This issue of The Mining Engineer is dedicated to our graduates. In December 2007 the last “UMR” graduate walked across the stage during commencement. This University started in 1870 as the Missouri School of Mines (MSM) and the first graduates were mining engineers. It was only befitting that the last UMR graduate was also a mining engineer. Alex Hofstetter, proudly wearing his hard hat, light and light belt, was the last undergraduate to walk across the stage in December 2007 to accept the congratulations by Chancellor Carney. Alex is working for Barrick in Elko, NV.
A Message from the Chair

Missouri University of Science and Technology (Missouri S&T) continues to excel at the frontiers of Mining Engineering education and research to provide critical human resource needs and technologies for a growing industry. The mining industry is growing in several dimensions, with difficult challenges, whose solutions require qualified graduates and advanced research initiatives. The expanding markets in Asia, Africa, South America and other parts of the world, have extended the demand for qualified graduates into the unforeseeable future. The vision of Missouri S&T’s Mining Engineering program is to be recognized as a global leader in Mining Engineering education and research. A number of strategic initiatives were adopted in the 2006-10 Strategic Plan to achieve this vision. These initiatives include: (i) maintain Missouri S&T at the frontiers of Mining Engineering education and research; (ii) expand the depth and quality of student experience at Missouri S&T; (iii) maintain the quality and broaden the research Experience at Missouri S&T; (iv) create resources and facilities for expanding research and education in Mining Engineering; (v) maintain and/or enhance our national and global partnerships.

Investments in Scholarships and Financial Aids: A quality audit of the Mining Engineering program was undertaken in the 2007-08 Fall Semester as part of the 2008-09 ABET accreditation process. The audit revealed three critical areas that require attention for achieving the vision of the 2006-10 Strategic Plan. These areas include: (i) the number of faculty; (ii) well-equipped teaching laboratories; and (iii) scholarships and financial aids. On behalf of the Department, I extend sincere thanks to our alums and supporters who have provided financial assistance for critical areas of the academic enterprise. Special thanks to Mr. Ted Ruppert, Mr. and Mrs. Tom Holmes, Bill Kennedy, Bill Summers, Elfred Stillman, Stephen Feder, G. Waring, G. Hubbard, Gjelsteen, J. Allan Spokes, Krauss, Naomi Parsons, Pat Hell, Pat Witt, Peter Kiewit, Robert Dye, G. Pollard, Stone, the Lang and the Hale Families, and TLT Babcock. Special thanks also to the following companies: Barrick Gold, Caterpillar, CEMEX-Rinker, CONSOL Energy, Freeport McMoran, Granite, Joy Mining, P&H Mining, Peabody, Rio Tinto and USG. The Department also values significantly the contributions of SME, ISEE, the Saint Louis Coal Club, and the Saint Louis SME Chapter for their contributions towards scholarships and support. Your financial assistance provided over $170K in financial aid to Mining Engineering students for the 2008-09 academic year.

Enrollment and Capacity Expansion: FS 2007 started with 33% increase in overall enrollment over the 2006-07 academic year. The total enrollment was about 215, which included 150 undergraduate and 65 graduate students. The program also graduated 25 mining engineers in the December and May Commencements. A number of program initiatives including the Summer Explosives Camps, Jackling Introduction to Engineering, and aggressive introduction of the program to the public contributed to this increase. The key to sustaining and growing this enrollment capacity is to provide the appropriate resources to train and educate the students. Toward this objective, the Department is planning a Capacity Renewal Conference to bring our alums and supporters to campus in April 2009 to discuss and develop a plan for reinvestments in critical areas of the program. The Department is also looking to boost the recruitment efforts by recruiting a Resident Recruiter for Mining Engineering.

Faculty Renewal and Expertise: Faculty renewal was a major focus of the Department within the 2007-08 academic year. Dr. Kwame Awuah-Offei, Plant Engineer from Granite joined the Department as Assistant Professor in September, 2007; Dr. Jason Baird, Research Associate Professor (Missouri S&T) and a Retired Lt. Colonel in the US Air Force joined the Department as Associate Professor in January 2008; Dr. Stewart Gillies, former Professor of Mining Engineering at Queensland, Australia, joined the Department as the Union Pacific-Rocky Mountain Energy Professor of Mining Engineering in August, 2008. As part of the Missouri S&T – University of Botswana (UB) academic agreement, the Chancellor and the Provost have approved another faculty line for the program in the area of Mineral Process Engineering. The additional faculty line brings the total of Mining Engineering faculty members to nine, which approaches the critical mass of ten (10) for the program expansion requirements at Missouri S&T.

ABET Accreditation of the Mining Engineering Program: As part of the quality management of the program, an ABET Accreditation Team will evaluate the Mining Engineering program alongside 15 other engineering programs at Missouri S&T in October 2008. The objective of this exercise is to ensure that engineering programs meet the requirements for professional engineering practice as defined by the Recognized Professional Engineering Societies. The significance of engineering accreditation includes: (i) quality indicator to the public and to the profession; (ii) basis for professional engineering certification; (iii) selling point for recruitment; (iv) pride of alums and supporters; (v) program continuity and insurance against attrition and closure; (vi) eligibility for scholarships and other financial aid programs; and (vii) a basis for growth and expansion. The program faculty, staff and students and the university have made significant efforts in preparing for the accreditation visit. A well-document self-study report covering the past five years, curriculum portfolios, and the education and involvement of program constituencies and supporters have been carried out in preparation for the ABET visit.

Program and Curriculum Expansion: The Department will introduce two major mine design courses (surface mine design and underground mine design) into the curriculum beginning FS 2009, based on our interactions with Board Members, industry, alums and students. These two courses will focus on geomechanical, geometric and computer-aided mine design and layout optimization. They will provide a foundation for the capstone design course in the senior year. An undergraduate seminar has also been introduced to provide a forum for students to sharpen their oral presentation skills. A Minor in Mineral Processing has also been introduced to provide additional
specialization with focus on introductory mineral processing, hydrometallurgy, plant design and aggregate materials. The Department is in the process of developing the MS/ME in Explosives Engineering by Fall 2009.

