

The News~tron Transport

NEWSLETTER OF THE NUCLEAR ENGINEERING PROGRAM AND THE AMERICAN NUCLEAR SOCIETY

ISSUE 4

[HTTP://NUCLEAR.MST.EDU](http://nuclear.mst.edu)

FALL 2009

Nuclear Engineering Summer Camp 2009

On July 12-17, 2009, we held our 10th annual nuclear engineering camp. The one-week camp introduces highly skilled and motivated high school students from around the nation to the fundamentals of nuclear engineering. With 36 students from 17 different states, the camp was truly a diverse group of individuals.

They say a picture is worth a thousand words but an experience lasts a lifetime, and the large number of events for the week-long camp proves just that. Some highlights from the diverse schedule ranged from designing a space nuclear reactor, cloud chamber experiments, half-life experiments at the S&T reactor, introduction to computer based nuclear core modeling, and visiting the Callaway Nuclear Power Plant. This was the first year campers were asked to design a space nuclear reactor, but the learning experience was incredible as campers quickly found out how every subsystem is dependent upon each other. For some campers the design project was their first taste of real engineering.

Thanks to AmerenUE who again was kind enough to allow campers a tour of their Callaway Nuclear Power Plant. Touring a commercial nuclear power facility allows campers to see firsthand how nuclear energy is safe, clean, and affordable. It amazed the students to learn the cooling tower, at Callaway, is one of the highest structures in Missouri, second to the St. Louis Gateway Arch.

It is hard to imagine a decade worth of students have gone through the NE camp, but it has proven to be a great recruitment tool. We would like to thank the faculty and staff involved that made this year's camp a success, especially NE students for their support throughout the program.



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Letter from the Program Chair

Greetings from the Nuclear Engineering Program at Missouri S&T! I am pleased to share with you some of our successes and apprise you of our challenges.

I am pleased to say that Dr. Hyoung K. Lee from Catholic University of South Korea became a tenure-track Assistant Professor of Nuclear Engineering in Fall 2009. Dr. Lee received his Ph.D. in Nuclear Engineering from University of California-Berkeley in 1995. He replaces Dr. Jeffrey King who left S&T to join the Colorado School of Mines. Please join me in welcoming him to our program. In addition to Dr. Lee, Dr. B. J. Shrestha has joined our department as an Associate Teaching Professor starting this Fall semester. Dr. Shrestha has a Ph.D. in Nuclear Engineering (UMR, '95) and has a joint appointment in N. E. and E. E. at S&T.

Summer Camp 2009 brought 36 high school students from 17 states for an educational experience in Nuclear Engineering at Missouri S&T. Twenty-six of these students indicated their interest in joining Missouri S&T in Fall 2010 or 2011. Our total enrollment in the Fall 09 semester, including 52 freshmen and 16 graduate students, is 178. The continued high enrollment has strained our resources, particularly for scholarships and fellowships for our students.

I am delighted to tell you that Missouri S&T is again one of the five universities (Illinois, Missouri S&T, Penn State, Purdue, and Wisconsin) selected by Exelon Nuclear to receive a gift of \$50,000 from the company. The NE faculty is in the process of developing training and education materials for Exelon-bound students to assist them in obtaining Qualified Nuclear Engineer certification sooner than the two years normally required.

I am pleased to tell you that we have made substantial progress in developing distance education materials and the associated infrastructure using the Lynx system. Dr. Usman and his graduate students now have the capability to teach Radiation Measurements Laboratory to off-campus students. In addition, this effort is being extended to provide distance education for other nuclear engineering classes.

In the area of new capabilities at our Nuclear Reactor (MSTR), we are in the final stages of construction and testing of an Internet-accessible Hot-cell facility for gamma spectroscopy with the help of Edwin Grant, a graduate student in nuclear engineering. This facility was built with support from a USDOE grant. In addition to this new capability at MSTR, a new facility for neutron radiography is being built under the guidance of Dr. Jeffrey King and his student, Warren Vaz. The two new facilities in Internet-accessible gamma spectroscopy and neutron radiography will be a substantial addition to our experiment capabilities at MSTR.

