

Annual Progress Report

Fiscal Year 2004

**Research, Graduate Studies, and
International Programs**

Prepared by

**Joseph F. Figueira, Ph.D.
Vice Chancellor
Research, Graduate Studies, and International Programs**

May 31, 2005

Annual Progress Report

Research, Graduate Studies, and International Programs

Fiscal Year 2004

I. Introduction

In this report we provide our annual assessment of the activities of the three offices under the supervision of the Vice Chancellor for Research, Graduate Studies, and International Programs. In FY 2001, we developed a methodology to look at performance trends and historical performance data. In this current report for FY 2004, we provide updates to that more detailed information but do not carry the analysis to the detail of the FY 2001 report.

Contributors to this report include:

Joseph Figueira
Irvana Kavanagh
Cindy Dunstan
Lynn Job
Evan Stockton
Cheryl duToit

Vice Chancellor
Office of Research Administrator
Office of Graduate Studies Administrator
Director, Office of Grants and Contracts
Student Assistant, Research Office
Administrative Associate, Research Office

II. Office of Research

Research Volume

The volume of research performed on the Montana Tech campus can be measured by two different but related metrics. The first measure is the total amount of grants funded in a given fiscal year. This is a direct measure of the grant writing success of the faculty in that year and the previous years—some agencies will take more than one fiscal year to determine the awardees from a specific competition. Figure 1 shows the trends for the last three years. Awards in FY 04 decreased from FY03.

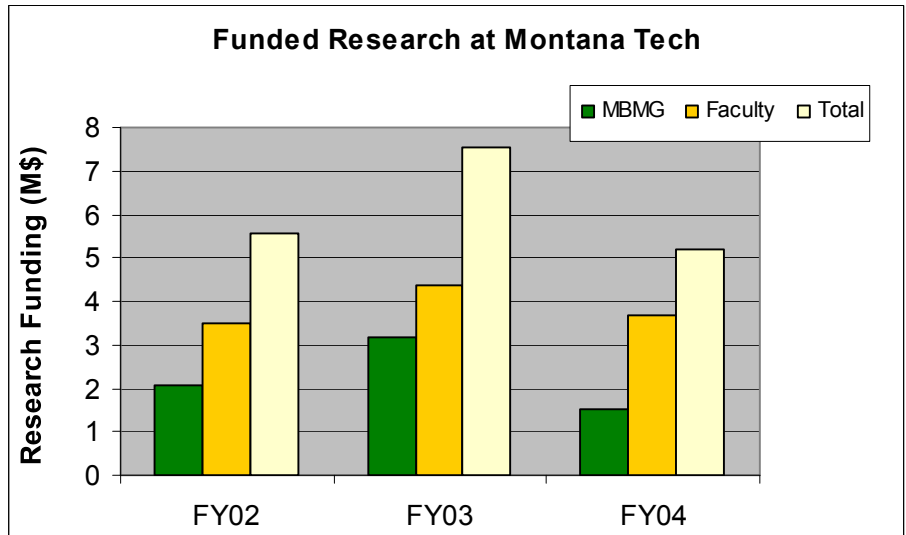


Figure 1: Total Awards Received FY2002 – FY2004

The second measure of research productivity is more directly related to the research activity of a given year. This metric tracks the actual expenses incurred by the faculty, staff, and students for research related activities and charged to our external sponsors. From 1990 to 2000 the campus experienced a growth from less than \$1,000,000 of annual expenditures to more than \$5,000,000 per year. Since 2000 the growth has been more sporadic. The data is shown in Figure 2. G&C volume in FY 04 showed no increase compared to FY 03. In FY2004, almost 70% of the G&C activity was generated by the faculty.

