

UMR MSE News

A Newsletter for the Alumni of the Metallurgical, Ceramic, and Materials Engineering programs of the Missouri School of Mines/University of Missouri-Rolla

Chairman's Letter

Greetings from Rolla! You are now holding the first edition of our *MSE Newsletter* a new venture from the faculty, students, and staff of the Metallurgical Engineering and Ceramic Engineering programs at the University of Missouri-Rolla. Since July 2004, these two venerable programs have formed the core of UMR's new Materials Science and Engineering Department. This newsletter will review some of the highlights of our first year and give you an idea about some plans for the future.

It is worth noting at the outset that the formation of the MSE department does not signal the end of independent ceramic engineering and metallurgical engineering programs. We continue to offer BS degrees in both disciplines, we continue to recruit undergrads to the two programs, and we will continue to encourage alumni to support the students who choose to become metallurgical and ceramic engineers. (To that end, you will be hearing from us shortly *the Metallurgical Engineering and Ceramic Engineering Phon-a-thons will be held between October 26th and November 7th. We hope to hear from all of you!*) We do not plan to convert our undergraduate programs to a common MSE program. As long as industry continues to demand highly trained, very motivated ceramic and metallurgical engineers, UMR will continue to provide them. On the graduate side, we have created Materials Science & Engineering MS and PhD degrees and in the first year, 15% of our grad students chose one of those new options. However, we plan to continue to also offer advanced degrees in ceramic engineering and metallurgical engineering along with a new MS program in Biomaterials.

Here's a departmental snapshot from mid-September 2005: **143 undergrads** (including those in the freshmen engineering program) call MSE home evenly split between the metallurgical and ceramic engineering programs. We have **60 graduate students** who are pursuing advanced Met, Ceramic, and MSE degrees. Our total student headcount is up 17% above where we were a year ago. The larger classes (and high quality of the students) have increased the excitement level

here beyond what it has been in many years, and that is beginning to garner some widespread attention. For example, a 2004 survey of MSE departments by the University Materials Council indicates that the UMR MSE undergrad program is one of the five largest in the US. The 2004 *US News & World Report* listed our program as the 41st ranked graduate MSE program in the US the first time that UMR has been included in these rankings.


We had several changes in departmental personnel this year. Associate Prof. **Chris Ramsay**, a fixture in the metallurgical engineering program since 1989, took a leave of absence last May to develop his consulting business. **Priscilla Winner**, the Metallurgy and MSE departmental secretary since 2003, moved on to the Freshmen Engineering Program but she didn't move far since FEP can now be found on the first floor of McNutt Hall. **Ron Kohser** stepped aside from his position as associate chair of undergrad programs, replaced now by **Kent Peaslee**. **Bob Schwartz** is occupying the associate chair position for MSE graduate programs. In truth, however, **Denise Eddings** and **Joyce Erkiletian** continue to be the ones who really run the show around here.

There have been some significant recent changes on campus, too. The new Havener Student Center opened last January. This remarkable building, located just across the now blocked 14th street from McNutt Hall, replaces the now demolished University Center West facility and bookstore, and is the new gathering point for many campus activities. The new residential college has also opened. Located across Bishop Avenue from McNutt Hall, this new facility offers student living, dining, and studying accommodations that are a marked improvement over those you might remember from TJ Hall, the Quad, etc. The groundbreaking ceremony for the renovation of the Mechanical Engineering Building will take place at Homecoming in October plans call for the demolition of the ME Annex and the expansion of the current ME Building. If you haven't been back to campus in a number of years, I think you will be pleasantly surprised by these changes.

Speaking of changes, on September 1st, we welcomed our new Chancellor to UMR. **Jack Carney**, formerly the provost at Worcester Polytechnic Institute, has taken the reins from **Gary Thomas**. Chancellor Carney has the challenge to build on the advances the campus has made over the past five years in enrollment, research productivity, and development, while dealing with decreasing support from the State of Missouri. And, **Mariesa Crow** was named the permanent Dean of the School of Materials, Energy and Earth Resources. The School was reconfigured in 2004 to include the Departments of Material Sciences and Engineering (MSE), Geological Sciences & Engineering (GSE), and Mining and Nuclear Engineering (MNE).

The MSE Department celebrated several faculty promotion and tenure decisions this past year. **Kent Peaslee** was promoted to professor of metallurgical engineering, **Von Richards** (associate professor of metallurgical engineering) and **Fatih Dogan** (professor of ceramic engineering) were granted tenure, and **Bill Fahrenholtz** was promoted to associate professor of ceramic engineering, with tenure. Finally, **Richard Brow** was promoted to Curators' professor of ceramic engineering. With Curators' professor emeriti **Don Askeland**, **Delbert Day**, **Tom O'Keefe**, **Harlan Anderson**, and the late **Bob Moore**, these prestigious positions have been very well-represented by MSE faculty.

There is plenty more news about the department spread throughout this newsletter; research advances, student successes, alumni tidbits. The departmental name may have changed- but the enthusiasm of our students and expectations of the faculty for excellence in metallurgical and ceramic engineering remain the same. I hope we have an opportunity to share some of the excitement with you- during the phon-a-thon, at Homecoming, or any other time. Drop us a line or give us a call- let us know how you are doing and how you think we are doing. I look forward to hearing from you!



