Message from the Chair

Dear Alumni and Friends,

The 2004/2005 academic year was marked by authorization from the University administration to hire two new faculty members. A faculty search was completed with over 130 applicants considered. After interviews and some considerable deliberation, an applicant for the first position was selected, and agreed to join us at the University of Utah.

The new member of the faculty, Prof. Michael Moats, joined us in August 2005 as an Assistant Professor and has already completed his first semester. Mike has a BS and MS in Metallurgical Engineering from University of Arizona. More details are provided later in the newsletter.

Our student enrollment has been maintained, and I am pleased to report that a new endowed scholarship program has been initiated by Phelps Dodge this year (see below). A number of faculty have been, or will be, recognized for research achievements, described under Faculty & Staff News.

Construction of the new Ivor Thomas Laboratory (ITL) will begin in 2006. After occupancy of the ITL, the old Ore Dressing Lab will be demolished, and on the site will be constructed the new Frederick Sutton Building for the College of Mines and Earth Sciences. We look forward to an increase in space and expansion of our facilities.

Our students continue to support U of U athletics, and, as you know, the 2004 season was quite exciting, especially the football team, which defeated the University of Pittsburgh in the Fiesta Bowl (35 to 7); this year the Utes defeated Georgia Tech in the Emerald Bowl (38 to 10).

As always you have an open invitation to visit us. We look forward to seeing you when the opportunity affords itself.

All the best,

Jan D. Miller
Ivor Thomas Professor of Metallurgy

The Fiesta Bowl

By Charlotte Block (BS, class of 2006).

The Fiesta Bowl was incredible! It was so neat to go down with good friends on a road trip to Arizona. It was so nice to go from Utah’s cold wintry weather to Arizona’s pleasant warm weather.

The game is something I’ll never forget. It was like swimming in a sea of red. There were so many Ute fans, and what was even better was we actually got to sit on the very front row. So of course we had our faces painted in a very festive manner and it was way fun.

I’ll never forget how at the end of the game all the stadium of Ute fans wanted to run out on the field to greet their champs, and the police and security guards would not have it! They were pulling out laser guns and shot all the kids who were trying to make a break for it! It was incredible! Go Utes!

Accreditation Questionnaire for BS Alumni

The Accreditation Board for Engineering & Technology (ABET) requires us to do a questionnaire on our Bachelor’s degree program every year. A copy is enclosed for our BS graduates.

It would be most helpful if especially 1986 to 2005 U of U BS grad would complete the questionnaire for us. You may return it to us in the business-reply envelope or fill it out on-line at www.mines.utah.edu/metallurgy/.

Ask your employer if he/she would help us by filling out the on-line employer survey.

Phelps Dodge Scholarships

Phelps Dodge Mining Company has graciously established six annual scholarships for our students with a potential value of $5,000 per annum for seniors, $3,500 for juniors, and $2,500 for sophomores. These scholarships are linked with summer employment experiences at Phelps Dodge operations. The faculty, staff, and students appreciate this commitment to provide financial support and work experiences for our students.
Faculty and Staff News

The department support staff are our Office Support Coordinator, Ms. Karen Haynes, Executive Secretary Ms. Kay Argyle, Technician Mr. Jim Davis, and Secretary Ms. Dorrie Spurlock.

Research staff includes Drs. Jose Delgadillo, Peng Fan, Gilsoo Han, Young-Ugk Kim, Jinshan Li, and Bin Wan.

Dr. Jaroslaw Drellich (PhD 1993), Associate Professor of Materials Science and Engineering, Michigan Technology University, is completing a sabbatical leave this year working on surface and colloid chemistry with Prof. Xenghe Xu at the University of Utah.

Dr. Matthias Vermaak was here from the University of Pretoria, South Africa, for four months this winter, working with Dr. Miller on procedures to study fundamental electrochemical interactions of individual particles measuring less than 100 microns in diameter. The single-particle microelectrodes made from sulfide mineral particles will enable researchers to investigate particles found in flotation concentrate and tailings streams for differences in their electrochemical signatures.

New Faculty Appointments

Prof. Michael Moats joined the department in August 2005 as an Assistant Professor. He comes to us from ELTECH Systems Corp., Fairport Harbor, Ohio, where he was a Research Group Leader. His work at ELTECH involved development of alternative anodes for copper electrowinning. Most recently, he has been inventing new nanostructured precious metal oxide coatings for industrial electrolysis anodes.

He received his BS and MS in 1992 and 1995 from the University of Missouri-Rolla and his PhD in 1998 from the University of Arizona, where his advisor was Prof. Brent Hiskey (MS 1971, PhD 1973). Mike’s PhD research, involving copper electrowinning and the problem of anode passivation, was funded by ten international copper companies. In 1997, while at the University of Arizona, Mike received the prestigious Thomas G. Chapman Fellowship in recognition for his scholarship, character and engineering promise.

Mike is a member of SME, TMS, and ASM International. As an undergraduate, he was awarded the SME-MPD National (now called the Richard R. Klimpel) Scholarship. He has a strong background and experience in electrometallurgy and electrochemistry, but his research has involved many aspects of the metallurgy discipline, including catalytic coatings, nanoscale advanced materials, heat-treated high-carbon grinding media and general hydrometallurgy.

Dr. Colleen D. Hough has joined us as a Research Associate Professor. Colleen received her MS in Microbiology from Washington State University and her PhD in Developmental and Cell Biology at the University of California, Irvine studying Drospithia tumor suppressors. She spent a postdoctoral fellowship at the National Institute on Aging identifying ovarian tumor markers. Her work was recognized by the American Association of Cancer Research with a Scholar in Cancer Research Young Investigator Award and by the International Research Promotion Council. She then became a BIRCWH (Building Interdisciplinary Research Careers in Women’s Health) Scholar at the Huntsman Cancer Institute continuing her studies on ovarian cancer.

