, Tennessee, and Texas. Some of these students have already applied for admission to UMR. Fall 2004 enrollment including freshman students has increased to 106, almost double the Fall 2002 enrollment of 57.

A number of scientists and engineers from across the United States came to UMR to help us with the summer camp. They included Dr. Wynn Volkert of UMC; Dr. Eric Loewen of INEEL; Mr. Tod Moser of Dominion Engineering; Dr. Dan Wachs of Argonne National Laboratory-West; Mr. Robert Roussin formerly of ORNL; Dr. Harold "Skip" Garner of University of Texas Southwest Medical Center; Mr. Charles Daily of Knolls Atomic Power Lab; and Mr. Jerry Goldsmith and Mr. Kevin Petrones of Black & Veatch.

On July 1, 2004, the name of our School changed to the School of Materials, Energy, and Earth Resources. The original seven degree programs joined hands to form three new departments, namely, Materials Science and Engineering, Geological Sciences and Engineering, and Mining and Nuclear Engineering. However, the independence of our academic program remains assured as before.

On a more positive note, Nuclear Engineering has acquired significant office and laboratory space in Fulton Hall. We now occupy all of second floor, excluding the lecture halls, rooms 220 and 227. We also have a significant lab space on the ground floor. As soon as required renovations are performed in the newly acquired laboratory space, our laboratories will move from the first floor to the second floor. There is a net gain of about 2000 sq. ft. which will help us tremendously with the increasing enrollment.

Unfortunately, the State of Missouri continues to be in a fiscal crisis. Therefore, little, if any, state funds are available for laboratory upgrade and student scholarships. As a result, we need your support more than ever, especially with the increasing number of students enrolling in the NE program. The scholarship needs far exceed our resources since the student fees are increasing in addition to the enrollment. Your help at any level is gratefully appreciated.

Please keep in touch and visit us when you can.

Best Wishes,  
Arvind S. Kumar  
Chairman, Nuclear Engineering Program

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## SOMM Alumni Academy Scholar

In a special ceremony last year, the School of Mines and Metallurgy (SOMM) selected Craig Heimericks, then a senior in Nuclear Engineering for membership in the newly formed Undergraduate Academy. The SOMM Undergraduate Academy was established to complement the SOMM Alumni Academy and to recognize undergraduates who show particular promise as future leaders and contributors to our profession. Craig made us all proud particularly because he was one of only two SOMM scholars selected this year. The membership in the Academy was sweeter for Craig since it came with a cash award of \$500 and a watch. Pictures of the awardees will be posted in a display cabinet near those now used for the Alumni Academy members in McNutt Hall.

THERE'S MORE 

## Dr. Tokuhiro's Summary

Since September 2003 another busy year has passed. Here are some of the highlights where I had direct involvement.

At the UMR Reactor, we finished our 42<sup>nd</sup> year and entered the year of our re-licensing application for the next 20 years. Our highlights include: 3 additional undergraduates were either certified as either RO or SRO at UMRR. Some 18 students have been licensed since 2001. For Fall Semester 2004, we have more than 20 students enrolled in Reactor Operations I (NE206) and 10 additional in Reactor Operations II (NE306). The Reactor Robotics Development and Deployment (R2D2) project is steadily making progress. We received a Fanuc robotic arm from Sandia to go with prototypes of a submersible ISI device, an I-beam surveillance robot and an autonomous "source hunter". We finished testing the Omron Face-Cue biometric facial recognition device and began testing a biometric fingerprint device in collaboration with BioMet Access of Springfield. We continue to receive kind support from DOE's Reactor Instrumentation and Reactor Sharing grants.

On teaching and related activities, here are brief highlights:

I have been teaching NE25 - Nuclear Technology Applications (mainly for freshman), NE206 - as above, NE304 - Reactor Laboratory I, NE306 - as above, NE307 - Nuclear Fuel Cycle (taking over Dr. Tsoulfanidis' well-established course) and NE308 - Reactor Laboratory II. To stem the tide of increasing enrollment, the UMRR staff and I taught NE206 and 306 during Summer Semester 2003. The UMR Reactor and I participated in yet another successful NE Camp in July 2003. In addition the UMR Reactor held its 2<sup>nd</sup> Reactor Operations Workshop for 9 selected NE Campers. NE undergraduates, Alfred Schovanez and Bren Phillips, were recognized for their Opportunity in Undergraduate Research Opportunity research projects (with me) at Capitol Day in Jefferson City in 2004.

Regarding research, we are:

Happy to announce that I was awarded a DOE Nuclear Engineering Education Research grant on, "Radiolytically-induced novel materials and their application to waste processing".