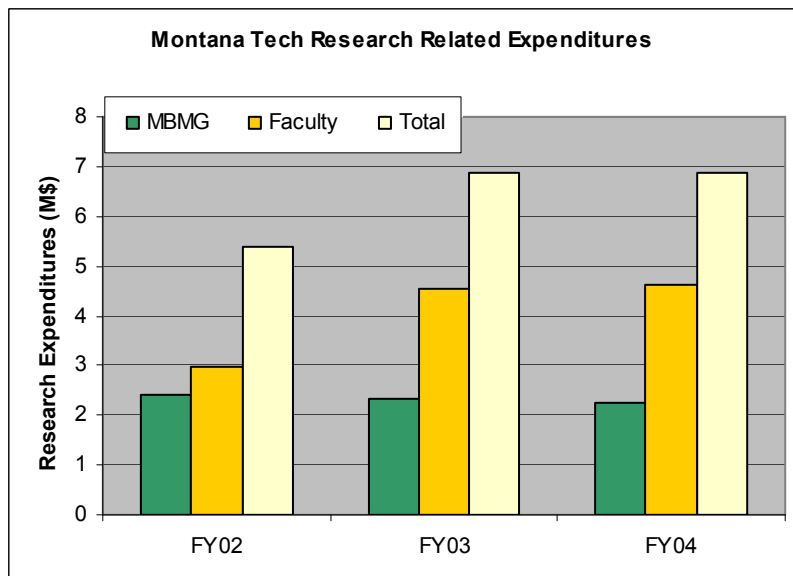


Figure 2: Funded Research FY2002 – 2004

Success Rate for Proposals Submitted

Another metric of grant writing is the success rate of our grant submissions. Table I compares the grant writing activity and success rates for the Fiscal Years 2002, 2003 and 2004. Submitted grants are shown for each year. Also shown are the data for funded, pending and denied proposals at the time of printing (June 14, 2005) for all Fiscal Years. Submitted values are used for the categories of Submitted, Pending and Denied. Primary Amount Awarded values are used for the Funded category. Appendix A is a summary of Proposals Submitted for FY 2004 sorted by Principal Investigator. Success rate for the number of proposals submitted typically reaches 75% to 80% and success rate for submitted value typically is between 40% and 50%.

Table I: Grant Writing Activity for Fiscal Years 2002 to 2004

	FY02		FY03		FY04	
Category	Number	Submitted Value (\$)	Number	Submitted Value (\$)	Number	Submitted Value (\$)
Submitted	126	\$ 15,127,295	129	\$ 11,694,400	125	\$ 28,634,488
Pending	11	\$ 2,229,514	15	\$ 2,565,853	33	\$ 4,460,445
Denied	16	\$ 4,619,473	17	\$ 3,918,383	10	\$ 14,643,279
Funded	99	\$ 7,600,234	97	\$ 5,084,105	82	\$ 5,380,761

Although the number of proposals submitted was constant, the average value of the submitted proposals increased dramatically from the previous year.

Campus Participation in Research

Another metric that we track is the number of Montana Tech employees involved in research. Data in Figure 3 shows the number of faculty and MBMG who have been involved in research for grants active in the fiscal year noted. Principal investigators and co-principal investigators are added for the total participant counts. This year has seen a rise of Montana Tech faculty and MBMG Staff involved in research.

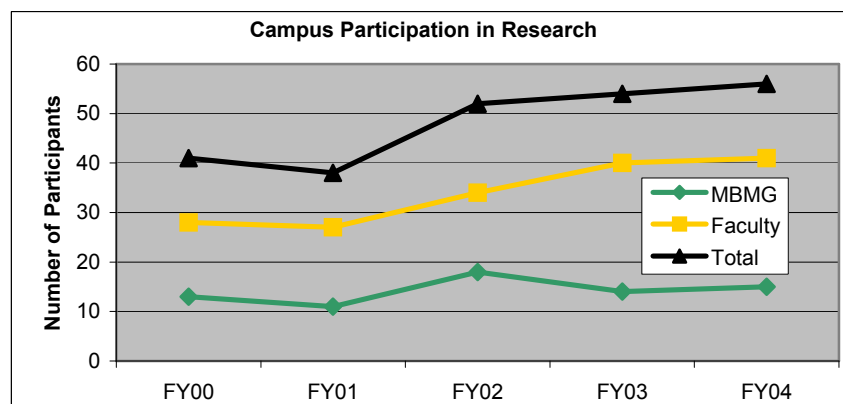


Figure 3: Campus involvement in research

Indirect Cost Returns

The Indirect Costs (IDC) assessed to each grant are used to support operational needs and provide investment funds for the campus research infrastructure. These funds typically amount to 15% of the total grants and contract activity for the year. These IDC funds are used to provide administrative support, institutional support, outreach support, and matching requirements. The remaining IDC funds are returned to Deans, Departments, and Principal Investigators (PIs). Figure 4 shows the historical value of these returns to Departments and PIs over the last four years. Note that net IDC collections exclude matching commitments. In FY2003 for example, gross collections were \$821,077, match commitments were \$116,222, leaving a net IDC collection of \$704,855. The long-term goal is to return 50% of the net IDC collections to the Deans, Department Heads and PIs. In FY 2004, we continued progress toward this goal by returning 58% of the net collected IDCs to the Colleges, Schools, Bureau, Departments and PI's with 45% going directly to PI's and Departments.