Her current work in the laboratory of Dr. Jack Adams focuses on identifying microbes essential for metal removal from contaminated water sources. Her goal is to characterize the key microbial proteins and enzymes involved in metal removal and develop innovative and affordable technologies for the water treatment industry.

Welcome to the department, Mike and Colleen.

Goodbyes

Dr. Zhorro Nikolov accepted a position as Director of Spectroscopy, Materials Science and Engineering at Drexel University, Philadelphia, Pennsylvania.

Dr. Sanjeeva Latchireddi is taking a position as a Process Engineer with Outokumpu Technology in Centennial, Colorado.

Faculty Honors

The Mellow Met Award for Excellence in Teaching Metallurgical Engineering Award went to Prof. Zak Fang, who taught MetE 5760 and 5780 Spring 2004 and MetE 1620 and 5270 Fall 2004.

Prof. Ravi Chandran was awarded the 2006 Champion H. Mathewson Medal of TMS for notable contributions to metallurgical science. The award, offered once a year by The Minerals, Metals and Materials Society, recognizes three important papers that Ravi and his students had published in Metallurgical & Materials Transactions A between 2002 and 2003 on aspects of titanium boride materials. The award will be presented to him at the awards banquet in the 2006 TMS Annual Meeting in San Antonio in March 2006.

The AusIMM awarded the Mineral Industry Operating Technique Award for 2004 to the twin chamber pulp lifter (TPCL) -- JKIRC, with the citation, “The TPCL is a very significant development arising from a team effort on the P9 mineral processing project by Sanjeeva Latchireddi, Steve Morrell, Lionel Pullum and Alcoa staff. However, principal recognition should go to Sanjeeva Latchireddi for an outstanding contribution to the industry arising from his PhD project.”

Dr. Chen-Luh Lin (MS 1982, PhD 1986) and Prof. Jan D. Miller were the recipients of 2005 Arthur F. Taggart Award for their paper, “Three Dimensional Analysis of Particulates in Mineral Processing Systems.” The Taggart Award recognizes the best paper in the field of mineral processing published in any SME publication during the previous two years.

C.L. is a Research Professor in the department. His research interests include applications of X-ray microtomography to characterization and quantitative analysis of particulate systems, mineral exposure analysis for heap leaching operations, fluid flow through porous media, on-line size analysis, and mineral liberation.


Since September 1st, 2005, Dr. Jan Hupka has held the position of Vice Dean for Development at the Faculty of Chemistry, Gdansk University of Technology.

A symposium and proceedings honoring Prof. Jan D. Miller, titled Innovations in Natural Resource Processing, was held as part of the 2005 SME Annual Meeting here in Salt Lake, 28 February to 2 March 2005.

In addition, Jan received the Za Zaslugi Dla (Special Meritorious Recognition) Medal, Gdansk University of Technology, Gdansk, Poland, June 2005, for the exceptional merit of his research achievements, long-term cooperation and special contributions to GUT.
Bachelor of Science Graduates

Selinda Crane Bryant
Rebecca Charlotte Chandler
Michael James Gonzales, Jr.

Master of Engineering Graduate

Terdkiatikul, Nuttiraporn

"Carbothermic Reduction of Metal Sulfides in the Presence of Lime" [Sohn]

Master of Science Graduates

Dabrowski, Bartosz
Devrani, Vikas
Joshi, Amol
Kumar, Purushottam
Maheshwari, Praveen
Nguyen, Kevin Duy

"Air Stripping for the Recovery of Cyanide Using Air-Sparged Hydrocyclone (ASH) Technology" [Miller]
"Blending and Grinding of Nuclear Oxides" [Rajamani] (no photo)
"Magnetostriction Studies in Ni-Based Alloys" [Guruswamy]
"Magnetic and Magnetostrictive Properties of Nickel-Palladium Alloys" [Guruswamy] (no photo)


Doctor of Philosophy Graduates

Choi, Byung Sang
"Crystalization of NaCl from a Concentrated CaCl2-KCl-NaCl Solution in a CMSMPR Crystallizer — Observation of crystal size distribution and model validation" [Ring/Sohn] (no photo)

Corson, Robert Pennington
"Processing and Magnetostrictive Studies in Binary Iron Alloys" [Guruswamy]

Fan, Peng
"Dissolution of Alumina, Copper Oxide and Nitrogen in Molten Slags: Thermodynamics and kinetics" [Cho]

Li, Jinshan
"Reaction Kinetics of Gold Dissolution in Acid Thiourea Solutions" [Miller]

Mungsantisuk, Pinai
"Magnetostriction and Texture Development in Binary and Ternary FeGa-Based Alloys" [Guruswamy]

Ryu, Dong Youp
"Understanding the Effect of Surfactant Adsorption Phenomena on Corrosion Inhibition" [Free]

Wang, Xuming
"The Surface Chemistry of Phosphate Mineral Flotation with Alcohol Solutions of Octyl Hydroxamic Acid" [Miller]

Wisniewska, Sylwia Katarzyna
"Surface Analysis of Selected Hydrophobic Materials" [Miller]

Oja, Michael
"Orientation Imaging Microscopy of Fatigue Crack Formation and Growth in Waspaloy: Crystallographic conditions for Crack Nucleation" [Chandran]

Prathy, Sravan K.
"Grinding Mill Shell Liner Wear and Its Influence on the Breakage Field" [Rajamani]

Sethi, Harappan
"A Planetary Mill Process for Blending and Dilution of Nuclear Oxides" [Rajamani] (no photo)

Snihurowych, Michael
"Modifications to Magnetic Activated Carbon for Toxic Metal Adsorption" [Duyvesteyn]

Wessman, Andrew E.
"Recovery of Metals from Dilute Aqueous Media Using Pulsed Electrodeposition on High Surface Area Electrodes" [Free]
Student Recognition
Graduate
The 2004/05 Graduate Seminar Award for best student presentation went to Robert P. Corson for his seminar, “The Effect of Binary Alloying on the Magnetostriction of Iron,” presented on February 9, 2005. His audience scored his presentation an average of 95.5 out of 100. Rob received the Department Teaching Assistant Award 2001/02 and a Cooper-Hansen Fellowship 2002/03.