**Industry Efforts in Mining Engineering Education:** In addition to providing scholarships, internships and permanent job opportunities, the industry was involved with the Development Board and the Senior Design Process and Presentations. The Board currently consists of senior executives from Arch Coal, BHP Billiton, Casper Stone Quarries, Caterpillar Inc., Centerra Gold, Conoco Quarries, Consol Energy, Doe Run Company, Fred Weber, Goodyear Rubber Manufacturing, Kenneecott Utah Copper Company-Rio Tinto, Kennedy Metal Products, Kiewit Mining Group, Marston & Marston, Martin Marietta, Newmont Corporation, Orica Inc., P&H Mining, Peabody Energy, Luminant Energy (formerly TXU), Vulcan Materials and Weir International Consulting. The Board meets annually in April to interact with the faculty, staff and students and to provide industry perspectives on the direction of the Mining Engineering Program at Rolla. Your counsel and contributions continue to shape Rolla Mining Engineering. In the 2007-08 academic year, BHP Billiton, Granite Construction, Hanson Aggregates, Peabody Energy, Pearidge Mine, and USG Corporation provided real-world data and information for the capstone design project in Mining Engineering. The industry judges for Fall 2007 included Dianna Tickner (VP for Generation Development of Peabody), Mark Sebree (Mine Mgr. for Peabody’s Farnesburg Mine, IN), Phil Collins (VP Operations for Hanson), Steve McCracken (Op. Mgr. for Granite), Brent Lamoure (Chief Engr. for Stillwater Mining) and Jason Ovanic (Snr. Mining Engr. for UNIMIN). The Spring 2008 judges included Jim Humphrey (Snr. Mining Consultant of CAT Global Mining), Jeane Hall (Snr. VP Eng & Tech. Services of Peabody), Terry Croxford (Gen. Mgr. for Fred Weber’s Bluff City Minerals) and Mark Long (VP/GM Hanson West Region). The Department highly appreciates these efforts by industry, alums and supporters of Rolla Mining Engineering.

**Research Capacity and Efforts:** The Department is engaged in several research initiatives of vital importance to national security. The faculty research awards totaled $3.7 million ($308,330/FTE) for 2007-08 fiscal year. The Department is a partner with four other universities that just won the DHS Center of Excellence on Explosives-Related Threats ($2.5 million per year for four years). The Department is home to the CDC-NIOSH $4 million Center for Mine Safety and Health Training and Translation Center over a period of 4 years. This is a research consortium that comprises CSM, Utah and Montana Tech with a mission for providing solutions to mine health and safety problems. Research Funding; ALERT Project; Number of PhD graduates;

**The Pride of Mining Engineering at Missouri S&T:** Over the year, our students and faculty distinguished themselves in a number of areas that were recognized locally and nationally as described below. **Daniel J. Tabacchi** (MinE’07) became the highest ranked Army ROTC Cadet in the university’s history. Tabacchi was ranked 11th (and 1st in Missouri, Arkansas, Illinois and Oklahoma) out of a total of 4,100 cadets in the nation based on academic performance, leadership skills and performance in physical activities. **Nassib S. Aouad** received the Department’s Graduate Research Award for his PhD research on truck and operator vibrations under high impact shovel loading operations. **David Nutakor** received the Department’s Graduate Teaching Award for his contributions in undergraduate teaching. Our students competed strongly in the 2008 International Intercollegiate Mucking Competition held at Rolla in April 2008. The Ladies’ Mucking Teams placed 2nd and 5th, the Men’s Teams were 2nd and 3rd and the Co-Ed Team was 1st. In the 2007-08 National Professional Mine Rescue competitions held in New Orleans and Rolla, **Casey Slaughter** (a senior) wrested the national Bio-marine title from the then champion. **Samuel Frimpong** was elected Chair of the ASCE-UNESCO Committee on Sustainable Energy, and Secretary for the Minerals and Energy Section of the National Alliance of State Universities and Land Grant Colleges (NASULGC). He was also appointed Associate Editor for the ASCE Journal of Energy Engineering and the International Journal of Mining & Mineral Engineering. **Greg Galecki** was elected as a Member of the Board for Water Jet Technology Association. **David Summers** was honored with an Honorary Diploma by Koszalin University of Poland and elected as a Life Time Member of the WaterJet Technology Association. **Jimmie Taylor Jr.** was awarded the 2006 UMR-MSM Alumni Staff Person of the Year in 2007. **Jerry Tien** was appointed a Member of the Federal Technical Panel on Mine Safety and Health. **Paul Worsley** was awarded a Sustained SOMEER Teaching Award, which is the highest teaching award given by the former School of Materials, Earth and Energy Resources.

**Samuel Frimpong**

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**CAPACITY RENEWAL CONFERENCE**
**Investing in Human Resource Development for the Future**
**Rolla, MO - April 8 – 10, 2009**

All Rolla alums are invited to attend a 3-day strategic conference on capacity renewal for the Mining Engineering program at Missouri University of Science and Technology. The conference will feature three keynote speakers from senior industry executives, four short courses, research presentations, forum with students on the mining industry, Development Board Meeting, golf with Jimmie Taylor and an Annual Awards Banquet with fireworks. The short courses will focus on (i) Evaluation & Control of Diesel Particulate Matter; (ii) Surface Mine Bench Design for Efficient Fragmentation; (iii) Future of Energy & the Mining Industry; and (iv) mine design or pit optimization. There will also be a forum on a call to invest in the program. The detailed programming activities will be sent in November 2008. Please send all inquiries to Barb Robertson at 226 McNutt Hall, 1400 N Bishop Ave, Rolla, MO 65409-0450; Phone: (573) 341 – 4753; Email: barb@mst.edu.
Dr. Stewart Gillies joined the Department in September 2008. Some of you might remember Stewart from his first employment with the University from 1978 to 1982. Stewart returned to Australia in 1982 and spent many years at the University of Queensland in Brisbane, Australia. He stayed in touch with us over the years and twice accompanied students to the Mucking Competitions. We welcome him back to his “old department”.