Richard Brow
MSE Chair

Scholarships News

One of the things that seem to set the students in the metallurgy and ceramic engineering programs apart from their peers (at UMR and around the US) is their ability to win national scholarships and their accessibility to financial support from alumni. Here are some examples:

- The MSE Department distributed over \$120K in financial support to ceramic and metallurgical engineering students for the 2004/05 year.

These funds were raised during the 2004 Phon-a-thon, and were disbursed from a variety of alumni- and corporate-funded endowments, including those created as memorials to Professors Bob Moore and Bob Wolf.

- Brandon Kruse (BS MetEng, 2004) received the 2004 ASM 'Woodside Founder's Scholarship', worth \$10,000, at the Oct. 2004 ASM meeting in Cincinnati, OH
- Daimon Heller, an undergrad in ceramic engineering, was selected as one of the 69 national Tau Beta Pi Scholars for the 2005-06 academic year. Daimon will receive a \$2000 cash award for his senior year of engineering study.
- Chris Buterbaugh (Edmund, OK), Brandon Kruse (Mascoutah, IL), Ryan Spoering (Springfield, MO), and Zane Voss (Fulton, AR) were awarded competitive scholarships from the American Iron and Steel Institute and the Association for Iron and Steel Technology Foundation. Chris, Ryan and Zane are all juniors in metallurgical engineering and were awarded the top scholarships, \$10,000 each, \$5,000 their junior year and \$5,000 their senior year in addition to a paid internship at a North American steel company. Brandon was awarded the \$2,000 Willy Korf Memorial Scholarship. UMR is the only university where more than two AIST scholarships were awarded this year.



AIST scholarship winners Ryan Spoering, Brandon Kruse, and Chris Buterbaugh.

- UMR continues to be one of the premier **Foundry Education Foundation** schools in the U.S. Fourteen UMR students were awarded FEF scholarships, totaling \$21K, and Bradley Morgan (Dexter, MO) won a David Laine Scholarship and an H.H. Harris Scholarship worth \$4000.
- Jennifer Gilmore (Raymore, MO), a senior in ceramic engineering, received a 2004/05 scholarship from the ACerS Southwest section.
- The faculty of the ceramic engineering program donated \$15K in 2005, matched by another \$15K from the University of Missouri System, to create a new scholarship for a student with financial needs to study ceramic engineering.

If you are interested in making a donation to any specific scholarship fund, or if you wish to start a new one yourself, please contact the MSE Department at mseumr@umr.edu.

- Our students were in summer intern and co-op positions all around the US (and a few abroad). A few examples include Sandia National Labs in Albuquerque (five students!), Nucor Steel (Blytheville, AR), Naval Research Lab (Washington, DC), NASA/Ames (Moffett Field, CA), Olin Brass (East Alton, IL), Cummins Engine (Columbus, IN), Kohler (Brownwood, TX), Delphi (Flint, MI), Univ. Bordeaux (France), Univ. Central Florida, etc.

Co-op positions are great experiences for our students and these experiences make our students much more valuable to potential employers. *If you would like to host one of our ceramic or metallurgical engineering undergrads in a co-op or summer intern position at your place of business, drop us a line (mseumr@umr.edu) and we will be delighted to set it up.*

Student Successes

UMR's Material Advantage Student Chapter Wins National Membership Award

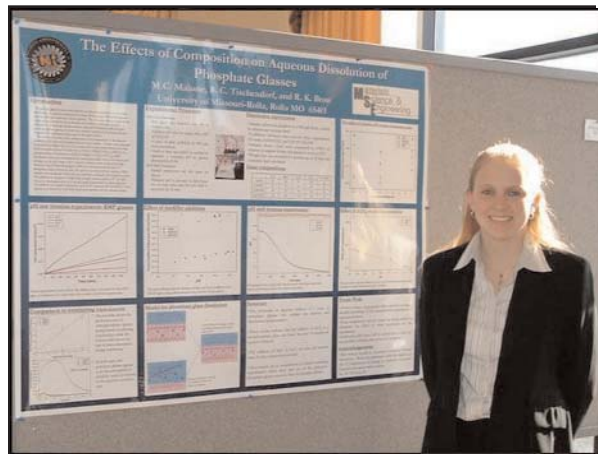
UMR's newly formed *Material Advantage* chapter won the 2005 "Most Students Recruited Award". The student chapter was awarded a check for \$500 for achieving a 27 percent increase in membership, beating out all other student chapters nationwide. UMR's Material Advantage chapter currently has over 60 student members. Material Advantage is a new organization that provides students with a single membership to several materials professional organizations including: American Ceramic Society (ACerS), Association for Iron & Steel Technology (AIST), The Materials Information Society (ASM International), and The Minerals, Metals and Materials Society (TMS). This is a tremendous benefit to UMR's students because through one membership they become full members to all four organizations, along with special conference rates, travel grants, publications discounts, and printed journals from each organization on a monthly rotating basis. This exposes our students to the many opportunities available in the materials field and makes our students eligible for the nearly \$600,000 in scholarships available from the various societies and their foundations. If you would like to find out more about this organization or would be interested in speaking to the student body please contact the chair of the UMR chapter, Steve Jung (sjung@umr.edu).