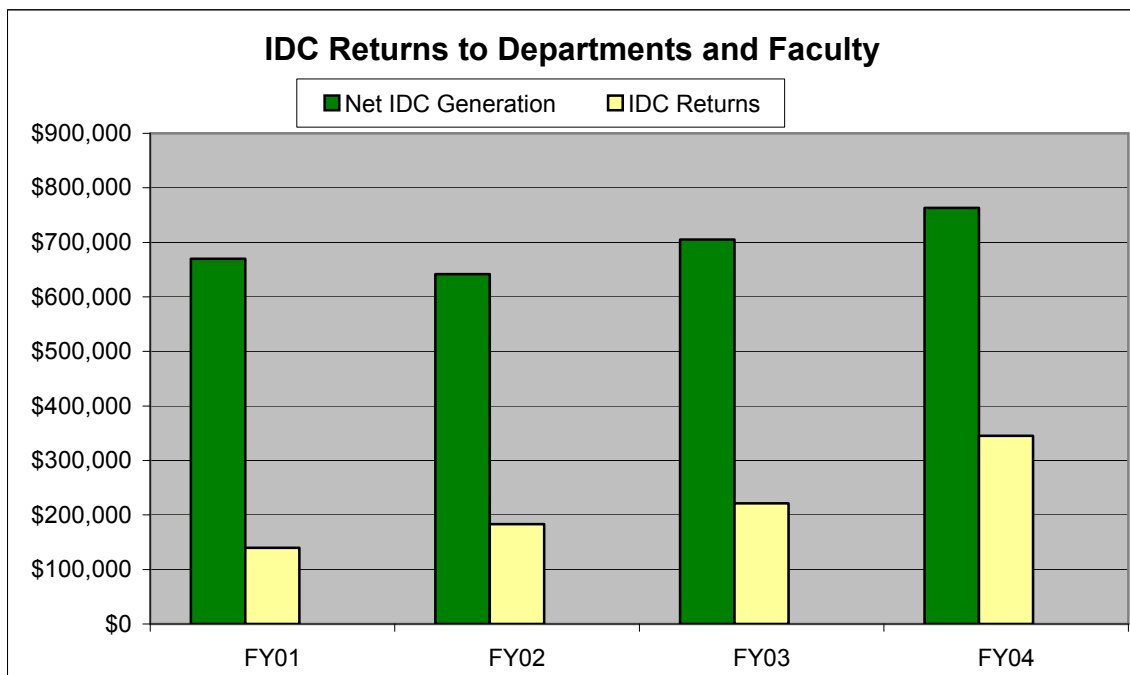


Figure 4: IDC Returns to Departments and Faculty

Scholarly Publications

The campus has no central collection point for the scholarly works produced by our faculty and staff. The Office of Research compiles publications associated with the research and scholarship of the campus and posts them on the Office of Research home page. Included in Appendix B is the list of publications for the 2004 calendar year as received from each faculty and staff member by March of 2005.

Industrial Collaborations

Collaboration with industrial partners is an important element of the support provided by the campus to existing and new business in Montana. These collaborations take various forms. These include developing marketable intellectual property, collaborative research and technology development ventures, and serving as a resource to regional businesses and industries. The information collected by the Office of Research provides specific information on the second form of interaction, funded collaborations. A list of these collaborations for FY 2004 is provided in Appendix C.

Undergraduate Research Program

The Undergraduate Research Program (URP) is now in its ninth year of operation. The program made a major decision in FY 2002 to double the value of the student stipends to \$1,000. In addition, travel monies for student participation at national conferences were also initiated. Both of these actions have had a major impact on the level of student participation as shown in Figures 5 & 6. Our major sponsor is the National Science Foundation (NSF). The NSF grant decreased in FY 2004 so efforts were made to control the growth of the program in AY 2003/04. A new NSF EPSCoR grant for FY2005 has been funded and efforts were made in the fall of 2004 to increase the participation in the program for AY 2004/2005. The graph reflects this success.