The Teaching Assistant Award went to Andrew Wessman. Andrew received his BS from us in 2001 and graduated Spring 2005 with a Masters of Science.

Undergraduate
The Outstanding Freshman Award went to James D. Paramore. His g.p.a. Fall 2005 was 3.96. James transferred from Salt Lake Community College. He received a Franklin & Elizabeth Alex Scholarship last year.

Taylor S. Bird received the Outstanding Sophomore Award. His 2004/05 g.p.a. was 3.74. Taylor attended Brighton High in Salt Lake.

Curtis D. Lee was awarded the Oblad Medal of Excellence in Metallurgical Engineering Award. His g.p.a. was 3.93. He added the Outstanding Senior Award to his Outstanding Freshman, Sophomore, and Junior Awards. He has been on the Dean’s List at least twice. His scholarships include Honors at Entrance, Thomas Parry Billings, George & Trudy Healy, the Departmental, Cooper-Hansen, Singer, Kennecott, and Franklin & Elizabeth Alex. He attended Skyline High in Salt Lake.

Curtis is continuing for his Masters degree under Prof. Chandran’s supervision.

Electrometallurgy
Prof. Mike Free’s research group is continuing research in the areas of corrosion minimization, finite particle removal, copper extraction, electrodeposition, and electrochemical machining. The work in Mike’s group has resulted in research opportunities for several undergraduate and graduate students this past year.

Andrew Wessman received his MS for his work in metal recovery from dilute solutions and began working for General Electric last summer, and Dong Ryu received his PhD in corrosion inhibition and joined Pella Corporation in February 2005.

High schoolers tour Dr. Guruswamy’s lab. The clean room is in the background.

Magnetic and Electronic Materials
It has been a great year for research and educational activities in the magnetic materials group. Prof. Siva Guruswamy’s Magnetic Materials Laboratory was selected as a State of Utah Center of Excellence in Magnetic Sensor and Actuator Materials. Research now covers several important areas, including development of high-performance magnetostrictive alloys for sensors, actuators, and other novel applications; solid-state thermal diode structure; examination of sub-surface damage in germanium; and study of failures in lead cable sheathing in high-voltage underground power-transmission systems.

The new clean room facility for magnetic materials and thin film development work has been expanded further, as has the high-temperature metallic single-crystal growth facility. The laboratory has rapidly grown over the past decade to have an impressive array of facilities for processing of magnetic, electronic, and structural materials, materials characterization, and device development. Besides these activities, Siva along with Profs. Mark Miller and Cheryl Forster of MSE has been able to bring back

and upgrade the JEOL 2000 FX TEM, thanks to a grant from the University Research Committee.

Robert Corson completed his PhD and joined the Bettis Atomic Laboratory in Pittsburgh, operated by Bechtel Corporation. Rob examined the influence of binary alloying additions on the magnetostriction of Fe, as a part of the NSF project on FeGa magnetostrictive alloys, and co-authored numerous papers. Rob was selected as a member of the US NSF/DOE student delegation to the 54th Nobel laureates meeting in Landau, Germany during 2004. He along with Pinai developed a safe technique for preparing FeBe alloys, and a P/M process involving explosive compaction for the synthesis of FeZn alloys.

Pinai Mungsantisuk completed his PhD and rejoined the Royal Thai Navy as a Senior Lieutenant. He was a University Graduate Research Fellow for the academic year 2004/05. He made important contributions to the understanding of ternary alloying additions to FeGa and showed that large substitutions of Ga with cheaper Al and Be can be made in Fe-20 at% Ga alloys while retaining large magnetostriction. Most notably, his work showed that the effect of solute additions on the magnetostriction of Fe arises principally from local strains and changes in local environment, and the effect due to image stress is less significant.

Purushottam Kumar graduated with an MS in Summer 2005.

Siva’s group is fortunate to have had several excellent students, Jay Jayaraman, Swieng Thuanboon, Deepak Thimmegowda, and Jason Neff, join the group to pursue graduate work. The group is also proud to have enthusiastic undergraduates Gavin Garside and Charlotte Baker.

Deepak Thimmegowda, Swieng Thuanboon, & Gavin Garside, of the magnetic materials laboratory.
Mining Processing

Prof. Raj Rajamani had a number of MS and PhD students pass their defense and accept positions this year, so much so that his camp is empty — he wants more students! His MS students are Harappan Sethi, Vikas Devrani, Harini Naidu, and Amol Joshi. Jose Angel Delgadillo will be receiving his PhD. The DOE/Industries of the Future program was pleased with Raj's progress in the SAG mill energy-efficiency project. Raj and his team visited Cortez Gold Mines, Elko, Nevada, several times in the past two years. The recommended changes in the shell lifter and the grate plate were made. The data collected at the mine showed an actual 12% reduction in energy consumption, besides saving over $1 million incurred due to unscheduled maintenance or shutdowns. This was a grand success for the DOE project.

