

EXTRACTOR

The Metallurgical and Materials Engineering Newsletter Of Montana Tech

We had hoped to send this newsletter to you well before now but, as you are about to read, we were simply too busy to draft anything let alone put it together. A lot of issues have confronted Montana Tech, both positive and negative, which have had a direct impact on the ol' department and, of course, each of us being active in and with various societies only makes us that much more busy. With Spring Break now upon us, we figured to use the time to get in touch with you again but with a hopeful promise of drafting our fourth newsletter next year around The Holidays as before. Needless to say, we hope you enjoy this newsletter as much as you have expressed to the previous two. Happy belated New Year and Millennium!

A Rose By Any Other Name

As of May of last year, the department officially changed its name to Metallurgical and Materials Engineering. Prospective students know what chemical engineering, materials engineering, mechanical engineering, etc. are but simply don't relate to metallurgical engineering anymore. It's a shame but it's a fact. Hence, upon recommendation of our Advisory Board, a proposal was drafted and eventually accepted by Board or Regents. Part of the program description is more in line with their way of thinking too; we describe it as the

chemical engineering of minerals, metals and materials but also addresses other issues including environmental, recycling, aerospace and forensics. In this manner, we retain our "School of Mines" heritage in mineral processing and extractive metallurgy but more clearly show that we simultaneously offer specialization in physical metallurgy, materials engineering, and welding/maintenance engineering. I think you will agree that we continue to do what we have always done best and that nothing has really changed.

Larry Twidwell Named AIME Minerals Educator of the Year

Larry Twidwell, the Anaconda Distinguished Professor of Metallurgical Engineering at Montana Tech and long time Butte resident, was named the "Minerals Educator of the Year" by American Institute of Mining, Metallurgical and Petroleum Engineers (AIME). He was presented the prestigious award at the SME Annual Meeting in Denver in February last month. His award citation read *"In recognition of a gifted and inspirational educator, innovative researcher and outstanding administrator who, throughout his career, has made profound contributions to both academia and industry."* The national award is given to only one individual each year. He was nominated by Courtney who further describes Larry as a brilliant teacher and researcher who devotes most of his time helping students.

president and president of Alpha Sigma Mu, presented papers at numerous national and international technical sessions, and served for many years as key reader for Metallurgical Transactions. Congratulations Larry!

You may recall that, in last year's newsletter, a request was made of you to write recommendation letters on his behalf. Thanks are extended to those who found the time to do so; the campus and the department are pleased as much as he is for his outstanding efforts and deserved recognition. Please keep in mind that Courtney has also renominated Larry for the TMS Educator Award and your recommendation letters are again requested. Please send/resent your letters to:

Larry, as many of you know, has been at Montana Tech for 31 years teaching courses in extractive metallurgy and metallurgical waste treatment and has been and continues to be an active researcher having developed several arsenic and mercury treatment technologies that are presently being utilized by industry to clean up waste. Four books, forty-six theses, forty publications and fifty-five national and international presentations have resulted from his teaching and research efforts. Dr. Twidwell has received several other outstanding teacher/researcher awards during his tenure at Montana Tech, such as the Montana Academy of Sciences Mershon Award as Outstanding Researcher, 1989; Outstanding Scholar Award, Montana Tech, 1985; Outstanding Educator Award, Montana Tech, 1970, 1971, 1973 and 1974. Dr. Twidwell has been active in SME, TMS, ASM, and ASEE and he has served on numerous technical and education committees, chaired and co-chaired fifteen technical sessions, co-edited a symposium volume, served as vice-

The Minerals, Metals & Materials Society
c/o TMS Educator Award Committee
184 Thorn Hill Road
Warrendale PA 15086
Telephone: (724) 776-9000

The TMS Educator Award recognizes an individual who has made outstanding contributions to education in metallurgical engineering and/or materials science and engineering based on demonstrated contributions to education and is not limited to classroom teachers but also considers contributions through writing of textbooks, building of strong academic programs, outreach to high school students, or innovative ways of educating the general populace. His citation for this award will read "In recognition of his distinguished contributions in extractive metallurgy for devoted and unselfish teaching, for thorough reviews of unit processes via modular tutorials, and for innovative solutions to environmental problems." Thanks in advance for your time and effort. Good luck again Larry!

Annual Phonathon and MESEP – A Big Winner Again!

Budget problems continue to plague Montana Tech making it difficult to not only replace retiring faculty such as Vern Griffiths but also to run the department as effectively as times past. Tuition will be on the increase soon because projected state surpluses have eroded into deficits and the state legislature simply does not believe higher education in Montana is as bad as it is. Even facts presented to them showing how Montana ranks dead last among the states in high education funding and has dropped from seventh in per capita income to 49th just doesn't seem to phase them. Meanwhile, the prison system gets everything it proposes; priorities just don't seem to be in the right place. However, the legislative session ends April 24 or so and anything could happen between now and then. We are as tired as you are about hearing this news but we could use your help. If you live in Montana, write to and call your area representatives. No matter where you live, write to and call Chancellor Frank Gilmore here at Montana Tech expressing your dismay at the situation and, while you are at it, you can also express your concerns to Chancellor Gilmore about not replacing Vern too:

Frank Gilmore, Chancellor
1300 West Park Street
Montana Tech
Butte MT 59701

Fortunately, we have all of you to depend on! Your kind donations this year and in the past have helped us recruit and give scholarships. This year, the Montana Tech Foundation Annual Phonathon was again coordinated with a departmental fund-raising letter. The Foundation received \$16,010 for MetE which is nearly \$2,000 over the previous year and \$5,000 over the year before!! If you have not honored your pledge yet, please do so as soon as possible; \$1,500 that

remains could easily go towards attracting another top-calibre student! The department spent one night making phone calls and helped raise \$6,000. Courtney and Carl spent one night a week calling and together raised about \$8,000. Students also got into the act and helped raise approximately \$5,000! Like last year, most of the money pledged to MetE was designated for the Metallurgical Engineering Student Excellence Program (MESEP). If you don't remember, this program is comprised of endowed and annual scholarships including any new ones you and others would like to establish. MESEP also consists of four established funds in the Foundation including the Ted S. and Gloria L. Jordan Fund, Mineral Processing Engineering Fund, Louis V. Bender Lecture Series in Metallurgy Fund, and Metallurgical Engineering Department Fund. These funds cover all facets of student education ranging from guest speaker travel to equipment repair/purchase.