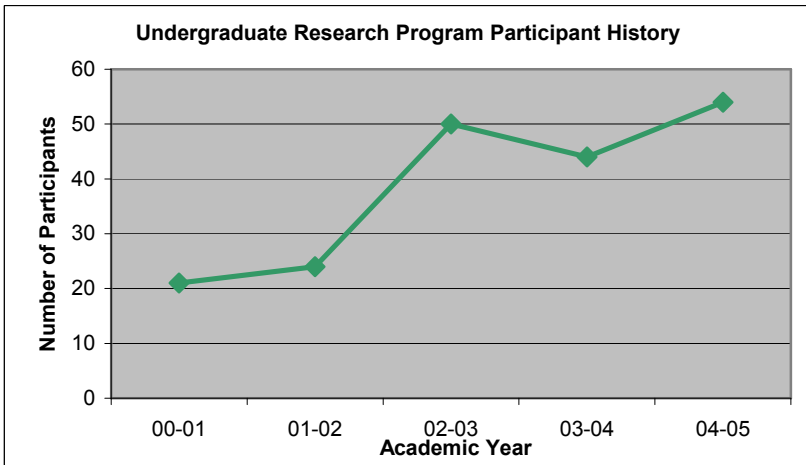
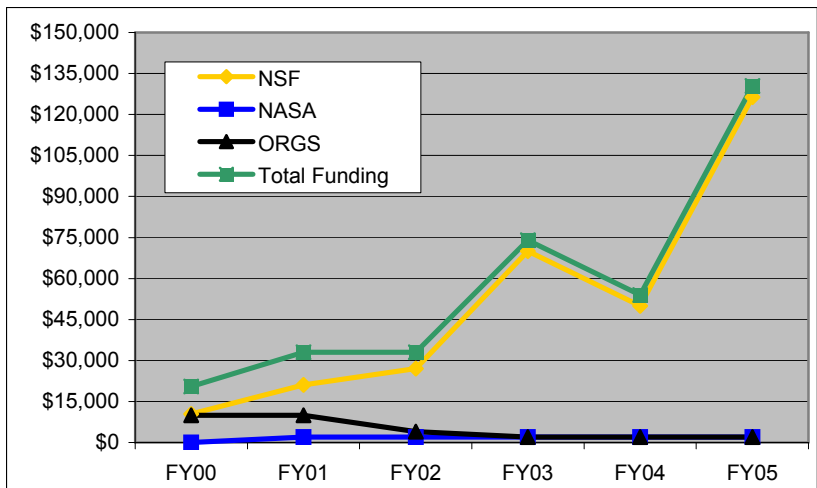


Figure 5: Undergraduate Research Program Participation

Figure 6: Undergraduate Research Program Funding



III. Office of Graduate Studies

In this section we examine trends in graduate enrollment and student financial support at Montana Tech.

Enrollment

In FY 2002, stipend levels for Graduate Teaching Assistantships (GTAs) and Graduate Research Assistantships (GRAs) were increased to a minimum of \$8,000/year from the previous value of \$6,800. Since the total budget allocated to GTAs did not change, the effect of the wage increase has been to decrease the number of GTA awards available. It was anticipated that although this change may adversely affect overall numbers of students, we should see an increase in the quality of incoming students because our awards would now be more competitive with our peer institutions. The numbers of GRAs were not directly affected by this change but remain more strongly coupled to the level of the funded research activity on the campus. The argument of improving the competitiveness of the GRAs is the same however. The historical enrollment trends are shown in Figures 7 and 8. Fall 2004 enrollments are up slightly.

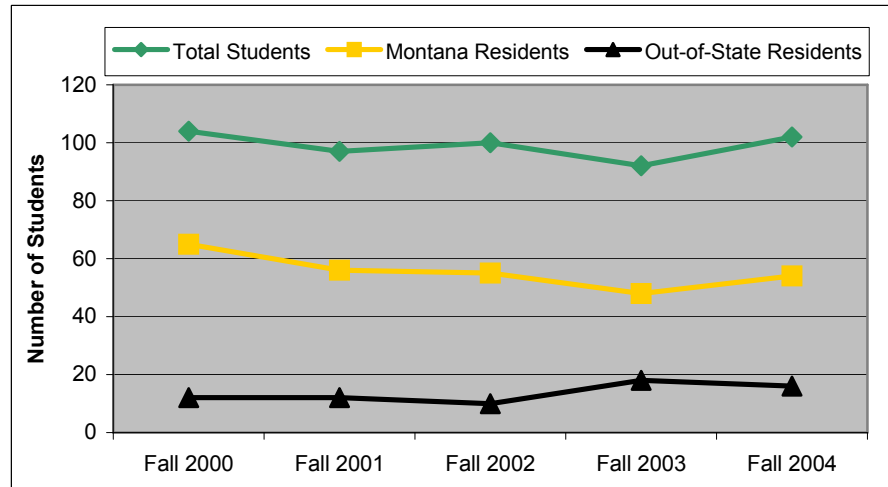


Figure 7: Graduate School Enrollment

The fifth year's MS program is recovering, while International student counts continue to fall in the post-911 environment. Another very interesting trend is the explosive growth in on-line students, driven by the Masters in Project Engineering and Industrial Hygiene.