Pyrometallurgy

Prof. H. Y. “Rocky” Sohn traveled to Monterrey, Mexico in July 2005 to plan pilot-scale tests for the AISI/DOE project, “Suspension Hydrogen Reduction of Iron Oxide Concentrate.” He has five new and three continuing research projects. He coauthored the feature article in Minerals and Metallurgical Processing (vol. 22, no. 2, 2005), “Sulfide Smelting Fundamentals, Technologies and Innovations,” as well as 16 other papers, some noted below.

The American Iron & Steel Institute and U.S. DOE are funding a new project on suspension hydrogen reduction of iron oxide concentrate, through February 2007. The U.S. Civilian Research and Development Foundation is funding a project on treatment of molybdenum sulfide concentrates, with K. Hakobyan, Navro LLC of Armenia.

The U.S.-Egypt Joint Science and Technology Board/NSF is funding two studies with researchers from Central Metallurgical R&D Inst. of Egypt, one (with Mahmoud I. Nasr) on metallic iron whisker growth during the reduction of iron oxide a two-year project to start soon, and one (with Yasser M. Z. Ahmed) on converting SO2 to sulfur without generating secondary pollutants through reactions with CaS/CaSO4 pellets.

Rockey received a one-year grant from the Korea Institute of Geoscience and Mineral Resources to study math modeling of flame reaction process for synthesis of silicon compounds from waste silicon sludge.

Rocky, Dr. Byung-Su Kim (PhD ’99), and several coauthors published a paper in the Journal of Metals on extracting precious metals from spent printed circuit boards and automobile catalysts. With Dr. Sohini PalDey (PhD ’95), Rocky and coauthors had a paper on chemical vapor synthesis of ultrafine Fe-Co powder in High Temperature Materials and Processes in 2004.

Rocky and Japanese coauthors had articles on arsenic’s volatilization from copper matte during Ar+O2 bubbling, in Metall Mater. Trans. B, and on using Na2CO3 slag to eliminate arsenic and antimony from molten copper, in J. Japan Inst. Metals. Journal of the American Ceramic Society published Rocky’s paper with Dr. Gilsoo Han (PhD ’03) on the effect of gas-volume change upon kinetics of hydrogen reduction of silica.

Physical Metallurgy — Fatigue, fracture, titanium boride

Prof. Ravi Chandran’s group is engaged in research on fatigue, fracture mechanics, functionally graded materials, composites, first-principles computational modeling of elastic constants and development of titanium boride materials. Ravi’s State Center of Excellence on Titanium Boride Materials Technology is in its third year and is engaged in the development and application of titanium boride materials under the support of the Utah State Office of Economic Development and private industry.

Ravi’s group now has four graduate students, Nishant Tikekar, Curtis Lee, Anil Kumar and Shawn Madtha, working on various research topics.

Having defended his dissertation, Dr. Krutibas Panda has joined Sandvik-Smith, formerly Smith Tool International, a Houston-based company that makes tungsten carbide and diamond-based hard materials and tools. He says he misses Salt Lake’s dry and pleasant weather but says he will probably get used to the uninteresting Texas flatness and humidity. Krutibas was a coauthor of Ravi’s papers in Metallurgical and Materials Transactions A that were selected for the 2006 Champion Mathewson Medal of TMS.

Michael Oja (BS 2003) graduated with an MS in 2005. He worked on orientation imaging microscopy of fatigue cracks as part of a project funded by DARPA through Vextec Corp., Tennessee. Mike joined the project sponsor, Vextec, in October 2005 as a materials engineer.

Ravi published ground-breaking work on the duality of fatigue of materials in the April 2005 Nature Materials, a highly selective journal in the materials field. The work demonstrates the occurrence of ‘duality’ of S-N fatigue curves in materials, a surprise to many in the field of fatigue, where S-N curves are commonly thought of as a single, deterministic curve. Ravi’s work has drawn attention to the peculiar statistical nature of fatigue and its significance in practice. This work has potential implications on fatigue analysis of components containing defects, such as P/M components in aircraft engines.

Ravi presented an invited talk on titanium boride materials at the Workshop on Titanium-Boron Alloys, October 2005, organized by the Air Force Materials Research Lab, Wright Patterson AFB, Ohio.

Powder Metallurgy & Nanocrystals

As an interdisciplinary engineering science, powder metallurgy has an indefinable boundary. With that spirit, the powder metallurgy group under Prof. Zak Fang’s direction has ventured into new research frontiers this year.

In collaboration with Rocky, the group was awarded two new projects by the U.S. Department of Energy, a $810,438 study on chemical vapor synthesis of nanocrystalline binary and complex metal hydrides for reversible hydrogen storage, through February 26, 2010, and a $226,903 three-year project on novel nanocrystalline intermetallic coatings for metal alloys in coal-fired environments. Both aim to develop energy-related metal materials technologies for a better environment.

Zak and Rocky are already working on a $1,962,814 DOE/industry project to develop bulk nanocrystalline cemented tungsten carbide for industrial applications. The industrial partners are INEEL, Kennametal Co., and Smith International. With several coauthors, they published “An Experimental Study of Sintering of Nanocrystalline WC-Co Powders” in the Proceedings of the 8th International Conference on the Science of Hard Materials 2004.

Zak’s group now consists of one post-doc and six graduate students. Oh, please let’s not forget our three undergraduate research assistants, Brady Butler, James Paramore, and Stephen Johnson, who are, without exception, taller than our graduate students. The future looks great for the powder metallurgy group from their vantage points. Based on his work in the group, Brady was selected as one of three in the country to receive an Alex Madsen Conference Grant, with which he traveled to Montreal, Quebec, and presented the paper, “Production of Nanocrystalline Tungsten Carbide Powder Using a High Energy Double Planetary Mill” during the 2005 Int’l Conf of Powder Metallurgy and Particulate Materials. This paper, a collaboration between the P/M group and Prof. Rajamani, was very well received.
MAC Technology Center

An R & D proposal for water treatment using modified and activated carbon (MAC) technology was selected for a State of Utah Center of Excellence this year. The MAC Technology Center is directed by Prof. Jack Adams, Jan, and Dr. Terry Chatwin (PhD 1987). Research covers interrelated areas, including the use of inorganics and biomaterials with activated carbons and biopolymers to remove metals like arsenic, selenium, and mercury from industrial wastewaters and municipal potable waters. New laboratories have been developed to address microbial bioprocesses important for water treatment and environmental remediation, plant and microbial functional groups and enzymes responsible for binding and transformations of metals and other inorganics, and molecular characterizations of proteins and nucleic acids.