Officers of the 2005/06 UMR *Materials Advantage* chapter: (l-r) David Sauer, Greg Baird, Cassidy Volek, Steve Jung and Timothy Freaney

UMR Students Participate in ACerS Annual Meeting

UMR was well-represented by undergraduate students at the annual meeting of the American Ceramic Society in Baltimore, MD in April 2005. The Missouri Chapter of Keramos shared 'chapter of the year' honors with the Penn State chapter. Jeff Rodelas (Webster, MO) and Andrea Muller (Manchester, MO) represented UMR as officers of the chapter. Steve Jung was the second runner-up in the student speaking contest, UMR design teams finished second in both the mug drop and ceramic putter competitions, and Melissa Malone (Columbia, MO) won the undergraduate research poster competition.



Melissa Malone with her award-winning poster at the 2005 ACerS meeting in Baltimore, MD

MSE Faculty Members Recognized for Teaching and Research Accomplishments

The MSE faculty were well-represented when UMR handed out the 2004 Outstanding Teaching Awards and Faculty Excellence Awards. Six MSE faculty members were among the twenty on campus to receive 'faculty excellence awards' for their outstanding contributions in research, teaching and service to the university, and four MSE faculty members were among the 32 on campus to be cited for teaching excellence. The MSE department, with sixteen full-time faculty members, received as many (or more) of both of these awards as any other department on campus in 2004.



2004 Faculty Excellence Award Winners
(l-r): Bill Fahrenholtz, Greg Hilmas, Rajiv Mishra;
sitting, Bob Schwartz, Kent Peaslee, Matt O'Keefe



2004 Outstanding Teaching Award Winners
(l-r): Jeff Smith, Kent Peaslee, Richard Brow,
Matt O'Keefe

Department Hosts Second ASM/UMR Materials Camp

Twenty eight high school students spent the week of July 24-29 on campus as UMR hosted one of three residential materials camps sponsored by ASM International; the other two camps were held in Ohio and in Ontario, Canada. The students came to Rolla from all around the US, from California to New York, with a large contingent from Missouri. The students toured campus research facilities, discussed materials engineering applications on field trips to Quaker Window (tempered glass) and Spartan Light Metal Products (die casting and finishing), and participated in small group lab projects under the guidance of departmental faculty and students. These projects included activities in metal casting, glass preparation, ceramic magnet fabrication, friction-stir welding, and mozzarella cheese. (**Mark Schlesinger** led a project that used thermal analytical techniques to differentiate between cheeses made with water buffalo's milk and cow's milk, proving that a materials engineer can tackle almost any problem!) Students got a feel for the wide range of potential career topics, with presentations on forensic metallurgy (**Chris Ramsay**), polymer research (**Jim Stoffer**), high temperature ceramics (**Bill**

Fahrenholtz), environmental aspects of materials (**Kent Peaslee**), engineering ethics (**Ron Kohser**), and biomaterials (**Greg Hilmas**). The students disassembled portable CD players under the guidance of **Bob Schwartz** to learn about the materials used to fabricate electronic components and **Wayne Huebner** highlighted research at UMR. Finally, the students participated in the infamous "Walk-on-Water" design contest. Student teams were challenged to design and build "shoes" that would attach to their feet and allow a member of their group to "walk" across the Thomas Jefferson Residence Hall swimming pool. Each team spent up to \$50 on their "shoes" and had to consider buoyancy, stability and propulsion. Like true engineers, duct tape was still being applied minutes before the actual contest. Only one team made it across the pool, but the others certainly had fun trying, and learned a bit about engineering design and materials.

Ron Kohser and **Mary Reidmeyer** organized and ran this camp. Financial sponsorship came from ASM International, Caterpillar Tractor, and Nucor Steel. If you would like to learn more, or perhaps help sponsor our Summer 2006 Materials Camp, please contact Ron at rkohser@umr.edu.

Graduation 2004/2005

18 undergrads and 21 graduate students received degrees offered by the MSE Department during the 2004/2005 academic year. About a quarter of our undergrads went on to graduate school, and the rest began their careers with a variety of companies, including Nucor Steel, Olin Brass, US Steel, Bechtel-Bettis, Resco, Boeing, and so on.

Several of our alums were honored with 'professional degrees' during the 2004/05 graduation ceremonies. **William H. Daniels** (ceramic engineering MS and PhD degrees in 1964 and 1969, respectively), president of Daniels Consulting Service and **Steven H. Wunning** (BS degree in metallurgical engineering, 1973), group president and member of the executive office of Caterpillar, Inc., received professional degrees at the December 2004 graduation ceremony, and **William E. Horst** (BS and MS degrees in metallurgical engineering in 1951 and 1952, respectively) received his professional degree at the May 2005 commencement. Professional degrees are awarded by UMR at the recommendation of the academic programs in recognition of career achievements by alumni. Our awardees are held up as examples to our students of what they might achieve in their own careers. Our congratulations are extended to Bill, Steve and Bill for these recognitions! (If you would like to nominate a classmate or colleague to receive a professional degree in ceramic or metallurgical engineering, please contact the MSE office at mseumr@umr.edu.)

Metallurgy and Ceramic PhD degrees awarded in 2004/2005

Ju Bao, *Study on abrasive waterjet nozzle materials and PTA hardfacing coatings*, advised by **Joe Newkirk**.