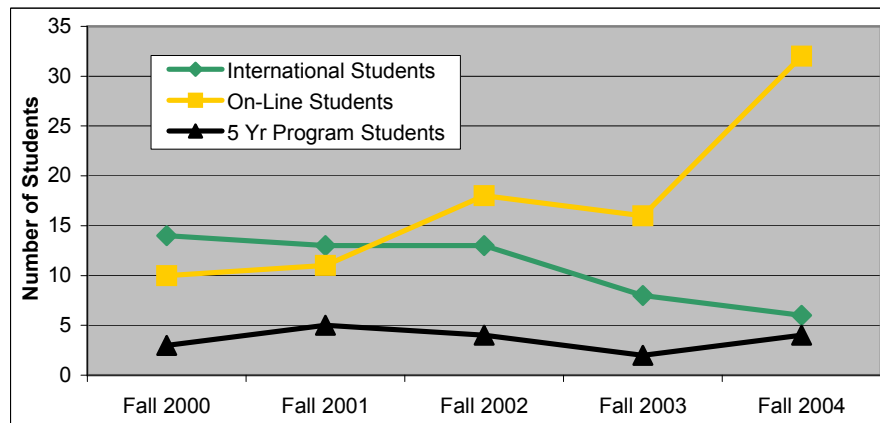


Figure 8: Graduate School Enrollment, Additional Data

Student Quality

As discussed above, we are interested in examining whether or not the increase in the monetary value of student stipends, both GRAs and GTAs has had any effect on student “quality”. The quality of incoming students is a complex issue to fully define. One simple measure that we have been tracking is the GPA and GRE scores of our incoming first year graduate students. In Figure 9, the GRE scores of the incoming graduate student class are shown for the past six years. After the recovery from the foreign student departure in 2001, we are seeing a slight increase in GRE scores.

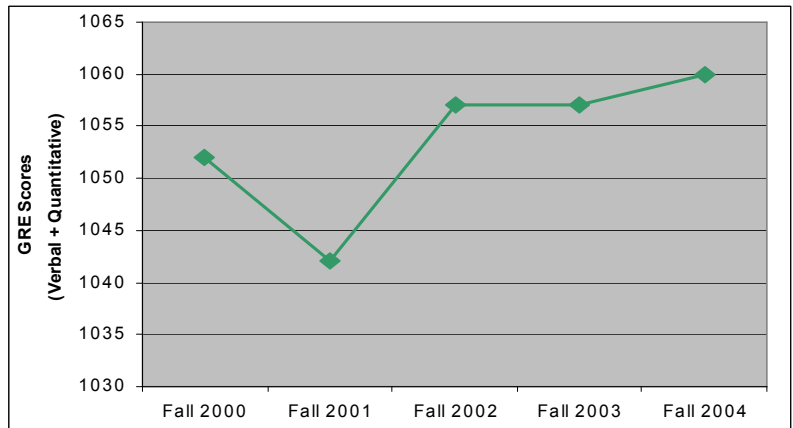


Figure 9: GRE Scores of Incoming Graduate Students (Verbal + Quantitative)

Figure 10 shows that same historical data range for the undergraduate GPA of the incoming graduate school class. These data show the same increase in quality (GPA) from the foreign student drop, followed by a recovery.

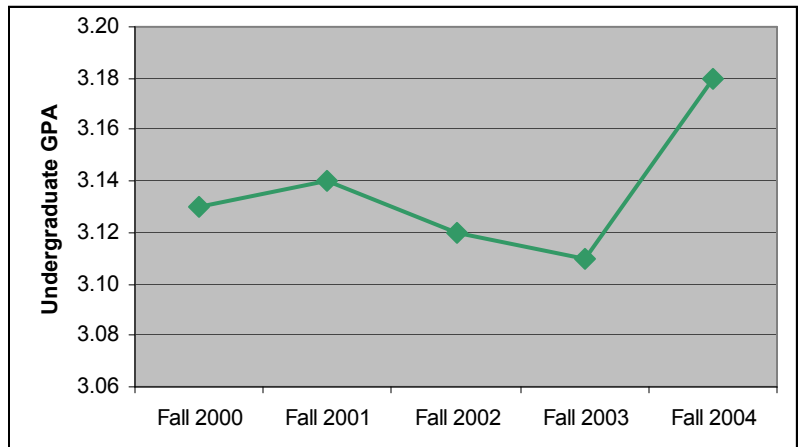


Figure 10: GPA of Incoming Graduate Students

The conclusions appear to be that we have seen a slight increase in student quality. We will continue to track these metrics to see if this result is sustained in future years.