Thanks mostly to you and partially to the department name change, we recruited 24 students into the program last year. Five were valedictorians of their high-schools, four had 4.0 cumulative GPA's, and the average GPA of all stood at 3.73! So far this year, we have 15 similar students accepted into the program with plenty of time to get more! As noted in last year's newsletter, higher education has become a business of "generating FTEs" seemingly meaning we need to accept any warm body that is interested or that we can get our hands on. This is a threat to graduating "good" students like we have in the past and will therefore be a threat to our continued 100% placement – industry simply may no longer like the product we have to offer. Thanks for your help and for many of you who met our double-pledge challenge; those threats about good students and 100% placement have greatly diminished. Hope you can do it again in the years to come. Your support is greatly appreciated and goes to continue meeting the needs of industry as well as the needs of our students.

Fighting for the Mining Industry

Courtney Young, Department Head and ASARCO Professor of Metallurgical Engineering, organized a symposium held at the SME Annual Meeting in Salt Lake City last year and edited the similarly named proceedings, *Minor Elements 2000: Industrial and Environmental Aspects of As, Sb, Se, Te and Bi*. Larry Twidwell and Corby Anderson both contributed significantly to the organizing and editing. The three amigos again teamed up to organize another symposium entitled

Cyanide: Social, Industrial and Economic Aspects, and edit the corresponding proceedings. This one was held at the TMS Annual Meeting in New Orleans this past February. Both symposia were well attended and both proceedings have sold well. The proceedings are available through the respective societies and are held in high regards due to these successes. Many have referred to them as "The Lastest Bibles" on Arsenic and Cyanide, respectively. Well done guys!

Club Met More Active Than Ever

Jennifer Conning, Amy Stepan and Adam House, all juniors and all officers in the department's student organization called Club Met, have been effective leaders for the group. They, with the help of Dan Gutscher and Josh Junkert, worked with the Mining Club to write the SME Montana Tech Student Chapter Report. Collectively, they are referred to as the Andersen-Carlyle Student Chapter and took third place this past year so congratulations to them and their efforts. Dan is currently updating the Student Chapter Report due to TMS in June. This will make the second year in a row that TMS student activities have been satisfied. The three juniors are

also leading the charge in fund raising activities for Club Met and are getting freshmen involved as well. Activities have included bake sales, dances, car washes, and raffles to help fund trips to SME and TMS Annual Meetings as well as field trips to various companies. They help man the booth that Montana Tech has at Exhibit during the SME Annual Meeting. So far, they have raised \$2000 and received another \$1000 in match from the department courtesy of Foundation donations from you. Thanks for your help. It keeps the students inspired, giving them something to look forward to and blowing off steam when it happens. Great group of kids!

Seminar Symposium A Great Hit Too

Four years ago, students gave presentations weekly over the course of the year. However, a decision was made to have all the students give their seminars on the same day. The idea was to get them to organize it symposium style, similar to professional meetings and to invite local and regional industry to attend. One of the students is also named chair; that student has to organize everything including collecting and arranging the abstracts. He/she does not have to give a presentation but is responsible for finalizing and submitting the TMS Student Chapter Report and helping with the SME Student Chapter Report which helps explain some of the successes just noted for Club Met. Everyone loves it, particularly the students. It's a win-win situation; however, finding a time and day appropriate to maximize industrial attendance is illusive. This year, the students have decided to try a two-day format electing to go April 26 from 4 to 7 pm for graduate students and April 27 from 1 to 4 for undergraduate students. You are welcome to attend!! Here are their presenters and paper titles:

Session 1 (Graduate)

Thursday April 26th

4:00–4:45 Lauren Cockhill: Removal Of Selenium From Wastewaters Using A Column Cementation Process.

4:45–5:30 Jason Gauer: Adsorption Technologies For Treatment Of Metallurgical Wastewaters.

5:30–5:45 BREAK

5:45–6:30 Tom Mcmillan: Berkeley Pit Water Remediation By Photolysis.

6:30–7:15 Andy Hadden: Review Of I-137 And Cyanide Leach Alternatives.

Session 2 (Undergraduate)

Friday April 27th

1:00–1:30 Pat Eden: Phelps Dodge's Tyrone SX/EW Operation.

1:30–2:00 Doug Humphries: Ray Concentrator – From Pit To Smelter.

2:00–2:30 Bill Dafoe: Flocculent Testing To Enhance SX Performance At Phelps Dodge Chino.

2:30–2:45 BREAK

2:45–3:15 Jacob Bummer: Lime As It Is Used In Recycling In Mineral Processing.

3:15–3:45 Chris Schweigert: Weld Induced Corrosion Of Stainless Steel.

3:45–4:15 Tim Mcinerney: Localized Metal Deformation Around A Moving Weld Pool.

Senior Design To Be Assessed by Department Advisory Board

Another change in the curriculum involves Senior Design, the capstone course where graduating seniors design/test/research a real-world project in which all of the cumulative knowledge of general engineering fundamentals, metallurgical and materials engineering, computer applications, engineering economics, communication skills, etc. are integrated. In order to promote team efforts, students are allowed to form groups and select from a number of projects including joining the Environmental Engineering Design Team to compete nationally on a problem. Last year, Israel Jessop, John Harrell and Jacques LeBlanc decided to do that; they examined a cerium as a surrogate for plutonium-ceramic capability, a problem from Los Alamos Research laboratory to prevent plutonium contamination of crucibles and thereby minimize waste. Their efforts, along with the help of Carl Cross, were

recognized with a first place award and helped the overall team place second in the competition. The group accepted an offer to visit the lab, an unusual and unprecedented offer! Congratulations to them and Carl for his help! This year, two groups formed and elected to go with a Cleveland Cliffs project on "Manganese Removal from an Iron Concentrate" and "Dissolution Kinetics of Grain Boundary Precipitates in Aluminum 2519" and will be defending their projects on May 4 from 1:30 to 4 pm. The Department Advisory Board has been invited to observe and assess the defenses as well as interact with the students. You are also welcome. Please keep in mind that, if you have a project in mind and would like CAMP and/or the MetE department to pursue it, please do not hesitate to let us know! These projects can also be pursued by the senior design class as noted.