Additional industry-funded research includes the characterization of microbes with the geochemistry and stability of mine rock piles, development of processes to increase the recovery of gold from carbonaceous and sulfidic ores, and development of bioprocesses for removal of arsenic, selenium, and mercury. This research is currently being conducted by a postdoctoral researcher, Dr. Colleen Hough and two graduate students, Nicol Newton and Madhuri Nanduri; and is supported by three undergraduates, James Kennedy, Brenda Quiroga, and Brett Richins. Two additional graduate students are planned to assist completion of these projects.

Synthetic Fuels

Dr. Wlodzimierz Zmierczak is developing a bifunctional catalyst for production of dimethyl ether (DME) from synthesis gas generated from oil shale, coal, biomass and methane-containing feedstocks. He and Jan have a patent pending on a catalytic slurry gas-sparged, cyclic reactor for production of DME from dispersed energy feedstocks, in collaboration with N-ERGY Company. N-ERGY acquired a license for commercialization of the reactor.

Wlodek is starting the first stage of an 8-month DOE project in collaboration with PureVision Technologies, Inc. to optimize the process for lignin (non-fermentable component of biomass) conversion to high-octane hydrocarbon bio-gasoline. He is investigating a novel catalyst system for selective hydrodeoxygenation of lignin-derived bi-phenolic products.

A solid superacid catalyst that Wlodek is developing for economic production of naphthenic kerosene from selected refinery naphtha feedstocks can provide an opportunity to produce high-performance jet fuel/rocket propellant compositions for the coming generation of high-speed aircraft and reusable space access vehicles. He has prepared a solicited research proposal for the International Business Development Corporation.
Atomic Force Microscopy

Dr. Jakub Nalaskowski is currently in charge of the Atomic Force Microscopy laboratory in our department. The laboratory is equipped with two state-of-the-art AFM systems capable of imaging, force measurement, and manipulation at the nanoscale level. Various research projects related to chemistry of mineral surfaces have been undertaken in this lab. The most recent research includes measurement of particle/bubble interaction forces in flotation systems, studies of removal of sub-50-nm particles in the hard-drive industry, surface chemistry of submicron clay particles, and studies of electrochemically induced oxidation at the pyrite surface.

Besides being used for research projects, the AFM lab has an important educational role in the department and is currently being employed in a graduate-level course, taught by Jakub, entitled "Surface Characterization using AFM." During Spring Semester 2006, twenty students from Metallurgical Engineering and other departments are learning how to use the AFM facility to study nanoscale properties of solid surfaces.

List of Faculty

The faculty totals thirty-three, with eight academic, nine research, eleven adjunct, and five emeritus appointments.

D. Jack Adams Research Professor 801/585-7349 jadams@mines.utah.edu
Michael L. Free Associate Professor 801/585-9798 mfree@mines.utah.edu
J. Gerald Byrne Professor Emeritus jgbyrne@mines.utah.edu
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Zhigang Zak Fang Assistant Professor 801/581-8128 zfang@mines.utah.edu
Jan Hupka Research Professor 48-58-347-1791 (Poland) hjupka@chem.pg.gda.pl

Steel

Dr. Weol Cho is engaged in a project using a newly developed flux containing titanium oxide to remove nitrogen from molten steel. Nitrogen is known as a detrimental element in many steels, and its content should be reduced to a minimum. Some experimental results on thermodynamics of nitrogen in the flux indicate that the new flux system has much higher ability to remove nitrogen than any other flux systems reported previously.

Another project is concerned about the copper content in ferrous scrap. The presence of trace amount of copper in the scrap hinders the effective utilization of ferrous scrap in the steel industry because copper causes detrimental effects on the steel properties. Preliminary studies show that the newly designed method consisting of oxidation and subsequent fluxing is feasible and promising. In-depth studies on the oxidation and fluxing are currently under way to fully develop the technology.

The Technology Transfer Office has filed provisional patents for both of these.

Alumni News

Dr. Luis Bittencourt & Dr. Claudio Schneider, recipients of the 2005 Samarco Award

Samarco Award

The paper, "Impact of porosity in iron ore metallurgical calculations," by Luis Bittencourt (MS '99), Director of Research and Development, Magnesita S.A. and Claudio Schneider (PhD '95), President of Mineral Technologies International, was granted the Samarco Award 2005 for the best paper published in the Iron Ore Symposium, organized by the Brazilian Metals Association in Vitoria, Brazil, September 12 to 15, 2005. The award was presented at the opening ceremony of the 60th annual meeting of the Brazilian Association of Metals, in Belo Horizonte, Brazil. The Samarco Award was instituted by Samarco S.A. mining company, and is granted in the areas of iron ore mining and processing. The authors received certificates, trophies and prize money.
Palladon Purchases Iron Deposits

Donald G. Foot, Jr. (BS 1975) was the featured speaker at our Awards Banquet April 22, 2005. Don is the Director of Palladon Ventures Ltd and the President of Paradise Technology Group, a mineral processing and project development consulting firm in Salt Lake City.