In May 2008, DeWayne Phelps joined us and is working with Jimmie Taylor at the Experimental Mine. DeWayne is already part of our ‘mining family’ and is involved in our activities. Stop by and meet DeWayne the next time you are in the area.

New Faces in the Department

Phonathon 2008

Fall is coming to the Ozarks and that means the annual Mining Engineering Phonathon is coming up. Our students will work the phones from November 2 to 5, 2008. We hope you will take their call and continue your generous donations to the Department. Remember that all Phonathon donations will come to the Department. The Phonathon funds support scholarships, mucking and mine rescue, as well as the four student organizations.
In February 2008 Bryan Lewis accepted a position with Newmont Gold in Carlin, NV. Bryan is working with the mine rescue teams in the Nevada Operation for Newmont Gold. Bryan has worked at the Experimental Mine for almost 10 years on a part-time appointment. His full-time job was with the Fire Department for the City of Rolla. Over the years, Bryan gained experience in all aspects of fire and rescue training and this position is perfect! We miss him, but he is still part of the “Mining Family” - now maybe more than before. The photo and news release shows Bryan with the Newmont Carlin Gold Team.

Reprint of Newmont Employee Newsletter

ROTC program produces highly ranked cadet

This past December, Daniel J. Tabacchi, MinE’07, became the highest-ranked Army ROTC cadet in the university’s history.

Each year, graduating Army ROTC cadets are ranked against others in the nation, receiving up to 40 points for their academic performance, 45 points for leadership skills and 15 points for performance in physical activities. Tabacchi earned a ranking of 95.54, placing him at No. 11 out of 4,100 cadets nationwide.

Tabacchi's score on the order of merit list also placed him at No. 1 in a four-state region that includes Missouri, Arkansas, Illinois and Oklahoma.

"He is the highest-ranked cadet we have ever had: says Lt. Col. William L. DeMalade, professor and chair of Missouri S&T's military science department. "It was his individual drive and his striving for excellence in each of those areas that earned him the ranking."

Tabacchi is now a commissioned second lieutenant in the U.S. Army. In May, he will begin basic officer training.

This article reprinted from the Spring 2008 Edition of the Missouri S&T Magazine
**ISEE Chapter Update**  
by Zach DeGraffenreid, President

The UMR/MS&T student chapter of ISEE wrapped up last semester by electing new officers for the 2008-2009 year. The new officers are as follows: President – Zach DeGraffenreid, Vice-President – Patrick Flaherty, Treasurer – Adam Markus, and Secretary – Maggie Hettinger. Congratulations on being elected.

ISEE will begin the year with the annual float trip. This year the group will be going down to Bennett Springs to relax before a busy semester begins. More students than ever are interested in the field of explosives engineering, and ISEE is hoping to recruit a record number of members. As always, ISEE will be helping out with this year’s biggest departmental fund raiser, the Haunted Mine. ISEE’s own fund raiser, Blow Stuff Up Day, was such a success in the springtime that we tried it again last winter; least to say that the winter version was just as successful, with a great turnout and the lighting of the first ever explosives Christmas tree. As always, Blow Stuff Up Day allows students to bring in projects, textbooks, old gifts, etc., and have them blown to smithereens. The UMR/MST chapter will also be sending a number of students to the Mid-America Blasting Conference at the Lake of the Ozarks, Missouri in November and to the ISEE National Conference in Denver, Colorado in February. The Chapter received 14 scholarships from the Education Foundation of National ISEE! Thank you to all the donors that helped make this possible.

The UMR/MS&T chapter of ISEE will continually strive to advance, educate, and inform students of the science and art of explosives engineering.

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**National Stone, Sand & Gravel Association**  
**Missouri S&T Chapter**  
by Darrin Smith

The members of NSSGA are excited to be back at MS&T for another school year. We plan to have several events this year to further the advancement and interest in the crushed stone, sand, and aggregate industry. Those interested in hard rock mining would be glad to know that we plan on taking a trip to a quarry in St. Louis, Missouri, and we would like to invite everyone to a BBQ, date TBA. We will also be helping with Haunted Mine in October and with the Phonathon in November.
Student Chapter of SME
by Amanda Kimbel, President

SME (the Society for Mining, Metallurgy, and Exploration) is quite involved in the Mining Department at the Missouri University of Science & Technology. Through the year, the society held socials, helped on Haunted Mine, worked with WIM (Women in Mining) on a General Education in Mining project, and attended the national conference in Salt Lake City. At the beginning and end of the year we always hold a kickball social. The last meeting of the year, where the new officers are elected is one such social. These are a great way to meet other students in the society and encourage others to join. The department’s biggest fund raiser each year is our annual Haunted Mine. All of the students from the department join in building and running each section of our Experimental Mine. The money raised from this fund raiser is then split among the different societies. Another big project for the Rolla SME chapter is the General Education in Mining, or GEM, project. With the WIM chapter, the department gives tours of the Experimental Mine and heads trips to different schools to promote Mining Engineering. This past year we took over 40 students to the national conference in Salt Lake City. The students had an opportunity to interact with industry representatives. Many of the students who had not yet acquired internships for the summer made connections with the industry representatives that led to a job. This year we plan on adding many more members from the freshman class and also from other fields of study (i.e. the Geology and Metallurgy departments).

We want to thank the companies that sponsored tables for the students at the awards banquet:

- Peabody Energy
- Arch Coal
- Kiewit Mining Group
- Martin Marietta
- Weir Int. Mining Consultants
- The Doe Run Co.
- Rio Tinto Energy

Without the help of these generous donors, the photo would show a much smaller group.
Women in Mining (WIM)
by Jessica Austin, Vice President

After missing the National WIM conference for a few years, in May 2008 Jessica Austin traveled to California to represent our Student Chapter. The three day conference is a chance for the members to plot the direction for the next year. We were the first student chapter approved by WIM and it is great to see the new chapters coming up now. But the conference is not all work. One trip took the group to Hearst Castle. A tour of Union Asphalt Inc. to visit their current mining operations and reclamation projects. They have a “Mines to Vines” project. Union Asphalt brings in top soil after the mining is completed, introduce nutrients and lease the land to wine growers. After the tour of the mining operations and the reclamation vineyard, the group had lunch at Riverbench Winery and taste tested 4 types of wine made at the winery. As you can see to the right, Jessica enjoys the lunch. After lunch, committee appointments were made. Next year’s WIM National Conference will be in Rolla, MO at Missouri University of Science and Technology (MS&T). We hope to see the whole group in Missouri next year.