In closing, I must say that our progress is highly dependent on your continued support for which we are extremely grateful. Thank you very much for everything you do for us.

Best wishes,

Arvind S. Kumar
Program Chair & Reactor Director
Nuclear Engineering



Dr. Usman's and his student's progress

I am please to report to alumni, faculty, students, development board members and friends of Missouri S&T's nuclear engineering program that we had a very productive last year. Several of my senior graduate students either have graduated and others have made significant progress and are nearing graduation. New students have joined my research effort. And they are picking up the research work where the out going students left.

Matthew Dennis finished his M.S. degree. His research was focused on special nuclear material accountability and monitoring. His thesis resulted in two conference papers and one journal article submission titled; Feasibility Study of Plutonium Based MOX Fuel Online Burnup Analysis Using Gamma Spectroscopy. Matthew is now employed at Sandia National Laboratory. He is planning to return to Missouri S&T to complete his Ph.D. in nuclear engineering. Michelle Bresnahan has joined me as my new Ph.D. student students to continue the spent nuclear fuel monitoring research. She has a B.S. and M.S. in nuclear engineering from Missouri S&T.

In addition, Amol Patil and Jonathan Frasch also finished their M.S. degrees. Amol research involves investigation of deadtime behavior of radiation detector. He presented his research at the ANS winter meeting in Reno and has published his work in Nuclear Technology. Amol is continuing for his Ph.D. in nuclear engineering at S&T. Vaibhav Khane is nearing his M.S. program. He has further investigated the phenomenon of natural convection for his thesis research. He presented his research results at the ANS winter meeting in Reno. He has submitted a journal article based on his findings for publication. The other exciting event of this year was the Missouri Energy Summit Conference held in Columbia, MO. Four of my students presented a poster each on their respective research. This event was highly successful. A large number of local as well as national leaders of energy and environmental issues attended the conference.

Upgrading of the radiation measurements and gamma spectroscopy laboratory has enabled S&T's nuclear engineering program to develop and deliver laboratory classes in distance education format. With the installation of Lynx system it is now possible for an off campus students to perform 4 radiation measurement labs using internet access to our radiation detection systems. This capability will promote research collaboration and as we are implementing the same technology at the reactor, sharing of our nuclear reactor facility with our off-campus collaborators will become possible.

I want to thank my graduate student David Gallego for his production of some high quality video based educational material to augment learning materials for the distance students. These DVD's contain rich text laboratory hand outs and presentation on the laboratory. With the help these DVDs students will be able to perform nuclear radiation measurement laboratory over-the-internet. Missouri S&T had also received a DOE GNEP Readiness grant for the construction a Hot Cell for low background measurements of irradiated specimen. This facility will be internet accessible. I am contributing to this project on detection system selection and design installation.

In the end, I want to thank all my graduate and undergraduate students for their help and support. I am also grateful to all the donors for helping with our laboratory upgrade project. Without all the help and support none of the above success would have been possible.

Shoab Usman
Associate Professor
Nuclear Engineering

Experimental setup for natural convection investigation under neutron radiation environment at S&T reactor facility





Dr. Shrestha - The New Professor

B.J. Shrestha, Ph.D. Associate Teaching Professor Joint appointment with the Department of Mining & Nuclear Engineering and Department of Electrical and Computer Engineering, S&T

At present, I am teaching various courses as an Associate Teaching Professor at both the Department of Nuclear Engineering and Department of Electrical and Computer Engineering, here at the Missouri University of Science & Technology. Along with teaching courses which is my primary responsibility per my contract, I am also excited about the prospects of getting involved in various research activities in both of these departments. With respect to my background in research activities, I have worked in the field of radiation transport, shielding, dose calculations, transportation of radioactive wastes, food irradiation, risk assessment of radiation leakage, etc. in the field of Nuclear Engineering. In the field of “Digital Image Processing” under the discipline of Electrical and Computer Engineering, I have developed image processing algorithms to extract features towards helping diagnose cancerous skin tumor. I, along with my fellow colleagues in Electrical & Computer Engineering Department was awarded a National Institute of Health (NIH) grant that totaled to \$999,202 over a 2-year period. This grant was for development of algorithms and imaging techniques for earlier detection of malignant melanoma. I, along with my colleagues from this team have been awarded a provisional patent for algorithms for detection of features utilized in digital imaging. I also like to present paper on my research work in various conference and symposium so I get to share my ideas among my peers.. Just last week on August 26, I presented a talk on my research work entitled “Dermvis Engine - A system’s approach” at the 2nd Quadrennial Cutaneous, S&T Imaging Conference held at Emerson Hall here at S&T.