Don described Palladon Ventures’ project in southern Utah, constructing a 2,400-tpd copper concentrator near Cedar City, Utah. Palladon, headquartered in Broomfield, Colorado, had just closed on the $10 million purchase of iron ore deposits from Geneva Steel of Orem, Utah.

The Comstock/Mountain Lion mine, an open-pit operation west of Cedar City, supplied ore to steel mills in Utah and Colorado for several decades before closing in 1995. The deposit has a measured resource of 25 million metric tons, averaging 47.1% iron, much of it exposed in benches. Palladon estimates it will last at least forty years. The Rex deposit was never mined and contains 89 million metric tons averaging 39% iron that also may be amenable to open-pit mining. Low-grade stockpiles in the vicinity of the Comstock/Mountain Lion deposit are estimated at 12.5 million metric tons, averaging 42% iron.

The first stage of the project, which the company hoped to start in 2005 after completing a feasibility study, would be mining the ore and selling it. The company plans to process the rock on-site, possibly into direct-reduced iron nuggets containing 95% iron, or “hot metal,” or liquid pig iron as feed for an adjoining copper concentrator steel plant, built in the project’s second stage, that could cost as much as $1 billion. The third stage would involve manufacturing steel products.

Don is a figure skating judge. He received a 2002 Winter Olympic Games Outstanding Volunteer Award. He is married. Among his many business ventures in Salt Lake, he opened “This is the ACE Hardware” in September 2003. He sold his process control software company, Mavin Technologies, to its employees. He was President of KnowledgeScape Systems, a division of Baker Process, and has worked for EIMCO, Pyramid Resources, and Control International. While at the U.S. Bureau of Mines in Salt Lake, he was Chief Scientist on a 17-day ocean cruise, collecting the largest sample of ocean crusts ever mined from the Pacific atolls.

Don received a Masters of Engineering Administration from the U in 1981. He served on the Salt Lake City School Volunteer Board of Directors and as Chairman of the Board, Crimson Club, University of Utah. He has over thirty technical publications and nine patents and patent-pendings, including the aeration system used on more column flotation cells than any other system in the world today.

The Alexander Sutulov Award

Jaime E. Sepulveda (MS 1977, PhD 1981) received the 2005 Alexander Sutulov Award, recognized as one of the most important awards of the Chilean mining community; the local equivalent, perhaps, of the Gaudin Award in the U.S. The Sutulov Award was established in 1996 and is granted yearly by the Chilean Minister of Mines, “with the aim of incentivizing the participation ... in the investigation, innovation and human resources training processes, in search for new technologies in the area of geological, mining and metallurgical projects, as a way to promote the growth of the national industry.” Some alumni will remember the years (1970–73) that Prof. Sutulov spent at the University of Utah.

Jaime tells us, “For me, this recognition is particularly special because it basically comes from my colleagues and friends of the national mining community to whom — without having the courage of setting roots in the upper mountains — I have dedicated my whole professional life, attempting to support them with ideas and knowledge for helping them do their jobs better, enjoying every day in the attempt. ... Don Alex — as we used to call Mr. Sutulov — was precisely the person who invited me to return to Chile and gave me the opportunity to take my first professional steps at the cherished CIMM. Finally, I wish to express my gratitude to the Moly-Cop organization for allowing me — in these almost 19 years of permanency — to develop myself into that rare mix of commercial, manager and overall, technical professional.”

The Douglas W. Fuerstenau Chair

Prof. Jon J. Kellar (PhD 1991) was awarded the Douglas W. Fuerstenau (DWF) Chair in spring 2005. The Chair was established to support faculty development associated with mineral extraction and development. The first DWF Chair was Prof. Kenneth Han, a former student of Doug Fuerstenau’s. It is only partially endowed, but allows some discretionary travel.

The Douglas W. Fuerstenau Chair

Prof. Jon Kellar, South Dakota School of Mines and Technology, recipient of the Douglas W. Fuerstenau Chair

Jaime E. Sepulveda (center), winner of the 2005 Alexander Sutulov Award (inset), with his family

The first stage of the project, which the company hoped to start in 2005 after completing a feasibility study, would be mining the ore and selling it. The company plans to process the rock on-site, possibly into

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Jaime E. Sepulveda (center), winner of the 2005 Alexander Sutulov Award (inset), with his family
$1M Grant for Hydrogen-Generating Research

The University of Nevada-Reno's Materials Nanotechnology Research Group, under the direction of Manoranjan Misra (PhD '81), received $1 million from the U.S. Department of Energy to develop titanium dioxide nanotube arrays for generating hydrogen by splitting water using solar light. The project was initiated by NSF.

This novel method can split water to produce hydrogen energy in a more efficient manner than what is available currently in the marketplace. The fabrication and production of these nanotubes are accomplished by an inexpensive electrochemical method. University scientists are capable of adding different tubular materials to increase the water-splitting efficiency and are able to use most parts of the solar light.

Dr. Misra said that they are working toward scale-up, generating a high amount of hydrogen from water, and its ultimate utilization as a clean energy resource.

"We can put one trillion nanotube-holes in the solid titanium oxide substrate, which is approximately [the] size of thumbnails," said Misra. "Each of these holes is a thousand times smaller than a human hair and act as nanoelectrodes."

The other part of the hydrogen project involves storage of hydrogen in the nanoporous titanium and carbon nanotube assemblies. These nanomaterials are powerful in storing hydrogen for vehicular application. The University of Nevada-Reno has filed several patents covering the related technologies.

Top Post in India's National Lab

Prof. B. K. Mishra (PhD 1991) took office as Director of the Regional Research Laboratory, Bhubaneswar, India, May 12, 2005. Prof. Mishra's immediate priority is to get networking with some of the laboratories most active in the international arena in our field.