Student Awards April 2008

High GPA Freshman
Justin Higginbotham
Eric Hoffman
Ryan Sinclair

High GPA Sophomore
Jill Groeblinghoff

High GPA Junior
Tristan Worsey

High GPA Senior
David Richey

Old Timers Award
Nathan Brownell

Outstanding M/NM Graduate
Nathan Woods

Outstanding Aggregates Graduate
Adam Eatherton

Professional Leadership Award
Dennis Sullens

External Relations Award
Amanda Kimbel

Student Recruiter Award
Jonathon McWade

Student Activity Award
David Lloyd

Chairman’s Award for Good Citizenship
Jill Groeblinghoff
Casey Slaughter

Outstanding Graduate Teaching Award
David Nutakor

Outstanding Graduate Research Award
Nassib Aouad
In April 2008 the 30th Mucking Competition was hosted by our Department. We had a great turnout and competitors in four categories. Teams from Penn State (1st time); Univ of Kentucky, Montana Tech, Mackay School of Mines, Virginia Tech, Univ of Arizona, New Mexico Tech., were joined by 6 teams from Western Australian School of Mines (WASM) and two teams from England. It was a truly international competition. It has become customary for the hosting team to provide housing for the international teams and it was impossible to miss the Australian and the British flag on the balcony of the Days Inn on Kingshighway. The competition went very well, except for the weather. This was the coldest day in April that we have seen here in Rolla. But the cold didn’t dampen the spirit of the teams. In the men’s division, Montana Tech placed first, closely followed by UMR A second and UMR B third. In the Ladies division, we had a tie between our Lady Muckers and the WASM team. The judges decided on the tie breaker and WASM placed first. For the first time in many years we also had a Co-Ed team and the UMR Misfits placed first in the division. Several years ago an alumni division was added and we had 3 teams compete. The 80’s Alums placed first by a pretty good margin. The OSB Team took second, followed by the Barrick Alumni. The 2009 competition is scheduled for Butte, Montana. Plans are underway for the teams here and the men’s teams are already practicing. We want to take this opportunity to thank all the sponsors that make it possible for us to continue with the mucking tradition here in the department.

MS&T/UMR?MSM had 3 mens, 2 women and 1 co-ed team in the 2008 competition. Look at all the trophies!

The 80’s Alums proudly displaying the first place plaques.

Photos by B. A. Rupert

The OSB Alumni Team kidnapped Jimmie Taylor for this photo.
MS&T Mine Rescue Team

Our Mine Rescue Teams are doing great! Two teams competed in the Southeast Mine Rescue Competition in New Iberia, LA., in early May 2008. Casey Slaughter, again, placed first in the Bench men Contest for BioMarines. Congratulations to Casey! The teams will have a big turn over in the next couple of semesters due to graduation. Therefore it is really good to see the interest in the freshmen and sophomore classes. The Missouri Mine Rescue Competition is coming up in early October 2008 and we will have two teams - again.

The industry is showing more and more interest in students that have participated in mine rescue. We established a mine safety and health emphasis area several years ago, and now the students completing this will see the benefits.

2008 Mining Hall of Fame Inductee

A new name was added to the Mining Hall of Fame plaque in April 2008. Theodore (Ted) A. Ruppert (PetE 1952) is the latest member of this group. He is a member of the Mines and Met Academy and established the lab equipment fund. He also provided $300K to fund the McNutt Computer Learning Centers. Ted was also the keynote speaker at the 2008 Student Awards Banquet and talked about his career and experiences. Congratulations on becoming a member of the Mining Hall of Fame.
Update from Paul’s Bunker

Dr. Worsey has been very busy during 2007 - 2008 expanding the explosives engineering program on campus. The number of explosives courses offered in 2008 has expanded to eight 3-hr courses and in 2009 we are anticipating offering an additional course and resurrecting an old explosives course. We currently have undergraduate and graduate certificates and undergraduate and graduate minors in explosives engineering available. We are about to submit the paperwork for a Master of Science in explosives engineering, which we hope to have available from Fall 2009. Once this is up and running we hope to expand to an on-line ME in explosives engineering too. Dr. Baird coming on board as a second faculty member in the explosives area in January 2008 has made the master’s program feasible.

Unfortunately, progress on the expansion of the explosives program was delayed by a tornado wrecking Dr. Worsey’s house on January 7th, 2008. Jim Taylor and several mining students that were in town went out and helped in the immediate aftermath, fixing fences and clearing trees and debris. A new roof was installed pretty quickly but the rain came in where the shingles had been torn off, which meant the house had to be dried out. The sheet rock had to be replaced on one side of the house and the wood floor refinished. After living in the basement for a while everything is now finished apart from the wood floor (which had to be left for six months to dry out) but that is about to be done and then things will be back to normal.

This summer the explosives camp expanded again to three back-to-back sessions so that this year 63 high school juniors and seniors (prospective mining students) came to campus to take part in a week of fun explosives-related activities. The camps continue to get great press, including this year the Kansas City Star and Rural Missouri, which has a circulation of 500,000 rural electric customers.

Much of Dr. Worsey’s time has been taken up with filming a series on demolition for the Discovery Channel, tentatively titled “Extreme Explosions.” This has been in the works for a while (Dr. Worsey originally met with the producers in September 2007) but eventually got off the ground in June. Unfortunately this was during explosives camp which meant that he couldn’t attend any of the demolitions in June but since then he has been to sites in Glasgow, UK, Louisville, KY and The Netherlands for demolitions and three sessions of filming of demonstrations have been shot at the experimental mine here in Rolla. Unfortunately, he spends most of his time wanting to throttle the producer, who changed the emphasis from explosives in general to just demolition without consulting him, is generally a technical moron and has tried the patience of several other people in the mining department too. However, it should be good publicity for the department and the university in general. Dr. Worsey and Braden Lusk (B.S. 2000, Ph.D. 2006) are co-hosting the series. Look for it in the winter of 2009!