Short Courses Continue To Be Offered

Fire Assay. This course has not been offered at Montana Tech in 18 years but was brought back during the last week of summer vacation before the Fall Semester started. Perhaps appropriately but unintentionally, it was simultaneous with all the forest fires in Montana. The course was predominantly conducted by Corby and CAMP but had invited lectures by both Larry and Courtney. It went well but would have been better if it were not for the awful smoke-filled air. In fact, the course went so well, it is being offered again from 8:00 to 5:00 on August 20 to 24 this coming summer. As before, field trips and hands-on labs will be conducted to break up the monotony of all-day lectures. Tentative plans call for a field trips to Hecla and their old Bunker Hill operation with an underground tour (i.e., silver), Golden Sunlight operation with a tour of their open pit and smelting furnace (i.e., gold), and Stillwater Refinery (i.e., platinum and palladium). Last year, 17 industrial representatives attended along with 4 students. It

was a big hit with them and a lot of fun for all explaining why it is being offered again. Just pray the forest fires are absent!

Chemical Speciation and Equilibrium Modeling. As mentioned previously, Courtney and Huang are working with Bob Robins to develop this course. If you are at all interested, please let us know and we will see what can be arranged.

JKSymMet and JKFloat. CAMP and MetE have sponsored JK MRC representatives, Rob Morrison and Mark Richardson, every other year for the past four years. On average, 10 industrial representatives attend along with 5 students. We are presently talking with them to bring them in this coming September, perhaps mid-month, for 4 days. If you are interested in this, let us know that as well! JKSymMet is an excellent program for modeling size reduction and classification circuits.

Other Curricular Changes

Last year, curricular changes were mentioned and discussed. These changes, including those discussed above, were implemented without a problem. Students enjoyed the new format for *Metallurgical Analysis* which replaced the old *X-Ray Diffraction* course by increasing the number of required credits from 2 to 3 so that other instrumentation could also be lectured on including ICP, SEM/EDX, etc. Larry took command of that! Likewise, Courtney, Larry and Carl decided to team teach *Introduction to Metallurgical and Materials Engineering*. The semester was divided into thirds and specific topics in mineral processing, extractive

metallurgy and physical metallurgy were covered. Although the course continues, it appears to be working well; not only does it expose the MetE students to the field in their freshman year giving them a chance at a summer job or even getting out of the program (no one has decided that option!) but also giving us a chance to internally recruit since General Engineering (Engr) majors are required to take the course as freshmen. 105 students have registered in the course with 19 being MetE freshmen and 33 being Engr freshmen so the plan appears to be working! Wow, the things we have to do to recruit, and that's only one of several ongoing efforts ...

Campus and Departmental Recruiting Efforts

The Alumni Recruiting Campaign is beginning to take shape. Several alums from across the country and in various cities have expressed a willingness to recruit students in their local areas to attend Montana Tech (and of course MetE!). Information will soon be sent out to the alums if it has not already. This information will be in the form of folders and brochures and possibly overheads or power point presentations to get the word out. We could use your help so if you think you can or know of prospective students including, of course, relatives, friends, your dog (just kidding), ..., contact Chris Van Nuland in the Alumni Relations Office at (800)445-8324 or his direct line at (406)496-4402. Campus Relations also just started a Faculty Outreach Program courtesy of a grant from the Foundation in which faculty volunteered to travel to area high-schools to give presentations in the classroom if they were invited. Brochures with a list of available faculty and their seminar titles was distributed. Courtney has visited Butte

HS as well as Great Falls (CMR and GFHS), Larry has gone to Billings (Billings West and Skyview) as well as Helena (Helena High), and Carl has traveled to Missoula (Sentinal and Hellgate). All Montana high-schools were given the brochures but it seems only the larger AA schools have taken advantage of it. In some respects, this is good news because the actual presence of students from these schools is low and likely to increase as a result. However, if you know someone that could get us into the classroom, please put us in contact, particularly the AA schools in Kalispell (Flathead) and Bozeman which have yet to respond to the program. The program has also been extended to cover trips to area College of Technologies and Junior Colleges including BCIT in Vancouver Canada where Courtney visited last November and seems to have gotten 10 students to apply, 3 into MetE! This, in fact, has lead to discussions to get faculty beyond the state borders including Courtney up to Alaska and over to Spokane.

Faculty and Staff News

Larry Twidwell, Anaconda Distinguished Professor of Metallurgical Engineering. Once again, Larry taught seven courses but included selenium and thallium in his Arsenic Control course and taught *Metallurgical Analysis* as noted above instead of Gold Processing. He directed or continues to direct the research of four graduate students (Ray Ziolkowski, Eric Dahlgren, Lauren Cockhill, and Andy Hadden). Eric completed his MS in May on selenium removal and has since gone on to obtain his PhD at UofM-Rolla. Ray has completed all his work on Berkeley Pitlake sediments and has the thesis to finish and defend but should be complete this May. Lauren and Andy are looking at different facets of selenium removal and both are expected to finish this coming December. Travis Orser and Steve Thurmond continue to work on writing their theses after taking on permanent jobs with Nordberg and Rouge Steel, respectively. They were warned about the difficulties in trying to do that, but Travis recently defended his thesis on arsenic remediation and is expected to complete everything this May as well. He's just one major step ahead of Steve who worked on bioremediation of Berkeley Pitlake water. Go Steve Go! Larry also continues to assist MSE in conducting three water treatment demonstration projects: antimony removal at Snowbird, selenium removal at Kennecott and arsenic removal at Potlatch. He presented a paper "Technologies for Removing Selenium from Wastewater" at the SME Annual Meeting in Salt Lake City in