Equally happy to announce the success of the following students (since September 2003):

- i. H. Noh, M.S., Dec. '03, Title: Flow Structure in the Near-Wake of Single Solid and Fluid Objects as Measured by Particle Image Velocimetry,
- ii. C. M. Carroll, M.S., April '04, Title: Using PARET and CONVECT to Perform Accident Analysis of the University of Missouri-Rolla Nuclear Reactor,
- iii. T. L. West, M.S., April '04, Title: An Evaluation of Domestic Nuclear Reactor Facility Security in the Post September 11<sup>th</sup> Environment: Perspectives from the National, State and Site-Specific Levels,
- iv. R. Kadava, M.S., May '04, Title: Flow Characterization Out of a Bi-Leaflet Mechanical Heart Valve Model using Ultrasound Doppler Velocimetry,
- v. I. Hagiwara, M.S., May '04, Title: Natural Convection Heat Transfer in an Enclosure with Hydrophilic Gelatin Particles, and
- vi. H. Dharavat, M.S., May '04, Title: Radiation Tolerance of CMOS Commercial-Off-The-Shelf Components to Fission-Product based Continuous Gamma Rays.

Additionally, N. Chennamsetty (M.S.) is working on, "Correlation of Facial Image Processing to Standard Facial Expressions using Neural Network Methodology" while M. Buragohain (M.S.) is developing a "Demonstration of an Autonomous Mobile Robot to Map Sources on a Radiologically Contaminated Surface." Finally, S. Vadakattu (M.S.) is concentrating on the "Initial Automation of a Control Rod Physical Inspection and Surface Condition by Surface Contour and Imaging Techniques." Six others are also in the research group.

Please feel free to drop by or contact me at [tokuhiro@umr.edu](mailto:tokuhiro@umr.edu); T: 573-341-4746.

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## Dr. Kim's Second Year

During the one year since I've joined the department, I have been busy establishing the "Two-phase Flow and Thermal-hydraulics Laboratory (TFTL)." The work is still in progress, but thanks to the help from many students in our department, the TFTL is slowly realized. The students who have helped establishing the lab include (in alphabetical order): Zachary Bacon, Alicia Canelos, Thomas Kindred, Steve Parle, Kevin Petrones, Hoseok Song, Beth Swofford, Justin Talley and Kevin Volk. Each one of them dedicated time and effort to help develop both the laboratory and the experimental facility we are currently building. I would like to thank them again for their hard work.

As mentioned above, we are currently building the first two-phase flow experimental loop in the TFTL to perform advanced two-phase flow experiments. It is a rectangular adiabatic air-water two-phase flow loop of approximately 20 feet in height (L/D ratio is over 100), where liquid and gas flow rates can reach easily up to 10 m/s and 50 m/s, respectively. The present test facility is capable of simulating a wide range of two-phase flow regimes, namely; bubbly, cap-bubbly, churn-slug (or cap-turbulent), churn turbulent and annular flow regimes, and the test section is made of clear acrylic for flow visualization. In this loop, detailed local two-phase flow parameters can be acquired at six different elevations by the local probe. In addition, the current test section is equipped with auxiliary side injection ports and laser view ports to account for the annular film flow experiments. Furthermore, the state-of-the-art design of the two-phase injection section not only realizes nearly uniform void profiles near the inlet, but it also allows the loop to be capable of various types of two-phase jet experiments. We are trying to complete and operate the test loop by the end of September, 2004. During my first year in the UMR, I was fortunate enough to acquire the first research fund from the University of Missouri Research Board to develop a single-stylus multi-sensor micro conductivity probe, which will significantly enhance the current capability of local probe technique in two-phase flow applications. In this project, Professor J. Choi in the Mechanical Engineering department is working together with me as a Co-PI. It was a busy but fun year to me, during which I learned a lot through interactions with students. Hopefully, I will improve to be better this year and in the years after.

ONE MORE 

## Dr. Usman Arrives at UMR!

Gamma Gazette provides me this excellent opportunity to introduce myself to all of you. As you may know, I have recently joined UMR as a new faculty in the department of nuclear engineering. My wife Lubna and I moved to Rolla from Ohio only a few weeks ago.

I was born and grew up in Karachi, Pakistan, where I obtained my B.E. degree in Mechanical Engineering from N.E.D. University. I came to the United States in 1990 as a graduate student in nuclear engineering at the University of Cincinnati. I finished my MS in nuclear engineering, an additional MS in health physics and finally a PhD in nuclear engineering all from the University of Cincinnati. During my stay at UC as a graduate student I worked in two areas; thermo fluids and radiation effects and measurements. While still a second year graduate student I wrote a winning proposal for research funding from NASA on an innovative idea for gamma dosimetry.

After finishing my PhD I entered industry while maintaining my association with academia as an adjunct faculty of nuclear engineering at UC. There I continued to teach graduate level classes on a regular basis including a lab sequence in radiation detection and measurement and a reactor physics lab. I also continued my research activities and wrote two successful proposals for research funding.