2008 Explosives Camp

In 2008 the Explosives Camp expanded to three sessions back-to-back. Sixty three campers from twenty states came to Rolla to ‘blow stuff up’ and had a ball. A new addition to the camp this year was an essay contest sponsored by Orica Explosives. The campers had to write an essay. These essays were forwarded to Orica and they selected the winners. Each session had two lucky campers that received a check for $500 - the cost for the camp. Orica donated $3,000 for this project.

Photo by B.A. Rupert

Here is Paul in front of the camera. Read more about his “movie career” in the Spring 2009 issue of Missouri S&T Magazine.
INVESTMENTS FOR GROWTH IN ROLLA MINING ENGINEERING

A quality audit of the Mining Engineering program was undertaken in the 2007-08 Fall Semester as part of the 2008-09 ABET accreditation process. Table 1 shows the result of the quality audit process. The Department is holding a capacity renewal conference in April 2009 to drum up the financial support of its alums to invest in the program for achieving excellence in graduate and undergraduate education and research.

<table>
<thead>
<tr>
<th>PROGRAM DIMENSION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum Quality Management</td>
<td>Excellent</td>
</tr>
<tr>
<td>Faculty Distinction</td>
<td>Excellent</td>
</tr>
<tr>
<td><strong>Number of Faculty</strong></td>
<td>INADEQUATE</td>
</tr>
<tr>
<td>Qualifications of Admitted Freshmen</td>
<td>Excellent</td>
</tr>
<tr>
<td>Undergraduate Enrollment</td>
<td>Excellent</td>
</tr>
<tr>
<td>Graduate Enrollment</td>
<td>Good</td>
</tr>
<tr>
<td>Student Academic Standing</td>
<td>Very Good</td>
</tr>
<tr>
<td>Number of Years to Graduation</td>
<td>4 – 5 Years</td>
</tr>
<tr>
<td>Research Capacity &amp; Distinction</td>
<td>Excellent</td>
</tr>
<tr>
<td>Staff Distinction</td>
<td>Excellent</td>
</tr>
<tr>
<td>Student Professional Development</td>
<td>Excellent</td>
</tr>
<tr>
<td>Student Leadership Development</td>
<td>Very Good</td>
</tr>
<tr>
<td>Summer Internships</td>
<td>Excellent</td>
</tr>
<tr>
<td>Permanent Job Acquisition</td>
<td>Excellent</td>
</tr>
<tr>
<td>Teaching Laboratories</td>
<td>VERY POOR</td>
</tr>
<tr>
<td>Scholarships and Financial Aids</td>
<td>NEED EXTRA</td>
</tr>
</tbody>
</table>

From Table 1, there are three critical areas that require immediate attention to achieve the goals set out in the strategic plan. These areas include: (i) the number of faculty required for teaching, research, program management and preparing students for the professional excellence; (ii) well-equipped teaching laboratories; and (iii) scholarships and financial aids. The program excellence requires investments in these three major areas. Current and future investment requirements are outlined under Capacity Renewal and Expansion initiatives planned for the Spring 2009.

The critical mass of faculty required for program efficiency is 10. Given the increasing capacity expansion in Mining Engineering, Explosives Engineering and the academic cooperation between Missouri S&T and UB, the Chancellor and the Provost have approved the addition of two faculty members for the Mining Engineering program. These additions bring the total number of faculty to 9. Table 2 shows the required undergraduate teaching laboratories for strengthening the program delivery. Tables 3 and 4 show the funded and existing scholarships and facilities, and faculty, respectively. Figure 1 shows the funded Computer Learning Center for Mining Engineering. There is a need for replacing old equipment and expanding existing laboratories and developing new ones. Additional scholarship and discretionary funding for student needs, recruitment, field trips and other program needs will ensure stability towards excellence. The Department is also looking to boost the recruitment efforts by recruiting a Resident Recruiter for Mining Engineering at the cost of $75,000 per year.