Student Support

One final metric from the Graduate School of particular interest to students is the level of financial support they and their peers receive. In 2004 the graduate students received \$706,471 of total support, with the major portion coming from tuition waivers. Figure 11 shows a summary of all support funds available. Figure 12 shows a histogram of the financial support (from all sources, GTA, GRA, and fee waivers) received by our graduate students in 2004. 80% of our students received some form of financial support.

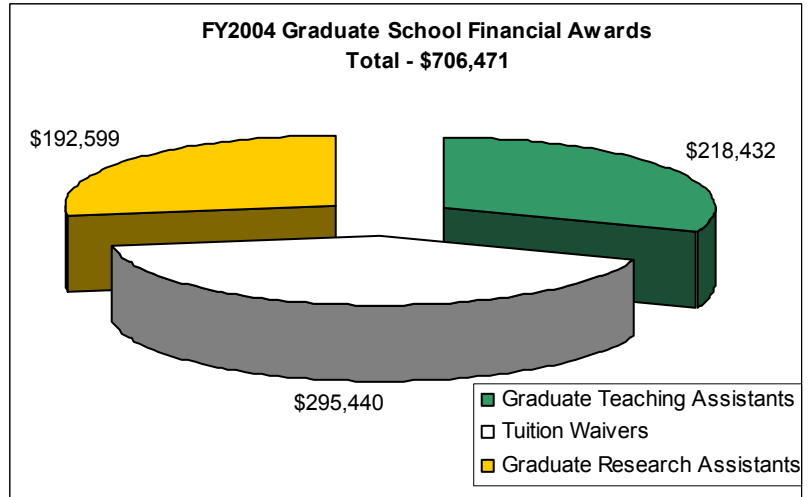


Figure 11: Total Graduate Student funding available

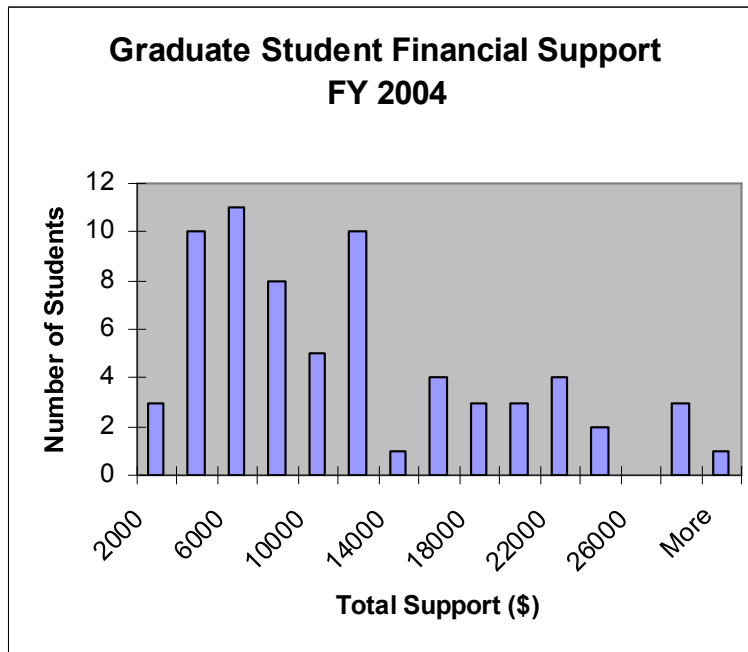


Figure 12: 2004 Graduate Student Support

IV. Office of International Programs

The Office of International Programs is currently working with six academic departments to strengthen our research exchange programs with partners around the world. This initiative is supported by the Bureau of Citizens and Cultural Exchanges of the U.S. Department of State. Participating academic departments include Metallurgical and Materials Engineering, Geophysical Engineering, Environmental Engineering, Professional and Technical Communications, Geological Engineering, and Biological Sciences. The program will be continued by US Department of State funding in September of 2005 and the participating departments are beginning the effort to plan this program for the next two years.

International Visits

As part of the international exchange program Montana Tech sponsors visits by our faculty to foreign institutions and research sites, and hosts visiting international partners in Butte. Appendix D lists the details of these visits for FY 2004.

In addition to the faculty visits, the program operates a "Thesis Abroad" program for Montana Tech graduate students. To date, 3 students have participated in this opportunity, with an additional ten trips planned for the fall of 2004.