The Regional Research Laboratory, Bhubaneswar is located on the eastern coast of India, about 400 km from the city of Calcutta. It is one of the 38 national laboratories run by the Council of Scientific & Industrial Research (CSIR) of Government of India. It has a staff of 350, of whom about 100 are scientists and engineers. The city of Bhubaneswar is a small town (by Indian standards), with a population of about 100,000, and is the capital city of the state of Orissa. It is a historical city of many temples and monuments. It is here that the great ancient king Asoka got converted to Buddhism after a very bloody war and vowed to spread the light of peace of Lord Buddha to lands as far as China.

The Laboratory has a strong focus on R&D for the utilization of India's vast mineral resources and has a multidisciplinary team for management of associated environmental and biodiversity-related problems. It has comprehensive expertise and facilities for carrying out mineral characterization, beneficiation, agglomeration, extraction of values through hydro-, pyro-, bio- and electrometallurgical routes, materials development, environment management, and natural products.

1950s

Richard A. Derby (MS 1950) retired in 1980 and lives alone in his log home in the woods, enjoying good health and considerable physical activity.

John Ong (PhD 1955) is a professor emeritus of the College of Engineering and Applied Science, University of Wisconsin-Milwaukee. He produced a 'Rosetta Stone' for chemical notation in the defect solid state, published in J Electrochem Soc, 1967. He had fun with, "If Only Aristotle Had Used the Block Diagram" (Proc. ASEE North-West Section Annual Mtg., 1988), in which he showed that Aristotle's four different types of causation were de-
rivitive from a basic feedback control system analog. He is working on another paper, “How to Look across the Room” — “a toughie!” he admits. His advice to our graduates is, “Know thyself, enjoy thyself, and use plenty of figures and diagrams in your communications. Best of luck.”

J. Lambert Bates (PhD 1957) and his wife finished a 22-month LDS “Family and Church History” mission at the Family History Library in Salt Lake City in April.

1960s
Masami Hayashi (MS 1961) was featured in the March 2005 Catalyst Magazine (Salt Lake). His work featured in an exhibit at the Japanese American Museum in Los Angeles, celebrating the 40th anniversary of the American Society for the Study of Japanese Calligraphy. He has been awarded the highest possible rank of Dojin in calligraphy. He has a master’s degree in Jodo Shin Buddhism from the Graduate Theological Union in Berkeley, California, and is an ordained Buddhist minister’s assistant at the Salt Lake Buddhist Temple.

1970s
M. Curtis Nielson (BS 1976) has moved to the Phoenix, Arizona area for employment at AMEC, after 28 years in Tucson working for Magma Copper Company and Batemen Engineering. It has been a difficult move, leaving friends and family behind, but the challenge of new work opportunities and new friends are before them.

1980s
Lt Col Michael D. Jackson (BS ’86) is still in the US Air Force (19+ years). He has spent most of his career working in military space operations, and has done launch operations, on-orbit satellite operations, missile warning (using on-orbit satellites), space surveillance (tracking on-orbit objects) and much work in the field of space control (offensive and defensive space measures). He was working in the Pentagon when it and the World Trade Center were attacked on Sep 11, 2001 and worked with senior AF leadership to restore operations in the Pentagon and prepare for Operation Enduring Freedom in Afghanistan.

After the Pentagon assignment, he spent two years in Las Vegas overseeing operational testing of command and control equipment, including the JSTARS and AWACS aircraft, as well as the advanced training of personnel who perform command and control of air and space forces on a theater campaign level. He is now at Vandenberg AFB in California overseeing the training and certification programs for all of the Air Force space units, encompassing 28 weapon systems, 12,000 personnel, in 155 units at 44 locations worldwide. He has received the AF Meritorious Service Medal (4 times), the AF Commandation Medal (3 times), the Air Force Outstanding Unit Award (4 times), the Combat Readiness Medal, the National Defense Medal w/Gold Star and the Global War on Terrorism Medal, among many awards. He and wife Marie (nee Seymour) have two children, a daughter Taylor, 6, and a son Brandon, 4.

Luis Rodolfo Mariani Bittencourt (MS 1989) tells us things are going well for his career. After he finished his PhD in ceramic engineering at The University of Missouri-Rolla in 1995, he came back to Magnesita as a production manager for about three years. In 1998, he left production to become manager of the Magnesita’s Research & Development Center. In subsequent years, he became responsible also for the Quality Control department, Raw Material Engineering department, and the Minerals Sales & Marketing department as the General Manager of Technology and Minerals. Marcia is doing OK working hard as a cardiologist. Paulo (16) and Eduardo (11) are also well.

1990s
Avimanyu Das (PhD 1994) is working at the National Metallurgical Lab, Jamshedpur, India. His daughter, Diya, is in fourth grade. His wife, Swastika, is working with a German Engineering organisation at Kolkata, India. She is a Chemical Engineer.

2000s
David Harding (BS 2002) continues studying in graduate school, pursuing the ever-elusive doctorate. Things do seem to be wrapping up, and now he’s looking into options of what to do once he reaches the light at the end of the tunnel (his wife Julia adds, “No more school would be nice!”). He was called as the ward clerk in March. It keeps him busy Sunday mornings and afternoons, but it is very rewarding. Last year he tried to run a marathon. With only one day of “training” he ran a 10 K and then a month later he ran a half marathon. During the half marathon a foot muscle cramped but he finished anyway. It left him on crutches for a few days and pushed back his goal for another year. He and wife Julia have a daughter Hannah, four, and son Jonas, one year. Hannah tells us she is taking gymnastics and ballet and makes bracelets in preschool. She says sometimes Daddy can fix broken things, especially her glass dolls. Mommy plays the piano in primary, and Jonas talks both with his mouth and with sign language; his favorite words are “Mama” and “Uh-oh” and “hi you.”