I earned my Ph.D. in Nuclear Engineering in 1995 from the then University of Missouri-Rolla working on a radiation transport problem. I used “Monte Carlo Techniques” to simulate transport of photons in a semi-conducting material in various source detector geometries. I bench marked my algorithm with other algorithms such as MCNP and EGS, etc.; it was a very rewarding experience. Then afterwards, I worked as a post-doctoral fellow in an algorithm development project where I used the energy minimization principle to identify the chemical species at thermodynamic equilibrium in a pyrometallurgical problem.

Around the same time in 1996, I received an offer to teach a course on photonic devices in the then Department of Electrical Engineering, here at this university which has since become the Department of Electrical and Computer Engineering. I enjoyed it thoroughly. Eventually, I ended up teaching whole bunch of other courses there ranging from “Photonic Devices” to “Electromagnetics” to “Communication” to “Power Systems”. I also taught several courses on “Electrical Circuits” and “Electronics” as well. Right now, I am teaching “EE281 - Electrical Circuits” this semester. At Nuclear Engineering Department, I have taught, “NE431 - Radiation Shielding” and “NE312 - Radiation Measurements & Spectroscopy” during the fall semester of 2008 and spring semester of 2009. This fall, I am teaching “NE307 - Nuclear Fuel Cycle” and “NE205 - Fundamentals of Nuclear Engineering”. I am very excited to teach these varieties of courses. It is a lot of work but it brings a wonderful sense of accomplishment when I realize that my goal of sharing knowledge among our students have been met.

During my 14 years so far in this university as an educator, I have served the departments not only by teaching varieties of courses and conducting research works, but also being a mentor to various graduate students. I have served in several Ph.D. and M.S. committees. I have also served as a co-coordinator supervising graduate teaching assistants, preparing qualifying exam, judging GTA workshops, welcoming visitors to our research lab, representing departments at various events, etc.

I have also advised several undergraduate students under the auspices of OURE program since the inception of this program at our university. My observation is that sometimes, in the rush of securing funding for research projects, undergraduate education especially, undergraduate engineering education gets pushed aside and I think it is very unfortunate. So, I have always made an effort to bring in as many undergraduate students to our research projects as I can. Being involved in research activities as early as in the undergraduate level is really a great way to help foster a significant research climate within the student community.

I have a great passion for graduate and undergraduate engineering education and as such, I have been involved in teaching varieties of courses here at MS&T. I believe that I have a commitment to an engineering teaching and research in a diverse academic community.

I have a commitment to building a program supportive to underrepresented students. I would gladly commit myself to help contribute to the development of a new Nuclear Engineering Programs with emphasis on project-based learning, team building, and other innovative approaches to preparing engineers.

Lastly but not least of all, I am very thankful for the wonderful welcome I have received from the program chair Dr. Kumar and the rest of the professors: Drs. Mueller, Usman, & Castano and administrative assistant Ms. Johnson.

In the hunt for research bucks!

Dr. Castano's Group - Activity Report



A little update to all... I have a new office in Fulton 224, and I am still adapting to my job as a tenure track assistant professor. This year has been particularly intense because of the multiple tasks required from professors, which include teaching new courses, service in multiple committees, student advising, research, and preparing research proposals to raise money to do the aforementioned research. All this is a set of complicated activities to balance at a time when research funding is difficult to obtain. Fortunately, I have help from some of you in pursuing interesting research initiatives, even as we struggle with little funding.

Since I have been unable to obtain research money independently so far, a broad range of exploratory activities have been pursued with your help. In the case of NE-308, seven groups of students pursued research initiatives with various degrees of success. Interestingly, we irradiated animals and plants to observe radiation effects on their development, growth, or conservation (planaria, crop beans, iris flowers, salmonella) as well as studying other applications (plastic hardening, money radiotracers, and neutron radiography of hydrides). With Edwin Grant (NE Grad) we are still doing some further planaria testing.