<table>
<thead>
<tr>
<th>Teaching Laboratory</th>
<th>Courses Supported by Laboratory</th>
<th>Total Cost of Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer-Aided Design**</td>
<td>Mi Eng 110 Surveying for Mineral Engineers</td>
<td>$350,000</td>
</tr>
<tr>
<td>(Funded)</td>
<td>Mi Eng 201 Surface Mine Design</td>
<td></td>
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<tr>
<td></td>
<td>Mi Eng 201 Underground Mine Design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mi Eng 393 Mine Planning and Design</td>
<td></td>
</tr>
<tr>
<td>Mine Surveying*</td>
<td>Mi Eng 110 Surveying for Mineral Engineers</td>
<td>$320,000</td>
</tr>
<tr>
<td></td>
<td>Mi Eng 201 Surface Mine Design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mi Eng 201 Underground Mine Design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mi Eng 324 Underground Mining Methods and Equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mi Eng 326 Surface Mining Methods and Equipment</td>
<td></td>
</tr>
<tr>
<td>Mine Rescue*</td>
<td>Mi Eng 003 Principles of Mining Engineering</td>
<td>$105,440</td>
</tr>
<tr>
<td></td>
<td>Mi Eng 151 Introduction to Mine Safety</td>
<td></td>
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<tr>
<td></td>
<td>Mi Eng 202 Mine Rescue</td>
<td></td>
</tr>
<tr>
<td>Mineral Processing*</td>
<td>Mi Eng 241 Principles of Mineral Processing</td>
<td>$67,200</td>
</tr>
<tr>
<td></td>
<td>Mi Eng 344 Coal Preparation</td>
<td></td>
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<tr>
<td></td>
<td>Mi Eng 351 Hydrometallurgy</td>
<td></td>
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<tr>
<td></td>
<td>Mi Eng 353 Plant Design</td>
<td></td>
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<tr>
<td></td>
<td>Mi Eng 301 Aggregate Materials</td>
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<tr>
<td>Explosives Eng. Facilities*</td>
<td>Mi Eng 307 Principles of Explosives Engineering</td>
<td>$86,000</td>
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<td></td>
<td>Mi Eng 350 Advanced Blasting Design and Technology</td>
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<td>Mi Eng 351 Demolition</td>
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<td>Mine Ventilation Lab*</td>
<td>Mi Eng 318 Mine Atmosphere Control</td>
<td>$76,950</td>
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<td>Mi Eng 418 Mine Atmosphere Control II</td>
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<tr>
<td>Rock &amp; Soil Mechanics*</td>
<td>Mi Eng 232 Statics and Mechanics of Intact Rock Structures</td>
<td>$70,500</td>
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<td>Mi Eng 331 Rock Mechanics</td>
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<td>Mi Eng 324 Underground Mining Methods &amp; Equipment</td>
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<td>Mi Eng 326 Surface Mining Methods &amp; Equipment</td>
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<td>Mi Eng 393 Mine Planning and Design</td>
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<tr>
<td>Major Investment Area</td>
<td>Investment Capital</td>
<td>Donor/Funded By</td>
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<tr>
<td>New Computer-Aided Des Lab/CLC</td>
<td>$350,000</td>
<td>Ted Ruppert (PetE 1952)</td>
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<td>New Laboratory Equipment</td>
<td>$50,000</td>
<td>Mines and Metallurgy Academy</td>
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<tr>
<td>New Endowed Scholarship</td>
<td>$100,000</td>
<td>Mr. &amp; Mrs. Tom Holmes (MinE 1950)</td>
</tr>
<tr>
<td>New Scholarship for 2008-09</td>
<td>$30,000</td>
<td>Barrick Gold</td>
</tr>
<tr>
<td>New Scholarship</td>
<td>$21,000</td>
<td>Rio Tinto</td>
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</tbody>
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**Figure 1** The New $350K Computer Learning Center for Rolla Mining Engineering

<table>
<thead>
<tr>
<th>Major Investment Area</th>
<th>Investment Capital</th>
<th>Donor/Funded By</th>
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</thead>
<tbody>
<tr>
<td>New Mining Engineering Faculty (SP 2008)</td>
<td>$100,000/Year</td>
<td>Missouri S&amp;T</td>
</tr>
<tr>
<td>New Mining Engineering Faculty (FS 2009)</td>
<td>$100,000/Year</td>
<td>Missouri S&amp;T</td>
</tr>
<tr>
<td>Robert Quenon Endowed Chair</td>
<td>$2.4 million</td>
<td>Robert Quenon and the Mining Industry</td>
</tr>
<tr>
<td>Union Pacific-Rocky Mountain Energy Professor</td>
<td>$312,543</td>
<td>Union Pacific-Rocky Mountain Energy</td>
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The utilization of coal as the fuel for compression combustion engines has been a goal since diesel engines were invented by Rudolf Diesel. General Motors Corp. (GM) engineers began exploring the possibility of developing a coal powered engine in the late 1970’s, when petroleum prices were skyrocketing. The use of powdered coal as a transportation fuel only became possible in the early 1970’s with advanced milling techniques that produced much finer powders, reducing the size of the average coal particle from 57 microns to about 3 microns. This reduction in size and greatly increased the volumetric heat released by powdered coal, permitting GM to build a smaller, more efficient engine than had been possible before.

Researchers at the Missouri University of Science & Technology (MST) – Mining and Nuclear Engineering Department/ Waterjet Laboratory, have successfully demonstrated that coal comminution is possible, with waterjets, to sizes below 1 micron. This offers a new and even more promising method for producing liquid fuel that can be used for compression combustion engines. Although the waterjet has been successfully proven to be an efficient medium in coal comminution, other liquids such as alcohols, diesel fuel #2 and biodiesel are being considered for the use in coal comminution with high pressure jets. An important advantage of coal comminution with liquid jets is that some impurities are also removed during the process.

The program of using submicron coal slurry to fire diesel engines will require developments in coal-fuel production and engine retrofit technology. It is anticipated that the new diesel fuel derived from coal could be used to drive large diesel engines for power generation. This would ease problems associated with fuel delivery and storage, emission control, and other infrastructure required to support commercial deployment of the technology.

News from Dr. Summers

After being at MS&T for most of the time that it was UMR, Dr. Summers is now just beginning to think that there might be something other than waterjets that spouting whales can refer to. And so in August of 2007 he asked to be relieved as the RMERC Director, with effect from May of 2008. He has now retired from that position, though still working as a faculty member, doing teaching and research.

The waterjet work has divided into two parts and with the recent successful demonstration of the Shell Handling, And Rotation Cutting Cell (SHARCC) the device that MO S&T had developed for sectioning 60-mm mortar rounds as part of a demill process that will be installed in Hawthorne Nevada, sometime in the next year, much of the precision metal cutting operation in the Center has been taken over by Greg Galecki.

Dave’s work is more focussed in a couple of areas, the first is an ongoing project to develop a new method of drilling vertical wells to depth, and a patent application (and license) is moving forward with that project (which has just picked up second stage development funding). Being also concerned about world energy supplies (he has taken over the Power and Drainage class) he continues to write for the Oil Drum (http://www.theoldrum.com) as well as looking into the increasingly credible concept of growing algae underground as a means of producing biofuels.
Greetings from the Experimental Mine: I have good news to report from the mine. Bryan Lewis who worked at the mine ten years is now the mine rescue coordinator for Newmont Gold in Carlin, NV. I am very proud of Bryan and Amy for taking a big step in their lives and moving out west. All the yelling I did about him getting his history degree finally paid off.

In April I went on a recruiting trip with four mining students to Bentonville High School in Arkansas. I was impressed with the school and the overall attitude of the high school students. During the recruiting trip we showed them a Biomarine and explained what the Biomarines are used for; while explaining mine rescue we had a few students model them for the class. Afterwards, we showed the 2007 Explosives Camp video, talked about MS&T's degrees, and taught some students how to pan for gold. A few of the students were interested in geology and geological engineering, and could answer our questions about the difference in rock types.