I am bringing many of my research projects to UMR. My most active area of research is the investigation of radiation induced enhancement of transport phenomenon in fluids. There are three independent projects related to this phenomenon of "Radio-turbulence" that I am currently working on. The second project that I am bringing to UMR is funded by NEPO. The project is focused on computerization of nuclear reactor operation and optimization of man-machine interface. This project offers lots of opportunities for someone who likes to work with computers. My third area of research interest is in radiation measurement with particular emphasis on medical application and radio-therapy. A graduate at UC is finishing up his MS project on the subject and has shown very promising results.

I am thrilled to be at UMR and am looking forward to seeing more of you in my classes and working with you on some of the research projects. If you like to learn more about my research activities please stop by at my office at 225 Fulton Hall.

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*The Nuclear Engineering department would like to thank and acknowledge the following alumni, friends and companies for their generous contributions between July 1, 2003 and June 30, 2004.*

### **GIFTS LESS THAN \$100**

Aceil, Smaeil M '84  
Alford, David B '98  
Barnes, David K '83  
Becka, Gary A '76  
Blase, John J '74  
Blondin, Dennis G '74  
Boles, Jason L '96  
Carter, Mark D '80  
Cline, Donald A '75  
Conner, Leslie R '68  
Covey, Mark K '82  
Cushman, Matthew E '98  
Cypret, Orville W '74  
Edwards, Kevin B '89  
Flynn, Darrell C '79  
Frankenback, David G '80  
Gharakhani, Albert '77  
Gharakhani, Maria G '77  
Hackett, Michah J '02  
Hadley, Stanton W '79  
Hart, Charles M '86  
Hinton, William K '76  
Holland, Timothy E '91  
Holtzschler, Dale L '72  
Hovland, Rebecca M '98  
Knaup, James W '84  
Krause, Serena J '98  
Kuspa, John P '72  
Lawson, James A '89  
Leong, Melvin R '84  
Liles, Darrell R '96  
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Meeker, Richard A '96  
Meyer, Mary Jo B '87

Nydegger, Heather Ann '01  
Rackley, Kevin D '80  
Sautman, Mark T '91  
Schottel, Jimmy D '70  
Shelton, Dale Alan '85  
Shores, Erik F '95  
Shrestha, Bijaya '95  
Singer, Richard J '75  
Smith, Michael A '98  
Starke, Richard M '71  
Szatkowski, Daniel J '89  
Tucker, Julie D '03  
Wagner, John C '92  
Wahler, Vincent C '65  
Walz, Mark D '80

### **GIFTS \$100 OR MORE**

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Andrews, Jonathan J '96  
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Bartlett, Bruce L '80  
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Bequette, Shawn E '95  
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Burchill, William E '64  
Buth, Donald J '85  
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Cragg, Christopher D '85  
Croessmann, C. Dennis '81  
Daiber, Bryan J '87  
Daily, Charles R '83

Doty, Elmer L '74  
Easson, Sheldon A '75  
East, Jacqueline M '89  
Eastburn, Michael R '67  
Erwin, Kenneth T '97  
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Ferguson, Phillip D '88  
Ford, Michael J '88  
Graham, Jacqueline S '80  
Garner, Harold R '76  
Hayward, Robert L '75  
Justic, Paul Glenden '85  
Kinn, Gregory S '87  
Knudsen, Andrew T '86  
Laky, Peter Gyula '94  
Langhorst, Susan M '76  
Lewis, Jeffery L '76  
Lilleston, Richard N '79  
Minarich, Craig M '98  
Mitchell, Brye C '00  
Moffett, Donald L '74  
Mueller, Gary E '76  
Palmtag, Scott P '93  
Pasley, Felicia A '84  
Pearman, John O '84  
Pendergrass, Gary J '84  
Phillips, Katherine A '90  
Pickard, Rodney G '95  
Reeves, Corie A '01  
Rempe, Joy L '81  
Rickard, Donald E '85  
Sakowicz, Paul M '93  
Schnell, Donald F '86  
Shelton, Rachel L '99  
Simpkins, Alice A '89  
Smith, Jeffery Joel '87

Smith, Lenard A '92  
Smith, Rowdy L '86  
Steinmetz, Keith A '94  
Struve, James E '73  
Suwal, Gajendra M '76  
Till, Henry A '68  
Van Asdale, Shawn M '94  
Venneri, Francesco '79  
Wolkenhauer, William C '62

*The gifts received by the department from individuals total \$10,180.*

*The following corporations made gifts to Nuclear Engineering during the same time period.*

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Dominion Virginia Power  
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Southern Nuclear Operating Co.  
Studsvik Scandpower, Inc.  
Studsvik of America, Inc.  
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*The matching gifts received by the department from corporations total \$2,225.*