Chrystian Posada my first graduate student arrived in January of this year. He had previous research experience in biological systems. Since then we have travelled to Idaho National Laboratory in June to the 2009 Advanced Test Reactor (ATR), Users Week. We plan to use ATR for material testing of special type of cement that would be adequate for gamma and neutron shielding of long term nuclear spent fuel storage and/or disposal (more to come).

The preliminary measurements are being conducted with the help of Prof. Henry Colorado from Universidad de Antioquia (currently at UCLA). He is creating the samples that are to be used in the experiment. Jason Pleitt (NE undergrad) is engaged in fabricating the device to measure the linear attenuation coefficient of the samples.

Thanks to Chrystian's dedication, Dr. Kumar's modulated beam mass spectrometer for exquisitely sensitive hydrogen measurements has been refurbish and is about to start roaring again. Chrystian have also helped me design and build a new type of Devanathan-Stachurski electrochemical cell including insitu X-ray diffraction that could put to rest an old debate on the nature of true nature of nickel hydride (important for hydrogen storage).

The latest addition to our group, thanks to funding provided by the Energy Research and Development Center (ERDC), is Jessika Rojas who has previous experience on material characterization and phase identification of stainless steels using X-ray diffraction. A research she presented at the 58th Denver X-Ray Conference last month. Jessika has also worked previously on mammography X-ray radiation dosimetry and quality control for X-ray room Radio-diagnostics.

Chrystian and Jessika are helping me also to pursue the development of materials that can store substantial amounts of hydrogen. This prospective research line is being done in collaboration with Andrei Lipson an old friend with whom I have worked before on hydrogen in materials. These materials can help us in the US to transition from our fossil fuel-based economy to a hydrogen fuel based economy. In particular, we are interested on the incorporation of nanoparticles into single wall carbon nanotubes (SWCN's) for hydrogen storage (more to come).

With Dr. Usman, and David Gallego (NE Grad) we have been studying electrical conductivity induced on insulators by neutron radiation. This is an interesting subject with potential applications into the failure of miniature semiconductor devices due to cosmic rays (at sea level 98% of cosmic rays are neutrons).

Last but not least, we are interested in studying the effect of free hydrogen in the ozone of the upper atmosphere. To that effect, Ryan Wohldmann (NE undergrad) with OURE funding (partial) and help from Chrystian is re-engineering a glass vacuum chamber donated to our group by Dr. Mueller. The objective is to obtain reliable data of the influence of hydrogen on the dynamics of ozone. Hydrogen is unavoidably released during normal operations, and the hydrogen economy might have unexpected negative impact in the ozone layer. This is a question of utmost importance, since ozone is vital for all life on the surface of the Earth.

Cross your fingers with me, we are stretched thin and really need some of those research bucks.

American Nuclear Society

ANS Officers

Devin Worstell—President Shannon Stacy— Vice President
Chris Crooks— Treasurer Amanda Merriken— Secretary
Daniel Kreis— Historian Warren Vaz— Reactor Liaison
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A.J. Fallgren— Public Information Officer
Matt Crinnian— Student Council Representative

NANT Scholarships

Congratulations to all of our outstanding students! Eight (8) undergraduate students in the Nuclear Engineering department at Missouri S&T are recipients of new NANT scholarships of \$2,500 each for the 2009-2010 academic year. These students are juniors ***Gregg Crannick, James Hachmuth, Nikolas Moesch, Megan Nydegger, Sonya Rhine***; and seniors ***Jamel Bell, Alexander Duvall, and Amanda Merriken***.

The National Academy for Nuclear Training (NANT) Scholarship Program awards scholarship 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

Hello from Missouri S&T's Women in Nuclear

By Savannah Avgerinos

Last spring Women in Nuclear (WiN), formerly Women in Nuclear Energy and Men Too, became active after a brief period of inactivity. WiN jumped full force into resuming the process of becoming a recognized student organization, working with Student Life to develop the necessary constitution to gain the support of the campus. Seven members were also able to attend a U.S. WIN delegation in Washington D.C. More information is available in Courtney St. Peters' article which was published in the *Missouri Miner*, the campus newspaper. WiN participated in a trip to Jefferson City, MO, to help show student support of legislation that aids the nuclear industry. The Society of Women Engineers (SWE) and WiN had an outreach picnic together in May, which was a great success despite the weather. Members of SWE and WiN had a great time eating, getting to know each other, and playing volleyball in the rain. We all thought it was a great success.