Bartosz Dąbrowski (MS 2004, advised by Professor Jan Hupka and Co-advisor Professor Jan D. Miller) obtained a special award amounting to 10000 zloty (approx. $3000) for his PhD dissertation at Gdan's University of Technology on “Investigations on advanced methods for treatment of cyanide containing wastewaters,” from the Lotos Group S.A., as the best dissertation about environmental protection and new technologies increasing energetic safety at GUT in the years 2004/05.

SeLinda Bryant (BS ’05) started a contract job with PacifiCorp the summer of 2005, performing failure analysis on the boiler tubes. When we heard from her, she and her husband were expecting to become parents around the end of the last year.

Michael Oja (BS ’03, MS ’05) has joined the Vextec Corporation in Brentwood, Tennessee. Although he regrets having to move out of Utah (his parents live in the greater Salt Lake area), he says he looks forward to fishing in the Ohio River and checking out blues or jazz in Nashville.

Let us know what’s going on in your life – fill out the alumni activity questionnaire at the back of the newsletter.

In Memoriam
Xavier M. A. M. De Callataj (MS 1956) died December 27, 1999 of brain cancer in La Hulpe near Brussels, Belgium.

C. (Charles) Keith Hanson (PhD 1960) died peacefully on Thursday, November 10, 2005, in Salt Lake City from complications of a heart attack. He was called as the ward clerk in March. It keeps him busy Sunday mornings and afternoons, but it is very rewarding. Last year he tried to run a marathon. With only one day of "training" he ran a 10 K and then a month later he ran a half marathon. During the half marathon a foot muscle cramped but he finished anyway. It left him on crutches for a few days and pushed back his goal for another year. He and wife Julia have a daughter Hannah, four, and son Jonas, one year. Hannah tells us she is taking gymnastics and ballet and makes bracelets in preschool. She says sometimes Daddy can fix broken things, especially her glass dolls. Mommy plays the piano in primary, and Jonas talks both with his mouth and with sign language; his favorite words are "Mama" and "Uh-oh" and "hi you."

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He acquired a doctoral degree in Metallurgy from the University of Utah in June 1960 at the age of 54. With his brother Burness and sister Gertrude, he designed and developed two small subdivisions in the northwest part of Salt Lake.

Keith was a lover of the outdoors and became an expert in fly tying and fly fishing. Keith was preceded in death by six brothers, Arthur (at the age of one month), Donald, Glen, Burness, Gerald, and Rulon, and two sisters, Gertrude and Dorothea. Keith is survived by one sister, LaVer H. Kapoloski Reece of Salt Lake City, and several nieces and nephews who will greatly miss him. Keith will be interred beside his wife in the Payson City Cemetery. Published in the Deseret News on 11/15/2005.

Prafulla S. Dhoble (MS 1961) passed away from multiple heart attacks in 1977.
Donors
We'd like to thank the many individuals and organizations who provided donations to the department, totalling $148,720.50 during the 2004/05 fiscal year.

Franklin Alex (BS 1957, MS 1969)
Franklin & Elizabeth F Alex Charitable Foundation

AMEC
American Chemet Corporation
Robert W. Bartlett (BS 1953, PhD 1961)

William D. Callister, Jr
Ecuador, May 31–August 26, 2005.

Engineering, University of Newcastle, NSW, Australia,

and Hector Lizama, Sr. Research Scientist, Teck
Fengqin Liu, Director and Professor, Aluminum Corp.
University, Guilin Guangxi, P.R. China; and Prof.
Xiang Liu, Professor, Academic Member of
Metallurgical Science and Engineering, Pretoria,

Coordinator, Bateman Metals Limited, East Rand,

Visitors & Speakers

Title of our weekly graduate seminar are on our website. To receive individual notices, contact Kay at (801) 581-6386, fax 581-4937, or kay.argyle@mines.utah.edu. Specify email or fax (local calls, to a dedicated fax line). The list below doesn't include the many seminars given by researchers within our department or others at the U.


"An Introduction to Water Flow & Salt Transport in Unsaturated Soil (Porous Media)," S. Lee Barbour, Professor of Civil & Geothermal Engineering, University of Saskatchewan, Saskatchewan, Canada, 13 Jan 2005.


Send address updates to argyle@mines.utah.edu or metallurgy@mines.utah.edu. Electronic transmission of the newsletter, in lieu of a paper copy, is an option; see the alumni questionnaire.

The faculty and staff wish you a prosperous year and hope you will visit us when the opportunity arises.

Yours,

Ravi Chandran
Professor of Metallurgy

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Alumni Questionnaire — February 2006

Name: _________________________ U of U ☐ BS ☐ MS ☐ Autumn/Fall ☐ Spring
Metallurgy: ☐ M.E. ☐ PhD Year: _______ ☐ Winter ☐ Summer

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Work Address ☐ Retired, year: _____

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Are these address corrections? ☐ Yes ☐ No

If someone wants to get in touch with you, may we tell them your address? ☐ Yes ☐ No

Please send me weekly graduate seminar notices by ☐ email @ ☐ fax (801) _____–_______ (local calls only).
(Sorry, not available by post.)

What news would you like to share with your classmates? Please write legibly, type, attach printout, or email.

Present position and responsibilities:

________________________________________________________________________
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Previous employment:

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Family news, hobbies and activities, volunteer work, and interesting experiences:

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Accomplishments, awards, achievements, special recognition:

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What type of news do you enjoy in the Mellow Met Newsletter? Other comments or suggestions?

Please send to Ravi Chandran, University of Utah, Department of Metallurgical Engineering,
135 S 1460 E Rm 412, Salt Lake City UT 84112–0114, U.S.A.; or fax 1 (801) 581–4937; or email ravi@mines.utah.edu.