the *Minor Elements 2000* symposium and also chaired a session in that symposium. He also prepared a paper for publishing and presenting entitled "Cobalt/Nickel Separation by Cyanide Complexation" at the TMS Annual Meeting in New Orleans in the *Cyanide: Social, Industrial and Economic Aspects* symposium. His co-author was Scott Shuey (MS 92). He also wrote a paper "The Recovery and Recycle of Mercury from Chlor-Alkali Plant Wastewater Sludge" which appeared in JOM this January. Finally, of course, Larry was selected by AIME to receive the Mineral Industry Education Award and was presented the award at the SME Annual Meeting in Denver.

Hsin-Hsiung Huang, Professor. H³, but better known simply as Huang, has taught 6 courses and 1 lab this past year: *Momentum and Heat Transport, Metallurgical Kinetics, Hydrometallurgy, Extractive Metallurgy Lab, Hydrometallurgy Fundamentals, and Advanced Extractive Metallurgy I and II*. Huang has been working with Larry on Andy's thesis project as well as with Courtney and Ces Fabian, a friend of theirs in Australia, using STABCAL to calculate high-temperature E_H-pH diagrams of copper-sulfur-water system to simulate autoclave leaching of ores at an Australian operation. They plan to present their work in Phoenix next year at the SME Annual Meeting. Huang continues to work on the corrosion problem that ASiMI is

experiencing. The work as well as that of Andy involves using the computer-controlled potentiostat/galvanostat as well as STABCAL. STABCAL, as you may recall, is world-renown and can be used to calculate speciation diagrams such as E_H -pH, $\log a_i$ -pH, and $\log a_i$ - $\log a_j$; determine adsorption isotherms; and simulate titration experiments; each with or without mass-balanced constraints and, just recently, in three dimensions if so desired (e.g., E_H -pH- $\log a_i$). If you are interested in this PC-compatible, Windows-based program, contact Huang at (406)496-4139 for purchasing details and check out CAMPs and MetE's websites on the Montana Tech homepage at www.mtech.edu for additional details. Courtney and Huang are slowly working with Bob Robins to incorporate the use of STABCAL into a one-week short course on *Chemical Speciation and Equilibrium Modeling*. If you are interested in this course, please let us know by contacting Courtney via e-mail (cyoung@mtech.edu). If enough people are interested, discussions will be pursued eventually to settle on a date. Let us know!

Carl Cross, Associate Professor. Carl is evidence how quickly time flies; he has just started his third year here and has more than gotten his feet wet. He presented a paper "The Effect of High Temperature Eutectic Forming Impurities on Aluminum 7108 Weldability" at the April 2000 American Welding Society (AWS) annual conference in Chicago. It was co-authored with two colleagues from the Metallurgy Institute at Norwegian University of Science and Technology in Trondheim, M.G. Mousavi and Ø. Grong. Carl also remains active with the Federal Institute for Materials Research and Testing (BAM) in Berlin, Germany. For a month last summer, he was a guest researcher there performing welding studies to identify the effects of fixture restraint on solidification cracking. The results of this study will be used to explain why certain alloys, aluminum and stainless steel in particular, only crack under certain welding conditions and is expected to be published later this year. This is a follow-up on a lecture Carl presented at the July 2000 AWS Weld Cracking conference held in Milwaukee, "Hot Cracking in Steels and Aluminum." During his visit to Germany, Carl helped facilitate the joint signing of a Memorandum of Understanding (MOU) between the BAM and Montana Tech, thus paving the way for future collaborative research projects. Efforts are already underway and it appears one lucky student, Tim McInerney (BS 01), will be traveling to Germany for a three-month stay to begin his MS thesis research for Carl and BAM. Carl also succeeded in landing a three-year grant from the Office of Naval Research (ONR). For that project he setup a new casting station to melt aluminum in an electric furnace and purchased a new state-of-the-art, computer controlled, pulsed gas-metal-arc welding machine as well as a weldability test system utilizing a new pulsed current gas-tungsten-arc welding machine. A small facet of the project is being conducted by one of the Senior Design groups but most of the work is being conducted by Dan Gutscher, who is Montana Tech's first 5-yr MS student, and Pavan Chintilapati, a MS student from India. Of course, Carl also has his teaching responsibilities which includes, because Vern has not been replaced, all of the welding metallurgy and physical metallurgy courses: Fundamentals of Physical Metallurgy, Metallographic Interpretation, Materials and Physical Metallurgy Laboratory, Materials Engineering and Design, Casting and Solidification, Metallurgy of Ferrous Welds, and Failure Analysis and Design Life. This was also

the first time that Carl taught several of these courses so, due to all the preparation that is needed and combined with all of his professional activities, he has been quite busy. Way to hang in there Carl. We will get Vern replaced yet!

Corby Anderson, Research Faculty and CAMP. Corby??

Tami Patrick, CAMP Office Assistant. Tami??

Rosalie Murphy, MetE Office Assistant. Rosalie still continues talking about retiring and has mentioned doing so this coming December. After 21 years of service, the MetE department would not be the same without her let alone the school! We hope it is just talk but being home with her husband Jim who has been retired for nearly two years now and is doing well; spending more time with him and the grand kids is sounding more and more attractive. But she also loves her job and particularly those MetE kids and obviously would also miss the daily interactions with the faculty and staff as well as, of course, you, our alumni. MetE will do its best to convince her to stay! Rosalie, with Huang's help, is doing a superb job with using Front Page software to update and edit MetE's web page. You should see what she has done; it's great! Rosalie is also excellent with other software packages including MS (Word, Excel, Power Point, etc.), Blackboard, and most recently, Razor'sEdge. If you need to know something about software, she's the best to ask and the campus knows it!