On April 11th and 12th, 2008 we hosted the 30th Annual Intercollegiate Mucking competition. The mucking students did a lot of preparation on the site. I really appreciated all the UMR Alumni judging the mucking contest. Also Mrs. Worsey did a fantastic job keeping scores.

Last May John Pennington from DXP donated the mine rescue teams eight BG-4’s. This is a big addition to our teams and is greatly appreciated. The teams now have a building to store all the breathing apparatus and equipment. The building is the old Wombat control house.

The MS&T Explosives camps [three total] took up the month of June. I believe sixty-three high school students attended these camps with one parent and a grandpa. Some of the students from the first explosives camp will be graduating in 2009.

On December 7th, 2007 my second granddaughter was born and her name is Tatum. She is going to be a blond with big blue eyes. The oldest granddaughter, Kenzie, will be 3 in February and is really smart.

If anybody has a track loader or a portable rock crusher we could really use one. When you are in the Rolla area and want to see the changes in the mine, give me a call at 573-341-6406, or email me at jtaylor@mst.edu
Welcome to Dr. Gillies

Stewart Gillies has just taken up the position of Union Pacific Rocky Mountains Energy Professor of mining engineering at the Missouri University of Science and Technology. He is delighted to be back in Rolla and is particularly looking forward to meeting the students he taught 1978 to 1982 when an Assistant Professor in Rolla.

He has kept in touch with the University and in 1998 brought four student teams from the University of Queensland to the Intercollegiate Mining Competition held at the University Experimental Mine in Rolla.

After leaving Rolla Stewart spent over 20 years at the University of Queensland in Brisbane. He then set up his own consulting company Gillies Wu Mining Technology. This company has been very successful serving Australian and Indonesian mining operations and he looks forward to continuing to support it clients. The company’s activities covers both hard rock and coal mining in the areas of mine ventilation, planning, system design, project evaluation, operation improvement and research. He has authored over 200 publications and has won over 25 major research grants in recent years mainly directly from mining operations. Recent research grants have been in areas of use of mine fire simulation techniques, mine underground inertisation, evaluation of a real time diesel particulate (DPM) monitor, evaluation of a new real time personal dust meter for engineering studies on mine faces and risk assessment approach to determining likely overpressures on underground seals.

Over recent years he has been called upon to undertake numerous Due Diligence studies and project evaluations. He has appeared as an Expert Witness in various court cases.

He has been busy in other areas. He is current Chairman of the International Mine Ventilation Congress Committee. He was Chairman of both the Fourth, 1988, and Eighth, 2005, International Mine Ventilation Congresses. He was until coming to Rolla National Coordinator of the Australasian Institute of Mining and Metallurgy (AusIMM) Australian Student Mineral Venture program. He established the system of Student Chapters within the AusIMM and the first Student Chapter in 1987. He has twice stood unsuccessfully as a preselected candidate for a major Australian political party, the Nationals, for the Australian parliament. He has three children, all engineers.

The Allen Hale Memorial Scholarship was awarded for the 2nd time in September 2008. Robert Wilkerson, junior in mining engineering, wrote the winning essay. The photo shows Marian Hale surrounded by family and friends that work on this project. The endowment was established in 2007 and already has over $31,000. This is truly a “labor of love and respect”.

New Thomas and Joan Holmes Scholarship in Mining Engineering

This scholarship started in Spring 2008 with an investment of $100,000. The initial plan was to use $20,000 per year for 5 years for mining scholarships. Instead the department started a endowment and we will pay out the first scholarships in the 2009-2010 academic year. We want to take this opportunity to thank Tom and Joan Holmes.
Update from Dr. Baird

The summer months of 2008 proved to be a busy time for explosives research at Missouri S&T, with projects running the gamut from hosting Paul Worsey’s TV production crew at the Explosives Lab (the old U.S. Bureau of Mines Building 4), to testing armor concepts for small business concerns operating under the Leonard Wood Institute’s (LWI) special funding initiative for Missouri small businesses.

In between, we found the energy to get the entire lab repainted, from the walls to the floors, and the time to get Dr. Baird moved from his old digs in the Rock Mechanics facility to new offices in Mc Nutt hall and in the Explosives Lab.

Our undergrad assistants, Jessica Austin and Erin Clark, helped graduate student Phil Mulligan set-up and shoot many of the tests we ran this summer, and they all worked hard to improve the test conditions in the Wombat Research Mine and the facilities at the Experimental Mine and the Explosives Lab. We are very proud of them, their work, and the results they achieved through their efforts.

Because of the limited newsletter space, we can only give a short list of some of the research and test work this summer:

- Designed, built, tested, and used Explosively-Formed Penetrators (EFPs) for testing armor designs as a subcontractor under an LWI contract with American Military Equipment.
- Completed blast testing of blast-sacrificial panels composed of corrugated fiberglass layers for Kansas Structural Composites, Inc. (see photo).
- Performed test consultation with, and explosively-tested reinforced concrete panels for the Missouri S&T Center for Infrastructure Engineering Studies under another LWI subcontract to investigate enamel-coated rebar materials for corrosion- and blast-resistance.
- Designed, built, and used simulated Mk 19 anti-tank mines to test HMWVV (“Humvee”) underside armor designs using funding from ATRO Inc., a Sullivan, MO – based small business.
- Continued the installation work on the large blast chamber acquired earlier this year.

We’ll continue our research and test efforts during the Fall semester, with 8 separate contracts to perform in the areas of explosives research, armor design, and blast-mitigation.