Dustin Beeaff, *Fabrication of electrode support structure for planar solid oxide fuel cells*, advised by **Greg Hilmas**

Joe Edington, *Development and characterization of cerium of oxide coatings on metallic substrates deposited by spontaneous processes*, advised by **Matt O'Keefe**

Benjamin Eldred, *Wetting phenomena of steels containing aluminum and titanium, and wetting of single crystal mullite by borosilicate and yttrium-aluminosilicate glasses*, advised by **Darrell Ownby**

Tihana Fuss, *Effect of pressure on crystallization in lithium disilicate glass*, advised by **Delbert Day**

Yan Liu, *Synthesis and characterization of metal-polyaniline thin films and membranes*, advised by **Matt O'Keefe**

Nathan Lower, *Failure studies of glass fibers*,

advised by **Richard Brow**

Nisanart Navapan, *Effects of stress on material properties, intrinsic and extrinsic behavior, and electro-mechanical response of stress-biased actuators*, advised by **Robert Schwartz**

James Sago, *Development and evaluation of P/M processing techniques to improve and control the mechanical properties of metal injection molded parts*, advised by **Joe Newkirk**

Robert Tuttle, *Innovative refractories for preventing nozzle clogging in continuously cast aluminum-killed steels*, advised by **Kent Peaslee** and **Jeff Smith**

NEW Sponsored Research Programs

MSE continues to lead UMR in sponsored research activities. Some of our research is described in the following pages. Here are a few more examples of programs that have been awarded since July 2004:

- *Fellowship program in graduate education in interdisciplinary in materials engineering*, US Dept. of Education, R. Schwartz, PI
- *High temperature differential scanning calorimetry*, NSF, M. Schlesinger, PI
- *Resilient sealing materials for solid oxide fuel cells*, US Dept. of Energy, R. Brow, PI
- *Refractory containment development & testing for black liquor gasification*, DOE, W. Headrick, PI
- *A composite reversible solid oxide fuel-fed electrolysis cell/solid oxide fuel cell for hydrogen and electricity production*, Materials & Systems Research, Inc., H. Anderson, PI
- *Mechanical property evaluation of Fe(Cr,Mo)B hard-facing alloys*, Caterpillar, D. Van Aken, PI
- *Unconventional dielectric materials and structures for ultra-high performance pulsed-power capacitors*, MURI (ONR), F. Dogan, PI
- *Crystallization of oxide melts in space*, NASA, D. Day, PI
- *Functional testing of tissue engineered osteochondral grafts with bioactive glass*, Musculoskeletal transplant Foundation, M. Rahaman, PI

Metal Manufacturing Thrives at UMR

Some have been concerned that combining the departments of metallurgical engineering and ceramic engineering in 2004 to form the materials science and engineering department would reduce the emphasis on the individual degree programs. Be assured that UMR remains a top (if not THE top!) university in educating metallurgical engineers, especially for metals manufacturing.



Students Abhay Singh and Jeremy Bryant pour steel in lost foam molds with data acquisition, one of the E-SMARRT programs.

The job market for metallurgical engineering has been consistently strong with nearly every graduate seeking a job being placed by graduation. Over the last 10 years, of our 228 B.S. metallurgical engineering graduates, 20% went to graduate school and 80% took jobs. Of those seeking jobs at graduation, 80% accepted manufacturing positions associated with transportation industries (automotive, tractors, aircraft, engine, etc.), iron and steel manufacturing, metal casting, and non-ferrous production and manufacturing. The other 20% found jobs in research laboratories, support industries (oil, airline, power), and the military. During the last year, our graduates have went to work for major metal manufacturers such as Nucor Steel, US Steel, Olin Brass, Phelps Dodge, General Motors, Boeing, Caterpillar, Falk Industries and Bettis Laboratories.

Metals manufacturing research at UMR, especially in the area of liquid metal processing, has grown dramatically in the last few years. Two new research projects, funded by the US Department of Energy with several participating steel companies and ferrous foundries, started this aca-

ademic year. One project involves a process that uses steelmaking slag to recover the CO₂ from steelmaking off-gas producing higher quality slag products and the second project ('Energy-SMARRT') will assist the iron and steel foundry industry through improvements in melting efficiency, lost-foam casting of steel, and improvements in cast iron aging. These projects are directed by **Von Richards** and **Kent Peaslee**, with the assistance of **Jeff Smith**, **David Van Aken**, and **Scott Miller**. Liquid metal processing research is one of the largest research areas in the department. Last year, these new projects along with existing projects in continuous steelmaking, investment casting, and development of new continuous casting nozzles provided financial support for 13 graduate students, 15 undergraduate students and two research engineers/professors.

Recognitions for UMR Glass Research

UMR achieved a rare sweep of the research awards presented at the November 2004 meeting of the American Ceramic Society's Glass & Optical Materials Division in Cocoa Beach, Florida. **Richard Brow** received the *George W. Morey Award* for 'significant contributions to glass research'. The award cited Brow's research on the structure, properties, and applications of phosphate glasses. Brad Tischendorf, who will receive his PhD in ceramic engineering in December 2005, received the *Norbert J. Kreidl Award* for his research on the weathering characteristics of phosphate laser glasses. Brad was the second UMR student to receive this award, following Sam Conzone (CerEng PhD, 1999). Laxmikanth Peddi, who will receive his MS degree in MSE in 2005, won the student research poster contest for his work on bioactive glass films for titanium.