Courtney Young, Department Head and ASARCO Distinguished Professor. Courtney's research efforts continue to involve cyanide destruction and acid-rock drainage (ARD) remediation. He is pairing up with Tam Tran of the UNSW in Australia to continue examining cyanide species particularly for recycling purposes in a program being established similar to Carl's with BAM; Jason Gauer, the student on the project, will likely head to Australia for the summer to complete some of his research activities with thiocyanate and looks to be on schedule for graduating in May of next year. Tom McMillan will graduate this May and is a MS student working on a MWTP project aimed at selectively recovering metal values in Berkeley Pitlake water. Courtney also has three MS students working off campus at their places of employment: Krag Filius and Dave Fowler are with MSE here in Butte and Heather McLoren is with Hecla in Idaho. Marty Bennett graduated last year on a project examining the natural remediation events induced by UV radiation on the Berkeley Pitlake and are nearly ready to submit their interesting findings for publication. As you know, Courtney worked intensively with Corby and Larry to organize and edit the *Minor Elements 2000* and Cyanide symposia and proceedings. In those, he presented and published three papers: *Solubility of As₂S₃ in Relation to As Precipitation from Process Solutions* with Bob Robins, *Remediation Technologies for the Management of Aqueous Cyanide Species*, and a plenary on *Cyanide: Just the Facts*. He also submitted 3 papers for publication in journals including one in *Hydrometallurgy* entitled *The Dissolution of Copper Sulfides Under Reducing Conditions* with Eric Dahlgren and Bob Robins and two in *Mineral and Metallurgical Processing* entitled *Thermodynamics of Oleate Chemisorption at the Surfaces of Semi-Soluble Calcium Salt Minerals* and *Conformation of Chemisorbed Oleate Adsorbed at a Calcite Surface* both with

Jan D. Miller as co-author. The latter just appeared in print in the February edition. Courtney, in an attempt to expand his horizons even further and get back to his love of mineral processing, recently teamed up with Tom Moon, Geophysical Engineering Professor, and Rand Swan of AdvR, a Sensor Manufacturer in Bozeman, and submitted a proposal to DOE – Mining Industries of the Future. Due to a simultaneous submission to the State of Montana, matching funds were made available and the DOE proposal on “Coal-Content Ore-Grade Analyzer” was accepted! Hopefully, the sensor will be developed over a three year period for use on conveyor belts as well as in the mine. Courtney continues to work with SDSM&T and UofIdaho to push their consortium but the latest efforts have proven fruitless but all involved are determined to make it happen and recent technological advances with visually going on-line for distance education purposes may prove to be advantageous. Keep your fingers crossed! Courtney is also assisting two undergraduates with their URP research: Alice Drew is thermodynamically quantifying cyanide adsorption at treated and untreated silicate

mineral surfaces where as Dan Gutscher is physically and chemically characterizing basalt wear-resistant tiles made by Abresist, a company in Indiana. Finally, aside from managing seminar and senior design courses, Courtney taught 5 courses: Mineral Processing Technology, Size Reduction and Classification, Flotation, Coal Processing and Materials Handling.

Bill Huestis, MetE Lab Director. Bill continues to be the laboratory work-horse in the department. He not only keeps everything operational but he also instructs our mineral processing labs year-round and, due to retirement of Vern, helps Carl with the physical metallurgy. Bill was also invaluable to Larry in Metallurgical Analysis helping to run and demonstrate the XRD scanning goniometer, ICP, ion-chromatograph, and SEM/EDX. His analytical skills and services are also invaluable for everyone’s research projects. Unfortunately, Bill too is talking retirement but says that it is 5 or so years away. Nevertheless, it’s enough to make Courtney and everyone else shudder at the thought.

He May Not Be Teaching But He’s Still An Important Cog

Dr. Vernon Griffiths was on one-third retirement last year and taught his last class after the conclusion of the Spring semester in May. Now fully retired, the Professor Emeritus and his wife Barbara have since gone on several trips, most noted was to New England to see the Fall and visit family. They plan to cross the Atlantic to see other relatives in England later this year. Vern, however, keeps an active presence on the campus and even volunteered to write an NSF Equipment Proposal to obtain a new SEM/EDX. He had input from across the campus and worked with Carl and Rosalie to get it submitted. Vern refused to be paid for his efforts and noted that “payment will come if the proposal is accepted” but chuckled when he added “and I have a new toy to play with.” Courtney thus

decided to initiate a scholarship in his name with his consent; \$2000 was transferred from unrestricted accounts in the Foundation for this purpose. The Foundation notes that \$8000 more is needed to endow the scholarship so, if you and/or your company are interested in furthering the scholarship, please send your donation to either Courtney in the department or Julie Crnich in the Foundation. Alumni donations that were received previously and restricted for purchasing a new SEM/EDX were used as match to the proposal. The department thanks you for your consideration of the Vern Griffiths Endowed Scholarship and for your previous donations to acquiring a new SEM/EDX. Let’s keep our fingers crossed for the success of the proposal.

Metallurgy Plays Host To A Visiting Fulbright Scholar

Mohamed Hesham Hassan Mahmoud, or Hesham Mahmoud for short, temporarily joined our department in August and will be with us as a Visiting Research Professor for 11 months. He joined us in the first 6 months courtesy of his supporting institute, Central Metallurgical Research and Development Institute (CMRDI) in his home city of Cairo, Egypt and is now with us in the remainder of his stay as a Fulbright Scholar through the U.S.-Egypt program. This marks the first time ever that Montana Tech plays host to such a distinguished guest. Hesham obtained his BS in Chemistry from Zagazig University in Egypt in 1985, his MS in Chemistry from Ain Shams University also in Egypt in 1993 with a thesis titled *Wet-Process High Strength Phosphoric Acid Production From Egyptian Phosphate Concentrates*, and his PhD in Chemistry from Institute for Advanced Materials Processing (IAMP) from Tohoku University, Sendai, Japan in 1997 with a dissertation titled *Separation of Molybdenum and Tungsten by Wet Process Based on Two Phase Distribution*. He has experience in the hydrometallurgical treatment of phosphate, ilmenite and bauxite ores as well as industrial wastes to produce metallic and non-metallic values particularly by solvent extraction, liquid membranes and ion exchange technologies for solution concentration and purification