Interested in news about MS&T and the Department? Do you want to get information fast? Would you like to receive job postings from around the country? Would you like to post an open position you have? If your answer is “yes” to one or all of the above questions, you need to add your e-mail address to the Mining Engineering Alumni List server. Getting added is a very simple procedure. Just send a note to either barb@mst.edu or mining@mst.edu and ask to be added. It is as simple as that. Over the past years this list server has become an important tool for our alums. Even if you are not looking for a new position, or have one to post, it is interesting to see all the opportunities that exist in the industry.
Active research initiatives are ongoing at Missouri University of Science and Technology (Missouri S&T) to advance research in heavy mining machinery. Heavy machinery health problems are critical in the production chain for large-scale mechanized mining operations. Higher fuel and electricity costs, tougher operating environments and high production demands also create additional problems that must be addressed to achieve higher machine reliability, maintainability, availability and utilization. These research initiatives in heavy mining machinery health and intelligent control systems are focused on shovels, dump trucks and draglines. The knowledge gained and the developed technologies can also be extended to cover other mining machinery. The research initiatives cover a broad spectrum of activities, including formation excavation science and engineering, machinery dynamics, fracture and fatigue failure of machine components, engineering process control systems, machine vision and kinematics control, machine vibrations control and operator safety, machine-road interactions and road design and maintenance. Funding for these research initiatives are sought from the mining industry for the research facility, the National Science Foundation, NIOSH, Caterpillar and P&H Mining Company. The primary objective is to create a Center of Excellence in Heavy Mining Machinery and Intelligent Control Systems (HMMHCIS) Research with practical significance and value-added technologies to industry, and with scientific merit in academia. It will seek to deliver practical results that will improve machine reliability, maintainability, and availability toward production and economic efficiency.

**Strategic Importance of Heavy Machinery Research:** The United States is a major mineral-producing country in the world. US produces 78 major commodities and it is ranked among the top five countries in the global production of aluminum (10.5%), coal (20%), copper (8.4 %), gold (11.7%), iron ore (4.8%), and silver (7.1%). The US mining industry also produces significant aggregates and stones for all construction and manufacturing industries. These minerals, aggregates and stones form the foundation of the US economy in all major sectors and they also provide the basis for technological advances. About 70% of all minerals and 90% of aggregates and stones are extracted using the surface mining technology. Shovel and dragline excavation and truck haulage are major primary operations in the surface mine production chain, accounting for over 50% of the production cost. These unit operations are characterized by severe dipper/bucket wear and fatigue failure in constrained geological formations, truck-terrain, and truck vision and vibration and operator safety problems. There is therefore a need for innovative research program, with appropriate infrastructure, to support this industry.

Below are some specific research initiatives currently being pursued by researchers in this area. For more information, contact Dr. Samuel Frimpong, Professor and Chair, Department of Mining & Nuclear Engineering, Missouri S&T, at (573) 341-7617; Email: frimpong@mst.edu
**Truck Vision Research**

Truck operators face severe challenges in surface mining and construction operations. These challenges include limited vision due to the extensive “blind” areas around trucks and its instability in responding to imminent dangers. Depending on prevailing conditions, vehicular control, in response to these dangers, can result in steering control losses and fatal accidents. The main objective is to develop intelligent sensing technologies with dynamic control and stability and collision avoidance capabilities.

**RESEARCHERS**

S. Frimpong and S. Agarwal

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**Shovel Fatigue Research**

The front-end assembly of the shovel is subjected to a number of forces during formation excavation. These forces include the breakout, cutting, boom – crowd arm-dipper loading, and hoist rope tension. Free body diagrams are used to capture the geometry, the motions and the incident forces to understand the kinematics, dynamics and the spatial control of this machinery and its efficient use in the excavation process.

Knowledge of the dynamics provides a basis for modeling the stress fields and shovel fatigue. Research is underway to provide basis for managing these stress fields and fatigue.

**RESEARCHERS**

S. Frimpong and A. Muhammad

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**Truck Tire Research**

Truck tires are used in rugged terrains with high rolling and grade resistances. These conditions increase the tmph rating of these tires leading to tread wear, cuts and complete failures. Tire load bearing capacities are sometimes exceeded resulting in over stressing, heating and subsequent failures. This research uses multi-body and soil physics to capture the dynamic behavior of tires under these conditions. Virtual simulators are developed to examine tire stress fields toward extend service life.

**RESEARCHERS**

S. Frimpong and Y. Li

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**Haul Road Deformation Research**

Haul road design and regular maintenance are keys to efficient and economic truck haulage. The transferred loads from truck tires to the wearing surface have increased significantly beyond the capabilities the CBR design curves given the large trucks. The formation structural components and the maximum incident loads must be rigorously modeled using the finite element (FE) technique to select appropriate road bed materials and geometry for attaining high safety factors.

**RESEARCHERS**

S. Frimpong and O. Brown

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**Truck Vibration Research**

The shovel dumping process is a high impact process. This results in significant vibrations, wear and tear of trucks. These vibrations are ultimately transmitted through the truck frame to the operator’s cabin, thereby exposing the operator to magnitudes of whole body vibrations (WBV), which may exceed the recommended ISO limits. Experimental results have shown that the first two shovel passes have the most impact on truck vibrations. Research is underway to examine, model, simulate and mitigate the impact of vibrations on trucks.

**RESEARCHERS**

S. Frimpong and N. Aouad

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**Shovel Spatial Kinematics**

The fundamental requirements for deploying any heavy machinery in surface mining applications include spatial geometry availability and variability, 3D machine motion and powered functional characteristics. These parameters are very useful in deploying large machinery. Knowledge of these parameters requires comprehensive machine kinematics models. Kinematics models are also the precursors to machine dynamic models. Machine kinematics research is a central component part of the core research in heavy mining machinery research.

**RESEARCHERS**

S. Frimpong and Y. Li
Finally, we want to thank you for all your support during this past year. As you have seen in this newsletter, our students, faculty and staff are very active and new projects or events seem to come out of nowhere. However, all these activities help us to “produce” the best young mining engineer possible - and we see that we are on track by increased numbers of companies looking to us for their mining engineers. The formula we use to mix curriculum, student and professional activities is working and we will keep on track. You can be proud of your “Old School” and the new generation of mining engineers. We always have mining companies coming directly to the Department to interview - but we are overwhelmed by the numbers we had this semester. Close to fifty companies are looking for mining engineers at the Fall 2008 Career Fair. MS&T/MSM mining engineers have an excellent reputation in the industry and we are committed to keep the tradition going.

The Faculty and Staff of the Mining Engineering Program

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