Richard Brow, Brad Tischendorf and Laxmikanth Peddi at the 2004 ACerS/GOMD meeting.

Ultrahigh Temperature Ceramic (UHTC) Research Goes International

UMR's UHTC research program is garnering international attention and providing new opportunities for MSE grad students. This multi-disciplinary program is supported primarily by the Department of Defense, NASA, and the National Science Foundation, and is directed by **Greg Hilmas** and **Bill Fahrenholtz**.

Jim Zimmermann, PhD graduate student in Ceramic Engineering, will be on his way to Faenza, Italy in September to perform UHTC research at the Institute of Science and Technology for Ceramics (ISTEC). ISTEC, a facility formed by Italy's National Research Council, performs research focused on material and processing innovations that satisfy requests from the industrial sectors and from the scientific and cultural communities of Italy for a host of application fields. Jim's research, funded by the Air Force Office of Scientific Research (AFOSR), involves the processing and properties of zirconium diboride (ZrB_2) based ceramics for use in the aerospace industry. The goal of the joint R&D effort is to compare the mechanical properties of ZrB_2 based ceramics fabricated at both UMR and ISTEC. Samples from each location will be fabricated by hot pressing ZrB_2 -SiC powder prepared using the distinct processing methods currently being used at each location. Jim will also have access to testing and processing capabilities not available at UMR. Specifically, ISTEC's nano-indentation machine will be used for measuring the hardness of specific regions of composite ZrB_2 samples produced at UMR. In addition, a spark plasma sintering (SPS) system will utilize a pulsed direct current to rapidly heat ZrB_2 -based samples to their densification temperature while minimizing grain growth and hopefully improving mechanical behavior over similar compositions produced by conventional hot pressing techniques.

Sean Landwehr, PhD graduate student in Ceramic Engineering, is on a six-month assignment at the Naval Surface Warfare Center (NSWC), Carderock Division, in West Bethesda, MD. As part of a joint research and development effort between UMR and NSWC, Sean is performing research on ultra-high temperature ceramics for future space and missile applications. Sean's research, in the area of processing and properties of zirconium carbide (ZrC) based ceramics for use in propulsion systems, is now being supported by both NSWC and the U.S. Army Space and Missile Defense Command (SMDC). The push for non-eroding nozzle throats in today's solid rocket motors, as well as for future digital propulsion systems and hypersonic air-breathing vehicles, is driving the

need for development of UHTCs with use temperatures well in excess of 2,000°C. Transition metal carbides, such as ZrC, TaC, and HfC, possess the melting temperature to fulfill the needs of these current and future applications, however their brittle nature makes them susceptible to thermal shock during the rapid heating cycles that the materials would be expected to see in service. Sean's research is thus focusing on the development of UHTC cermet, or ceramic-metal, composites that will possess both a high melting temperature and the thermal conductivity and strength required to survive the thermal stresses posed by these extreme environments.

Faculty Notes and Highlights

- In October 2004, **Delbert Day** was inducted into the *National Academy of Engineering* for his innovative approach to fight liver cancer using microscopic, irradiated glass beads.
- **Von Richards** and **David Van Aken**, were co-authors on a publication that was selected as the winner of the "2004 Best Paper Award" from the Cast Iron Division of the American Foundry Society for his paper on "Effects of Room Temperature Aging on Ductile Iron".
- **Bill Fahrenholtz** is currently serving as chair of the ACerS education integration committee.
- **Rajiv Mishra** co-organized and co-edited the proceedings for a session on friction stir welding and processing at the Feb. 2005 TMS annual meeting.
- **Kent Peaslee** and **Jeff Smith**, with S. Ramachandran, received the 2004 "Al Allen Award" for the best paper on refractories in 2003-04 from ACerS for 'Thermochemistry of Steel-Refractory Interactions in Continuous Casting Nozzles'.
- **Richard Brow** was elevated to Fellow of the Society of Glass Technology in May 2005, and received the Keramos Greaves-Walker Roll of Honor Award at the ACerS annual meeting in April 2005.
- **Mark Schlesinger** is an associate editor of the *Journal of Phase Equilibria* (ASM International).
- **Scott Miller** was named assistant director of the UMR Freshmen Engineering Program, which moved to McNutt Hall in July 2005.
- **Jeff Smith** has organized the technical program for UNITCER '05, a meeting of nearly 1000 refractories manufacturers, users, technologists, and scientists, in Orlando, FL, Nov. 8-11, 2005.

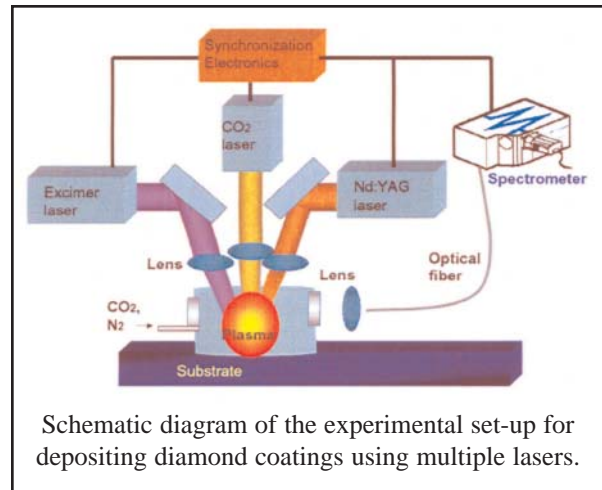
New Microfabrication Lithography Equipment Installed