purposes. He is also well versed with analytical techniques including ICP and AA. He gained the experience throughout his education as well as through 5 industrial projects but also on the job with Abu-Zaabal Fertilizers & Chemical Company, The Executive Organization for Industrial and Mining Complexes (IMC), US AID Science & Technology Cooperation Program (STC), Japan International Cooperation Agency (JICA), and Finish Ispo Research Center of Kemira Agro Oy Company. He has 11 publications and 13 presentations to his credit. His last two publications include “Iron Removal from Wet-Process Phosphoric Acid by Sludge Precipitation” with E.A. Abdel-Aal, I.A. Ibrahim, T.A. El-barbary and A.K. Ismail in *Minerals and Metallurgical Processing* in 1999 and “Separation of Metal Values from Brass Alloy Scrap” with M.A. Barakat in *Separation Science and Technology* in 2001. The latter was presented at 29th Annual Hydrometallurgical Meeting in Toronto Canada in 1999. His latest presentation was Utilization of Spent Copper-Pickle Liquor for Recovery of Metal Values with M.A. Barakat at the International Conference on Renewable Energy in Cairo in 2000. Clearly, Hesham is an international traveler and researcher but this marks the first time he has ever been in the U.S. With us, he is examining and reviewing methods for

recovering platinum from spent automobile and petroleum catalysts in hopes of developing a technology to bring back to Egypt for industrial application there. Significant economic gains could be realized in Egypt if the catalysts were recycled instead of sold abroad. At least two publications are expected to result from his efforts at Montana Tech. Aside from conducting research, Hesham has also taken the fire assay short course, traveled to Rapid City to meet with Ken Han at SDSM&T and see the ammonia leach process he has developed for recycling platinum (and processing gold ores), and traveled to Philadelphia where he visited a gold recycling facility (Profiners Inc.) as well as a friend. He will also

present two seminars toward the end of his stay here, one to review his studies with IAMP and a second to review his studies here. He will also travel to Tucson in early June to attend the IPMI Annual Meeting, meet with Brent Hiskey at the University of Arizona and present a paper to his research group, and visit with at least one of the four precious metal recyclers there. After finishing his stay in the U.S., he will return to Egypt and begin developing a MOU to establish a formal collaborative research effort between Montana Tech and CMRDI. He is already working on an agreement between our respective libraries. Hesham and Courtney have already submitted a proposal to NSF to begin the process.

Other International Research Efforts In The Works

As you have read above, international research efforts have been or are being established with BAM in Germany, UNSW in Australia, and CMRDI in Egypt. Relationships continue with our sister universities in Japan (Akita) since 1988 and Peru (Antiplano in Puno) since 1999. With Akita, Montana Tech has a faculty exchange program that allowed Ted Jordan to visit in 1993, Sam Worcester in 1996, Larry in 1999, Courtney later this year, and Carl in 2004. Plans to bring Dr. Nagasaki here early this year from IAMP (Akita) fell through but are being planned again. With Antiplano, Courtney and various Mining and Geological Engineering faculty travel to Peru to investigate and solve various sites polluted by mining with current emphasis being placed on the use of mercury for gold processing in the absence of a retort. Resulting amalgam

is treated with open fire, often at the stove top, thus polluting the environment including Lake Titticacca, a beautiful high altitude lake, as well as its associated wildlife particularly the fish. Research has so far shown that soil throughout the area is also contaminated thus giving suspicion that land species are also poisoned including animals and plants consumed by people. MOU's are also being sought with Dave Dreisinger at the University of British Columbia, Matt Jeffrey at Monash University in Australia, the University of San Carlos in The Philippines, and Indian Institute of Technology – Kuagpur, India. These efforts are being pursued to maintain our international reputation in the mining and metallurgical industries which has been somewhat eroded due to environmental activities in Montana and throughout the U.S.

Visiting Seminar Speakers

This past year, a number of out-of-town guests gave presentations to our seminar class. Most were partially hosted via the MESEP's Bender Lecture Fund in the Foundation:

Thomas Bollinghaus – BAM, Berlin, Germany – ?? Carl will get this ??.

Greg Weller – Silver Valley Resources, Wallace, ID – Career Planning Beyond 2000: Things I Wish I Had Known as an Undergraduate.

Matthew Jeffrey – Monash University, Melbourne, Australia – Use of Rotating Electrochemical Quartz Crystal Microbalance for Hydrometallurgical Applications.

Tam Tran – University of New South Wales, Sydney, Australia – Ion Exchange Resins for Cyanide Recycling.

Bill Costerton – Center for Biofilm Engineering, MSU-Bozeman – The Role of Biofilms in Biogeochemistry.

Hesham Mahmoud – CMRDI, Cairo, Egypt – Separation of Molybdenum and Tungsten by Solvent Extraction, Supported Liquid Membrane and Ion Exchange.

Ralph Hutcheson – Scientific Materials Corporation, Bozeman – Improving Laser Performance with Advanced Optical Materials.

Gary Tuss – Boeing Materials Technology, Seattle – Applications for Aluminum Alloys in Jet Airplanes.

Several of the visitors are associated with our initial attempts at establishing international research efforts; many thanks are extended to them for their return efforts! In addition, Bill Costerton (Biocorrosion) and Gary Tuss (Aerospace Materials) were also asked to be guest lecturers in the introductory course the following day. Students were quite receptive of these talks. If you are interested in doing either or both of these things as well, please contact us!

Alumni To Be Honored

Nominations for the Distinguished Alumni and Alumni Recognition Awards can be made by anyone on behalf of an alumnus and should be sent to Courtney for forwarding to the selection committees before the December 15 deadline. However, you should get the guidelines before doing so to make sure all required application materials are sent in. Distinguished Awards are given during commencement in May and generally reserved for alumni who graduated more than 20 years ago and **who are in a position of responsibility AND have contributed significantly to Montana Tech??**.