APPENDICES

Appendix A: Summary of FY 2004 Proposals Submitted

Appendix B: List of Publications for 2004

Appendix C: Industrial Collaborations in FY 2004

Appendix D: International Collaborations FY 2004

APPENDIX A
Summary of FY 2004 Proposals Submitted

PI Name	Department	Number of Proposals Submitted	Total Request Sponsor from Sponsors
Abdo, G	Montana Bureau of Mines and Geology	4	\$169,261.00
Anderson, C	Center for Advanced Mineral and Metallurgical Engineering	4	\$658,048.00
Anderson, S	Geophysical Engineering	4	\$2,249,782.00
Apple, M	Biology	1	\$57,376.00
Baker, J	College of Technology	1	\$35,000.00
Berg, R	Montana Bureau of Mines and Geology	1	\$20,000.00
Burgher, K	Mine Waste Technology Program	3	\$386,636.00
Cameron, D	Chemistry	1	\$306,500.00
Conrad, P	Mining Engineering	3	\$747,436.00
Cronable, R	Mining Engineering	1	\$5,500.00
Donovan, R	Engineering Science	8	\$2,083,227.00
Douglass, R	Biology	4	\$2,688,957.00
Duaime, T	Montana Bureau of Mines and Geology	9	\$500,099.00
Elliott, C	Geological Engineering	4	\$943,027.00
Figueira, J	Research	1	\$216,668.00
Gammons, C	Geological Engineering	1	\$113,226.00
Ganesan, K	Environmental Engineering	3	\$906,317.00
Gerbrandt, B	General Engineering	2	\$7,918.00
Hobbs, D	Chemistry	1	\$60,000.00
Jensen, R	Safety, Health and Industrial Hygiene	2	\$86,768.00
Knudsen, P	Mining Engineering	1	\$4,875.00
Kuenzi, A	Biological Sciences	2	\$1,013,159.00
Kunz, K	College of Technology	1	\$2,000.00
Link, C	Geophysical Engineering	1	\$461,874.00
Lopez, D	Montana Bureau of Mines and Geology	3	\$413,719.00
Macgregor, W	Professional and Technical Communications	1	\$5,000.00
McCulloch, R	Montana Bureau of Mines and Geology	1	\$21,770.00
McDonald, C	Montana Bureau of Mines and Geology	1	\$119,118.00
Metesh, J	Montana Bureau of Mines and Geology	1	\$25,534.00
Mitman, G	Biological Sciences	1	\$4,000.00
Moon, T	Geophysical Engineering	2	\$41,831.00
Morrison, J	Engineering Science	1	\$10,000.00
Munday, P	Professional and Technical Communications	1	\$11,661,398.00
Olsen, J	Montana Bureau of Mines and Geology	3	\$130,000.00
Parker, S	Chemistry	1	\$1,098.00
Peterson, H	Environmental Engineering	2	\$77,500.00
Peterson, M	Mine Waste Technology Program	1	\$20,000.00
Porter, K	Montana Bureau of Mines and Geology	5	\$512,888.00

PI Name	Department	Number of Proposals Submitted	Total Request Sponsor from Sponsors
Reick, K	College of Technology	1	\$25,000.00
Reiten, J	Montana Bureau of Mines and Geology	7	\$257,410.00
Shirk, H	Professional and Technical Communications	1	\$88,342.00
Speece, M	Geophysical Engineering	1	\$60,000.00
Stickney, M	Montana Bureau of Mines and Geology	3	\$49,028.00
Stierle, A	Chemistry	2	\$347,500.00
Stierle, D	Chemistry	2	\$25,000.00
Twidwell, L	Metallurgical and Materials Engineering	1	\$60,000.00
Van Daveer, K	College of Technology	2	\$70,000.00
Van Voast, W	Montana Bureau of Mines and Geology	2	\$127,000.00
Verlanic, A	OUTREACH	7	\$68,145.00
Wheaton, J	Montana Bureau of Mines and Geology	3	\$314,345.00
Wilde, E	Montana Bureau of Mines and Geology	1	\$40,000.00
Young, C	Metallurgical and Materials Engineering	4	\$238,000.00
Ziaja, M	Petroleum Engineering	1	\$97,208.00
		125	\$28,634,488.00