A mask aligner and exposure tool used in the fabrication of microelectronic devices was installed in **Matt O'Keefe's** lab in the Materials Research Center during the 2004-2005 school year. Located in a soft-walled cleanroom, the equipment is used to expose ultraviolet radiation through a mask transfer a pattern onto substrates with a photosensitive polymer (photoresist). Shown below is graduate student James Reck operating the new system. Used in conjunction with thin film deposition of metallic, ceramic, and polymeric materials, this process enables faculty and students to build devices for test and evaluation. Addition capabilities and equipment to augment the facility are planned for the near future.



Diamond Coatings Research

MSE faculty members **Bob Schwartz** and **Matt O'Keefe** and students began a new collaboration in the summer of 2005 with colleagues at the University of Nebraska-Lincoln (UNL) and Dr. Hai-Lung Tsai's group in the UMR Mechanical Engineering Department during the summer of 2005 on a new project to develop processes to deposit diamond and diamond like coatings (DLC) in atmosphere using multi-energy laser sources. The work is being funded by the Office of Naval Research (ONR) under a 3-to-5 year Multi-University Research Initiative (MURI). One of the challenges to be addressed by the research is to deposit high quality diamond films without the use of a vacuum system, as is currently done for most DLC depositions. If successful, this could lead to use by the Navy for on-ship repair and replacement of wear resistant and thermally conductive coatings. The UMR materials group is focusing on characterization and testing of the films depositing by UNL.



Center for Friction Stir Processing

Several years of effort by Prof. **Rajiv Mishra** paid off this summer with the establishment of an NSF-sponsored Industry/University Cooperative Research Center (I/U-CRC) on Friction Stir Processing. The Center combines UMR's materials processing and design expertise with the manufacturing capabilities and experience of

industrial partners including Boeing, General Motors, Pacific Northwest Natl. Lab, Hitchcock and Friction Stir Link. Center research projects will include studies of microstructural modifications by friction stir processing, and the fabrication and characterization of fsj joints. In the picture to the right, graduate student Tim Freeney mans the



controls of the robotic friction stir welder. The FSP Center has three dedicated friction stir welding machines, including a friction stir spot welder.

This is the third NSF I/U CRC that involves the UMR MSE Department. The Department also hosts satellite sites for the center for Dielectric Studies (Profs. **Harlan Anderson, Fatih Dogan** and **Bob Schwartz**) and for the Center for Glass research (Profs. **Jeff Smith** and **Richard Brow**).

Every year, the MSM/UMR Alumni Office provides us with lists of alumni who made donations to support the metallurgical engineering and ceramic engineering programs. Listed below are the names of alumni who donated hard-earned dollars to our programs between September 2004 and August 2005, either through our annual phon-a-thon or by other means. If we missed including your name, please let us know (and accept our apologies). We very much appreciate the support, financial and otherwise, of all our alumni and friends!

Ceramic Engineering Alumni

Terry L. Adams	Benjamin Todd Eldred	Donald L. Kummer	Don V. Roloff
Larry A. Addington	Benita Carita Engle	Glen A. Larsen, Jr.	Angela Jeanne Sabo
Laura Tegethoff Agee	Erik Michael Erbe	James Lawrence	Brett James Scarfino
John H. Ainsworth	Brian K. Flandermeyer	Christopher Leach	Matthew Mark Seabaugh
Gerald W. Allmon	John R. Ford	Billie E. Leach	Lenn J. Scheibal
August Altenbaumer	Aaron Todd Freese	John W. Lewis, Jr.	Samuel J. Schneider
Dean Alden Anderson	Vicky Lynn Gerber	Vincent N. Logan	Patrick Jon Schroeder
Harlan Anderson	Guy V. Givan	George MacZura	Douglas B. Schwarz
Brent Markham Babyak	David E. Goldammer	Benjamin McCarthy	J. Roger Scrivner
Duane D. Bequette	Brian Patrick Gorman	Walter E. Mason	Narayan M. Sedalia
Holly Rose Bentley	Donald C. Griffin	Ronald A. McCauley	Andrew Dean Selvy
James S. Blank	Robert M. Gruver	Willie E. McCullah, Jr.	James E. Shelby, Jr.
David S. Blauvelt	William B. Guinn	Lane A. McCullough, Jr.	Cynthia A. Simpson
Jason Bodson	James D. Haffner	William D. McKee, Jr.	Rebecca Ann Shawgo
Dr. Edward N. Boulos	Matthew Micah Hall	Philip D. McPherson	Ryan James Shawgo
Mrs. Henry C. Brassfield	Gene H. Haertling	Kerry Duane Meinhardt	Kristine A. Shiffman
Lana J. Bray-Scott	John W. Halloran	Elena D. Melnik	Jeffrey Douglas Smith
Thomas C. Browne	Andrew David Hanser	Gilbert F. Metz, Jr.	Russell D. Smith
Julie Lynn Brunner	Bret Allen Harles	Thomas Miller	Ellis J. Smith
Vernon L. Burdick	Robert L. Hart	Gary D. Millsap	Vincent L. Sprenkle
John F. Burst	Wendell L. Haubein	John F. Mitchell	William E. Steinkamp
David W. Carter	Dennis H. Headington	Michael F. Modde	Jeffry W. Stevenson
James E. Cauthorn	James Gordon Hemrick	Christopher Monge	Alan E. Stricker
Carol Click	Enrique S. Heller	Edward E. Mueller	David J. Suiter
John Charles Cochran	Edgar J. Hellriegel	Robin A. Murphy	George H. Taylor
John Andrew Conrad	James L. Hill	Tara Nolley	Carl David Tucker
Timothy Coppinger	Emil C. Hrbacek	Donald R. Orcutt	Maurice E. Vandenbergh
Sarah Jane Cupps	Wayne Huebner	P Darrell Ownby	Cynthia L. Wagner
William H. Daniels	Rong-Fong Huang	Mrs. Ralph C. Padfield	Jennifer Lynn Wagner
Delbert E. Day	Orville Hunter, Jr.	Paul Michael Pericich	Jeremy Lee Watts
Elizabeth Sandefur DeBraal	Ann A. Ihms	Charles Pokross	Kent Weisenstein
William J. Denk	Paul L. Inman	Jeffrey A. Phillips	Roy C. Werner
Israel Denlow	Raymond B. Jones, Sr.	Jerry D. Plunkett	Kenneth M. Wilhelms
Robert M. Doerr	Gordon E. Jungquist	Darren Leon Proctor	Sara Ellen Wilke
Edward C. Duderstadt	Matthew J. Kerper	Edgar A. Quick	Amanda Lynn Young
Howard W. Durham	Walter H. Kiburz	Mary R. Reidmeyer	John C. Young
Julie Eager	Irving Klaus	Frances D. Rensvold	Weiming Zhang
		Erika Maya Rezek	Xiao-Dong Zhou