Recognition Awards were given at Commencement but will now be given during Homecoming in order to make that event more attractive for alumni to attend and participate. These awards are usually reserved for alumni who graduated less than 20 years ago and **who show promise for their profession AND are contributing to Montana Tech??**. It is key to remember that a position of responsibility does not necessarily mean “being President or CEO”, that promise does not necessarily mean “will become a CEO,” and that contributions do not have to be financial. This year, several

Montana Tech Alumni were nominated for both awards, particularly alumni in MetE. It is a great pleasure to note that this year's deserving winners and representatives of the department are John Hager and Frank Bowdish for Distinguished and Steve Lloyd and Tim Walsh for Recognition. It is not often the department gets two, let alone one, of its alumni selected for the Distinguished Award. However, it is worth noting that, after 2010, only one Recognition Award will be given per department. MetE is currently allowed two because it also represents mineral processing alumni but degrees from that program were no longer awarded after 1990. Congratulations to our award winners! Their bio-briefs follow:

John Hager graduated with a B.S. in Metallurgical Engineering in 1958. He continued his education at Missouri-Rolla, where he graduated in 1960 with a M.S. in Metallurgical Engineering and at MIT where he graduated in 1969 with a Sc.D. in Chemical and Process Metallurgy. During his B.S. and M.S. days, he worked in five different summer positions with widely varying companies: Kaiser Aluminum, Moat Chemicals, Union Carbide, Battelle, and AVCO Corporation. He also spent three years as an assistant instructor and later, at MIT, another five years as an instructor and research assistant. It is clear that, by this time, John had prepared himself for a career in academia and, before he graduated, an opportunity at Colorado School of Mines (CSM) arose, which he could not refuse. Three years later he was promoted from Assistant to Associate Professor while simultaneously finishing his Sc.D. Within two years he was promoted to Professor and became Department Head of Metallurgical Engineering, a position he enjoyed for four

years. Afterwards, he was named St. Joe Minerals Corporation Professor and, fourteen years later, Hazen Research Professor and W. J. Kroll Institute Director, a position that he currently holds. In 1998, he received the Dean's award for Excellence in Teaching and Research from CSM. In his thirty-three year and continuing career at CSM, John has made a major impact in thirty-five consulting/research areas in extractive metallurgy, publishing 60 papers whenever non-disclosure agreements would allow. In addition, he dedicated a lot of time to professional societies, particularly the Minerals, Metals and Materials Society (TMS). With TMS, he is a member of the Process Fundamentals Committee and Treatment and Minimization of Wastes Committee, which he founded. He has also served as Editor of EPD Congress (a major annual publication) for two years, as Director of Publications for EPD Division (a major monthly activity) for three years, and as co-organizer/co-chairman for several important meetings and symposia. In addition, he is a member of the ABET accreditation committee, having participated in 10 visits. TMS has accordingly recognized John by naming him Plenary Speaker at the TMS 2nd International Symposium on Recycling, and having him serve on their Board of Directors from 1988-1991 and 1999-2000. He also served in elected positions as EPD Vice-Chair from 1992-1999 and EPD Chair from 1999-2002.

Frank Bowdish??

Steve Lloyd??

Tim Walsh??

Budget Funding Sparks Recruiting, Scholarship and Endowment Drives

Because of its importance, this article was repeated from last year's newsletter. Your help to continue offsetting the financial problems will be appreciated. The Board of Regents (BOR) have been making changes to the Montana University System (MUS) for several years. The most noteworthy occurred a few years ago when the MUS was restructured into a two-university system putting Montana College of Mineral Science and Technology under the jurisdiction of The University of Montana and renaming it to Montana Tech of The University of Montana. Recently, however, the BOR began a new policy in which funding would be determined by the number of full-time students (full-time equivalents or FTE's) at each school. The BOR would give each school funding based on enrollment projections. If those projections were not met, some funding would have to be returned. Montana Tech was hit with a \$400K deficit. As a result, budgets across the campus are constrained and replacing faculty is becoming impossible, including Vern, unfortunately.

Low enrollment programs like MetE need to increase their FTE's or face the consequences of maintaining low faculty/staff numbers or, at worst, closing their doors. Furthermore, tree-hugger type activities are also making things difficult; the passage of I-137 is but an example. In this regard, a major campaign will soon be implemented to ask alumni to recruit students in their local areas to attend Montana Tech (and of course MetE!), establish new scholarships, and endow positions across the campus, particularly those in The School of Mines, including Vern's. If you think you can help or help champion such causes with a company or an individual, please contact Chris Van Nuland in the Alumni Relations Office at (800)445-8324 for the recruiting efforts and Jim Peak and/or Jay Vogelsang in the Montana Tech Foundation at (800)984-4683 for the scholarship and endowment opportunities. Partial endowments of \$150K are needed at a minimum but estimates show that fully endowed professorships will take about \$1.5M.

Lost Alums

Please help us find our lost alumni in Mineral Dressing (MD), Metallurgical Engineering (MT), Ceramics (C), and Mineral Processing (MP). They graduated with either a Bachelor of Science (BS) or Master of Science (MS) degree in the indicated year. Thanks! ...??

Department News

Equipment and Book Donations. No equipment and books were donated to MetE and the Ted Jordan Memorial Library in 2000.

Student Placement. Last year, permanent placement continued to be 100%! Furthermore, all undergraduates wanting a temporary position found one and nearly all of them decided to register for internship credit. This year, the same looks to be true but the number of graduates is down to 6 BS and 5 MS which is why you see the department changing its name, recruiting with all barrels loaded, requesting your help with scholarships, endowments, writing letters, etc. Numbers simply must come up in order for the program to survive. Still, there are a few students looking for a position so if you hear or know of an opening, please let us know.