SWE-WiN Picnic

Over the summer, two of our members, Shannon Stacy and Courtney St. Peters, were able to attend conferences in Washington D.C. for the Region IV, US, and Global WIN meetings. They were paired with a mentor, attend presentations, and went on plant tours. A presentation was also given by Shannon Stacy highlighting our chapter's work and future plans. This was a great opportunity for our students to learn and network with professionals.

WiN is working with ANS to host a Nuclear Career Fair on September 28th, the night before the Missouri S&T Career Fair. This year the Nuclear Career Fair will be held in the Haven Center to accommodate the large number of companies in attendance, and we hope it will be a great success. WiN and ANS are also working together to host a two day conference

in February 2010 for regional chapters of both organizations.

WiN is very excited for the upcoming year. Check out the rest of the articles to learn more about our delegation last spring and our outreach plans. We'd like to extend our thanks to the Nuclear Engineering Department Chair, Dr. Kumar, and the alumni for their support. If you would like more details about the activities of WiN, feel free to contact me at sma9rc@mst.edu.

Missouri S&T students attend Women in Nuclear delegation conference

By Courtney St. Peters

On March 17th, 2008, members of Missouri S&T's Women in Nuclear left to attend a delegation conference in Washington D.C. Eight students, a faculty member, and a representative from Calloway's Women In Nuclear made the 15-hour drive to DC. The conference took place March 18th-19th.

"It was very exciting to travel to Washington D.C., and to have the opportunity to be involved with the political side of the nuclear world. I was very awed that we had the chance to speak to the individuals who might be able to make a change. I hope to be able to participate in similar delegations in the future, and would highly recommend it to anyone," said Savannah Avgerinos, a junior. The students were split up into two groups. One of the groups went and met with Senator Bond along with staff members for various Missouri Senators and Representatives while the other met with staff members from Illinois and Indiana.

The job of the participants in this conference was to sit down and talk to Congressmen about nuclear topics. "The government regulates almost all aspects of the nuclear industry in some way or another, and educating lawmakers is a very important step into promoting nuclear technologies. It was amazing some of the questions that were asked. These were intelligent people, so it's not like they are incapable of understanding. They just had so many misconceptions. I would definitely do it again," said Mackenzie Sweeney, a senior.

Women in Nuclear is a professional organization for not only women but men too who work or plan to work in nuclear related fields. The S&T chapter is open to all students and you do not need to be a nuclear engineering major to join.

WiN focuses on Outreach

By Courtney St. Peters

As most professionals in the nuclear engineering field know, the industry employs people of many different degrees and backgrounds. The members of Women in Nuclear recognize this, and would like to make an effort to extend membership to students with majors other than nuclear engineering. In order to do this, some outreach projects are planned for the upcoming semester.

Some majors that WiN has chosen to focus on for this year to try and get involved are mechanical engineering, chemical engineering, physics, and materials science. These are degrees that affect and work alongside many aspects of the nuclear field.

Since WiN is a professional organization, its members are also hoping to reach out to other professional organizations on campus such as the Society of Women Engineers, the American Society of Mechanical Engineers, or the Missouri S&T mucking team to exchange knowledge and arrange outreach activities. By interacting with other organizations, WIN can inform students of the many benefits of working in the nuclear industry for all majors.

Another form of outreach WiN is planning for the upcoming year involves working with the local middle and high school students. WiN is hoping to work with SWE and do outreach to local schools to educate students about careers in engineering and get them excited about math and science. This program is a continuation of one from last year.

WiN is looking forward to these outreach programs, but is always looking for more suggestions. If you have any ideas, please contact Savannah Avgerinos at sma9rc@mst.edu with details.