Metallurgical Engineering Alumni

David A. & Jill Akers	Mike W. Bench	Craig Alan Brice	Peter C. Collins
Becky & David B. Akers	Heather Benhardt	Jennifer Leigh Brooks	Zayna Marie Connor
Charles Akmakjian	Robert L. Benner	Stephen C. Brunts	William C. Connors
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Mary & Michael Becher	Aaron Kent Boyll	Thomas G. Chronister	William A. Dibert
Charles P. Becker, Jr.	Bruce L. Bramfitt	Shannon Cismoski	Dionne Ann Dillon
Christel M.A. Bemelmans	Ernest J. Breton, Jr.	Frank J. Coffey	Darrell W. Donis

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Dennis G. Drever
Raymond L. Drury, III
J. Matthew & Rebecca Dunezew
Mark John Dunlay
Jason Phillip Eckert
Joseph Epperson
Robert Adrian Etien, III
Rhonda L. Falaske
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Dennis J. Fesler
Armin F. Fick
Alicia Jeffrey Field
Robert & Cynthia Lee Fischer
David Fitzgibbons
Lee A. Flanigan
Robert F. Fleischman
Paul I. Fleischut
Gery R. Foehrweiser
Joseph W. Forren
Donald R. Fosnacht
Raymond A. Fournelle
John W. Frame
Kristopher M. Franken
Philip Freking
Gale Fulghum
Robert Allen Fyalka
Paul William Galbraith
Michael James Galbraith
Matthew & Dena Gaw
Stephen P. Gaydos
James Theodore Gee
Mark Steven Geissler
John Edward Gerfen
Lawrence L. Gidley
Kenneth W. Gieg II
Kenneth D. Gielow
Douglas & Diana Goedecke
Edwin C. Goetemann
Ronald A. Graham
Jennifer Lynn Graham-Rateliff
David C. Grimm
Myron E. Grizio
Thomas Gerard Grosko
Joseph M. Grosko
Michael Joseph Gross
Matthew Darrell Groves
Denise & Joey Hale
William L. Hallergerg
James F. Hamilton
David A. Hampton
Timothy & Nancy Kay Harster
Kristen L. Hartman
David C. Hatfield
Paul H. Hausner
Harry D. Hays
Joseph T. Hepp
James R. Hesse, Sr.
Barry S. Heuer
James L. Hickernell
Frederick Hohenberger
William Hollander
Robert L. Hollenbeck
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John D. Howell
Gary W. Hudiburgh, Jr.
David A. Hughes, Jr.
Lindell R. Hurst, Jr.
Santiago & Cheryl Ibarra
Nathan David Jaffe
George M. Johns
Gregory Wayne Johnson
Robert L. Johnson
Ralph E. Johnston, Jr.
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Richard L. Jones
Larry E. Jones
John B. Jones, Jr.
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Harold A. Koelling
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William Samuel Kolnik
Paul Stephen Korinko
Zelma Jean Kostyshak
Randall Charles Krause
Keith Michael Kreidler
Richard A. Krieger
Dave Kroeter
Shrirang A. Kulkarni
Charles O. Kunz
Stephen & Shelly Lane
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George L. Lee
Michael P. Lewis
Daniel J. Lichtenwalner
Floyd E. Loftin
Spencer Otto Luke
Charles P. Lusher, Jr.
Leonard & Paula Lutz
William H. Magruder
Elisabeth Maguire
Brian Mangogna
Purushottam Manusmare
Harvey G. Martin
Richard L. Martin
Kenneth & Jessica Martinez
Anthony Mascalco, Jr.
Michael Ralph Mayer
John & Catherine McCain
William T. McClane
Michael Scott McClellan
Thomas McClenahan
Chris J. McReynolds
Richard W. Meek