Student Highlights. In spite of the increased activities with Club Met, attendance to the 2000 TMS and SME Annual Meetings in New Orleans and Denver this past year was low. The close proximity to Spring Break and hence upcoming mid-term exams plus the expenses (particularly New Orleans) kept them away. No students went to TMS and only two joined the 10 Mining and Geological Engineering students who went. Next year, TMS is in Seattle and SME is in Phoenix. The students are eyeing both and leaning toward Seattle because of its proximity. The Andersen-Carlyle Student Chapter submitted their Annual Report to TMS and SME and placed third with SME. Efforts continue to get the Environmental Engineering and Occupational Safety and Health departments involved since they have divisions that they can identify with in SME. Students love the symposium format for seminar and are expected to put on a great show and thus hope you are in the audience. The event is also being used to recruit "undecided" students but only 3 students in the past three years have ever bothered to show but it is better than none even though none of those 3 have transferred in (yet!). Jenny Conning was awarded the \$10,000 Copper Club Scholarship recipient and will be graduating next May.

Advisory Board. Currently, the MetE advisory board includes the MetE faculty, Corby Anderson, Ray Beebe, John Hager, Wally Schultz, Kathleen Kitto, Richard Sutherlin, Frank Aplan, Mike Eiselein, Don McMillan, Jay Waterman, Gary Tuss, Ken Han, Greg Roset, Pat Taylor, Ed Dowling, Jerry Harrington and Rob Stephens??. We may be seeking nominations to seek additional members so if you know of someone interested, get their permission and send his/her name in. The board consists of academic and industrial representatives who volunteer their time to meet with the faculty and staff of the department typically in May the week before or during graduation on a Saturday morning to discuss and often take action on many of the items noted in this newsletter. As you know, one of those items is assessing the senior design presentations. Because very little funding is available to support travel costs of the members, MetE is very appreciative of the time and effort that they volunteer.

Accreditation and Assessment. As Department Head, Courtney continues to get prepared for the next ABET

accreditation visit in 2005 under the new 2000 Criteria which requires the MetE program to give students an integrated understanding of the four major elements in the field: structure, properties, processing and performance, satisfy the "a-k" criteria, and most importantly assess and show continued and thorough assessment of the program. Feedback from the students (through course/instructor evaluations, mid-term surveys, exit interviews, meetings) and other constituency groups such as CAMP, the Advisory Board, you our Alumni, and your employers (student meetings, graduate surveys, employer surveys) is gathered, discussed and acted on. All of these activities are now implemented but, of course, is very tedious on our part as well as yours. However, it is important so please, if you receive a survey or questionnaire, fill it out and send it back. If you participated in any of the assessments already, THANKS!

Campus News. After serving two years as VCAAR with one as interim, Dan Bradley applied for and accepted a Chancellor position at a school in West Virginia. He left February 1. John Hintz, VC of Student Affairs (VCSA), whose contract was not renewed, will be leaving July 1. Chancellor Gilmore has assumed VCAAR duties and will assume VCSA duties. The Chancellor subsequently formed a committee to assess restructuring of the administration. The committee recommended that the VCAAR position be filled immediately so that the Chancellor could pay more attention to fund-raising activities so badly needed at this time. They recommended that the VCSA position be filled as soon as possible (but considering the budget that may take a while) and suggested the Dean of Students (Paul Beatty) be named interim. The committee also suggested that the campus needs only three academic deans: one for the COT (Jane Baker) but only two, not three, for the main campus. Finally, they recommended that Deans should not serve simultaneously as Department Heads due to potential conflicts of interest. It is a strong likelihood that Chancellor Gilmore will enact each of these recommendations. The only other issue worth mentioning is the Petroleum Engineering Department is in the midst of a major campaign to obtain funds to build a new building; they have realized about 25% of their goal and have another year to raise the rest to stay within schedule.

Alumni News. We need to hear from you! Please, drop us a line. Here's what others had to say:

ROSALIE's files?? last time we gave news on **Frank Panisko** and **Kunfu Chuang**. We should do something on Jerry Downey, Debbie Laney, etc.

Obituaries. This is probably the worst part of this newsletter but it is needed to tell a final but everlasting story out of respect for each other and our accomplishments.

ROSALIE's files?? last time we gave news on **Sam Worcester**, **Harold "Tweek" Treweek**, **Lawrence Braunbeck**, **Russell E. Hoar**, and **Stiles R. Slosson**. We need to do at least the one who sent in a check.

A Message from the Department Head

You know what they say, "Better late than never!" Keeping in touch with each you is too important to do never so we hope you enjoyed this newsletter. This year was a busy year, very similar to last year in fact, but we had to survive it without Vern or his replacent. Higher education remains in a state of flux and it is doubtful anything will change in the next few years either since this year's state budget looking grim and too many state congressmen seem to desire putting money elsewhere. We can only hope that that will change in the next month before the Fifty-Seventh Montana Legislature comes to a close. This is why we ask for your help to write letters to convince Chancellor Gilmore to replace Vern, to write letters to Chancellor Gilmore (if you are from out-of-state) or to your state congressman (if you are in-state) to show your support of and need for higher education. This is also why we ask you to increase your donations, to help us recruit, to come back and give seminars, to listen to our students give seminars, to continue hiring our students for both temporary summer internships and permanent positions, to endow fully or partially various positions and/or laboratories, etc. In last year's newsletter, you read about the things that we were doing or planning with your support as well as the things we were doing and planning outside of it. You will be pleased to know that everything that was promised was delivered! It is clear, however, that we can not do it without you so we simply need your help and continued support. Again, we do not look at this as doom and gloom but rather as a temporary phase that we must endure in order to come out of it for the best; and together we will!

We hope all is well with each of you. Please allow us to "extract" some news from you; drop us a brief note to let us know what you have been doing; we hope to include it in the newsletter next year. Send it to us by e-mail to either myself (cyoung@mtech.edu) or Rosalie (rmurphy@mtech.edu). The MetE office phone and fax numbers are (406)496-4314 and (406)496-4133. Take Care and Thank You once again for your support!