Front Row: Dr. Jeff King, Savannah Avgerinos, Chelsea Ware, Shannon Stacy, Senator Bond, Mackenzie Sweeney, Janese Neher, and Courtney St. Peters. Back Row Devin Worstell and Jeff Whited.

Thank You

The Nuclear Engineering department would like to thank and acknowledge the following alumni, friends, and companies for their generous contributions between July 1, 2008 and June 30, 2009.

GIFTS

\$1 - \$99

Michael Erin Alley	1996
John J. Blasé	1974
Jason Lee Boles	1996
Mark D. Carter	1980
Mark Kevin Covey	1982
Lorne Joseph Covington	1986
H. Joseph Dickerson	1997
Jane Theresa Diecker	2003
Entergy Services Inc.	
Charles M. Hart	1986
William K. Hinton, Jr.	1976
Dirk D. Holt	1980
Rebecca Michele Hovland	1998
Glen T. Kaegi	1983
Darrel Ray Liles	1996
Jan R. Lojek	1969
Stephen Wayne Luther	1999
Donald L. Moffett	1974
Bren Andrew Phillips	2005
Dale Alan Shelton	1985
Bijaya Shrestha	1995
Richard M. Starke	1971
Rebecca Lee Steinman	1996
Nicholas Tsoulfanidis	
Vincent C. Wahler, Jr.	1965
Charles W. Wiese	1976

\$100 - \$499

Accenture Foundation, Inc.	
Smaeil M. Aceil	1984
Ameren Charitable Trust	
American Electric Power	
Thomas W. Barkalow	1974
David E. Bartine	1966
Bruce Loren Bartlett	1980
Bechtel Foundation	
Carl A. Brewer, Jr.	1975
Frazier L. Bronson	1964
Christopher D. Cragg	1985
Charles R. Daily	1983
Dominion Foundation	
Sheldon A. Easson	1975
Michael R. Eastburn	1967
Kenneth Thomas Erwin	1997
Curtis David Eshelman	1986
Phillip Dean Ferguson	1988
Darrell C. Flynn	1979
Bradley Alden Fulton	1988
General Electric	
Albert & Maria G. Gharakhanian	1977
Corie Allene Glenn	2001
Robert L. Hayward	1975
Timothy Edward Holland	1991
Jonathan D. Huecker	1993
Gregory Scott Krinn	1987
Andrew T. Knudsen	1986
Arvind S. Kumar	
Peter Gyula Laky	1994
James Darren Ross	
James Alan Lawson	1989
Lockheed Martin Corp.	
Nuclear Advisory Group, Inc.	



Annual Phonathon November 1 – 5, 2009

Your generous contributions in the past have tremendously helped our students with the costs of attending Missouri S&T, greatly aid our recruitment efforts, and helped us upgrade our labs by providing matching funds for equipment purchases. This year's Phonathon is scheduled for **November 1 - 5, 2009**. Nuclear Engineering students will be contacting you during this five day period. Your generous support this year will be highly appreciated. We look forward to talking to you again!

\$100-\$499 (continued)

Scott P. Palmtag	1993
Katherine Ann Phillips	1990
Kevin D. Rackley	1980
Brian David Richardson	1996
Donald Edward Rickard, Jr.	1985
Paul Michael Sakowicz	1993
Mark Thomas Sautman	1991
Savage Management Inc.	
Robert Douglas Savage	1987
Donald F. Schnell	1986
Alice Ann Simpkins	1989
David L. Smith	1980
Keith Alan Steinmetz	1994
Brian Keith Taber	1991
Stacy Ann Walker	1996
William C. Wolkenhauer	1962

\$500-\$999

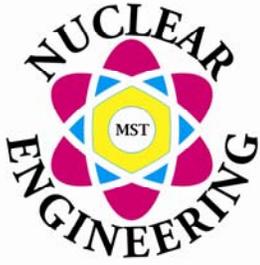
Richard N. Lilleston	1979
Jamie Marlene Wieschhaus	2003

\$1000+

Omar Ivan Aguilar	1985
William E. Burchill	1964
Deloitte & Touche Foundation	
Harold R. Garner	1976

\$50,000

Exelon Corporation



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What's New?

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happening with you or if you have
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