Chun-Ping & Jenny Meng
Carolyn & Clay Merritt
Gene Ray Meyer
Sumita Mijumdar
Pamela & Eric Miller
Brett Andrew Miller
Michael James Minard
Francis J. Minden
Michael & Amy Moats
Francis E. Moore, Jr.
Richard A. Mueller
Steve C. Mueller
Sherri & Jeremy Murrish
Peter Mushovic
Brent Larson Mydland
James L. Nagv
Martin Mark Nash
Francis M. Nataluk
Eric Jeremy Neal
Leander A. Neumeier
Robert E. Newcomer
Kenneth E. Niewoehner
Daniel Carl Nix
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John H. Olson
Robert & Lorna O'Rourke
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Mario A. Padilla
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Jeremy Gene Pepper
Terry E. Perkins
Michael A. Perkins
David Earl Perkins
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Stephen Eric Post
Tim R. Postlewait
Vernon C. Potter
Harold B. Pressly
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Miles C. Propp
Ravikumar Purimetla
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Richard H. Redline
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David Eric Reinhart
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Steven John Renick
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Frederick J. Rocchio, Jr.
Gerald J. Roe
Harvey D. Ross
Lewis E. Rosser
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Christopher & Tamra Jean Scheibhofer
Royce G. Schierding
Mark E. Schlesinger
Richard L. Schmidt
Robert F. Schmidt
James Lee Schoen
Kevin C. Schoolcraft
Wade H. Schott, IV
Karol K. Schrems
Allan A. See
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Semahat Sinharov
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John H. Smith
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Richard & Amy Stehlin
Joesph Steinkamp
Mark Alan Stennett
Peter G. Stern
Leslie D. Stewart, Jr.
Henry L. Strieder
Colleen N. Stucker
Yu-Ming Su
James D. Sullivan
Steven M. Sullivan
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David Andrew Swartz
Roger M. Swenson, Jr.
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Clarence M. Tarr, Jr.
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Andrew J. Tayon, Jr.
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Milton M. Tilman
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Mark Daniel Varwig
Kerri A. Vencato
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Sean E. Walker
Douglas J. Walker

MetEng Alumni (cont.)

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Samuel C. Weaver
Mrs. Robert B. Webb
Wilbern L. Weddle

Baltasar R. Weiss
David Michael Welsh
Thomas E. Wevand
Nicholaus A. Wheeler
Gary Douglas White
Larson E. Wile

Michael Lee Wilkening
Kimberly Kay Williams
Benjamin P. Winter
William E. Wistehuff
James R. Wolfe
Chyang-Jer Wu

Shen K. Yeh
Sunila Young
William J. Zenik
Jian Zhang
Sanhong Zhang
Scott C. Zimmer

Thank You, Everyone!

How does the MSE Department use your phon-a-thon donations to support our metallurgical engineering and ceramic engineering programs? Lots of ways!

During the 2004/05 academic year, we provided over twenty-five scholarships, ranging from \$600 to \$2000, for freshmen and transfer students interested in pursuing degrees in ceramic engineering and metallurgical engineering.

We helped support the travel costs for juniors and seniors to participate in national meetings of professional societies like ASM International, ACerS, and TMS.

We purchased supplies and materials used by our senior design teams.

Last year, three teams of seniors in the metallurgical engineering and ceramic engineering programs designed, fabricated and tested novel armor systems for personnel and vehicle protection. Last Spring, the three teams went head-to-head in presentations on their projects, and the project "Evaluation of the Ballistic Impact Resistance of Possible Engineering Materials for use in HMMWV Door Panel Armor," organized by seniors Bryan Johnson, Tim Nitz, Bradley Randall, Andrew Sommer, and Emily Welch, was selected as most promising. (The team designed and completely manufactured door panel inserts from two different types of materials (cemented carbide and Hadfield steel), and then tested the panels, using their own ballistics and ballistics testing apparatus, to determine the best combination of materials.) We submitted the project report for the 2005 TMS Materials Science & Engineering Undergraduate Student Design Competition, and in August, we learned that the UMR team received an honorable mention for this work. This is a nice success story of how we were able to leverage alumni support with student enthusiasm to generate national recognition for the UMR MSE Department. The senior design students were advised by Professors **Greg Hilmas**, **Kent Peaslee**, **Von Richards**, and **Jeff Smith**.

We used alumni donations to upgrade materials preparation and characterization equipment used in our undergrad labs. Several furnaces, saws and grinders, and a variety of light lab equipment were purchased. Under the direction of **Mary Reidmeyer**, we have developed new recruiting materials designed to excite high school students about careers in metallurgical and ceramic engineering. These materials include kits that high school science teachers can use to explain physical and chemical properties of materials, departmental brochures and fliers, displays, and web-based content.

It goes without saying that your support means a great deal to our students and faculty. We appreciate what you have done for us already, and we hope we hear from you again soon!

***The Metallurgical Engineering and Ceramic Engineering
Phon-a-Thon will be held from October 26th to
November 7th. We hope to hear from you!***

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