APPENDIX B

List of Publications for 2004

- Amtmann, J.** 2004. "Self-Reported Training Methods of Mixed Martial Artists at a Regional Reality Fighting Event." *Journal of Strength and Conditioning Research*. Vol. 18, No. 1, pp. 194-196.
- Amtmann, J.** and Amtmann, K. 2004 "Strength Training for Nurse Professionals." *The Pulse*. January, February, March, Volume 41, No. 1, pg. 9.
- Amtmann, J.** and Cotton, A. In Press. "Strength and Conditioning for Judo." *Strength and Conditioning Journal*.
- Amtmann, J.,** Berry, S. and Spath, W. In Press. "Heart Rate Effects of a Beginning Judo Class." *Intermountain Journal of Sciences*.
- Amtmann, J.** and Amtmann, K. 2004. "Take a Deep Breath and Relax." *The Pulse*. Vol. 41, No. 2, pp. 10-11.
- Amtmann, K.** - Amtmann, J. and **Amtmann, K.** 2004 "Strength Training for Nurse Professionals." *The Pulse*. January, February, March, Volume 41, No. 1, pg. 9.
- Amtmann, K.** - Amtmann, J. and **Amtmann, K.** 2004. "Take a Deep Breath and Relax." *The Pulse*. Vol. 41, No. 2, pp. 10-11.
- Anderson, C. G.** -- Abisheva, Z. S., Zagorodnyaya, A. N., Bochevskaya, E. G., Matichenkov, V. and **Anderson, C. G.**, "Comprehensive Processing of Waste of Phosphorous Industry Resulting in the Production of Mineral Fillers", REWAS 2004, Madrid, Spain, September 2004.
- Anderson, C. G.** -- L. V. Bouchouk, Yu. I. Sukharnikov and **C. G. Anderson**, "Formation of Active Carbons from the Rice Processing Waste." *Proceedings of the K.I. Satpaev International Conference on Engineering Education and Science in the XXI Century*, Kazakh National Technical University, Almaty, Kazakhstan, September 17-18, 2004.
- Anderson, C. G.** -- Luganov, V.A. and **Anderson, C.G.**, "Behavior of Arsenopyrite During Roasting with Pyrite", *Proceedings of the K.I. Satpaev International Conference on Engineering Education and Science in the XXI Century*, Kazakh National Technical University, Almaty, Kazakhstan, September 17-18, 2004.
- Anderson, C. G.** -- Sukharnikov, Y. I., and **Anderson, C. G.**, "Processing of Anthropogenic Vegetative Raw Material (Rice Hulls) and Application of the Products Produced", 1st International Conference Advances in Mineral Resources Management and Environmental Geotechnology, Crete, Greece, June 2004.
- Anderson, C. G.**, The TEMPER Initiative at CAMP; Providing Modern and Low Cost Beneficiation, Refining and Fabrication of Titanium Metal, Akita University, Akita, Japan, August, 2004.
- Anderson, C. G.**, "Applications of NSC Pressure Leaching", International Pressure Hydrometallurgy 2004, CIM meeting, Banff, Alberta, Canada, October, 2004.
- Anderson, C. G.**, Dickinson, T., Grayson, L., van Zyl, D., "Materials Count: The Case for Materials Flow Analysis of Natural Resources, Products, and Residuals, 1st International Conference Advances in Mineral Resources Management and Environmental Geotechnology", Crete, Greece, June, 2004.
- Anderson, C. G.**, Figueira, J., Twidwell, L. G. "Collaborative Activities with Akita University", Akita University, Akita, Japan, August, 2004.
- Anderson, C. G.**, "Alkaline Sulfide Hydrometallurgical Recovery of Gold from Refractory Ores and Concentrates", 1st International Conference Advances in Mineral Resources Management and Environmental Geotechnology", Crete, Greece, June, 2004.
- Anderson, C. G.**, "Alkaline Sulfide Hydrometallurgical Recovery of Gold from Refractory Ores and Concentrates", Precious Metals 04, MEI Conference, Capetown, South Africa, November 2004
- Anderson, C. G.**, "Alkaline Sulfide Hydrometallurgical Recovery of Gold from Refractory Ores and Concentrates", SME Annual Meeting, Denver, Co., February 2004.

- Berg, R.** -- Twidwell, L. G., **Berg, R.**, Young, C., "Deep Water Sediment/Pore Water Characterization from an Acidic Metal-Laden Pitlake," Proceedings 1st International Conference Advances in Mineral Resources Management and Environmental Geotechnology, MJMP&EP, June 7-9, 2004, Chania, Crete, Greece, Heliotos Conferences, Athens, Greece (ISBN:960-88153-0-4), pp. 507-12.
- Berg, R. B.**, 2004, Geologic map of the Deer Lodge and Conley's Lake 7 1/2' Quadrangles, Powell County, Southwestern Montana: Montana Bureau of Mines and Geology Open-file Report MBMG 509, map scale 1:24,000 with cross sections and 12 p. text.
- Berg, R. B.**, 2004, Probable bedrock source of sapphires in alluvial deposits north of Butte, Montana, in Castor, S.B., Papke, K.G., and Meeuwig, R.O., Eds., Betting on Industrial Minerals, Proceedings of the 39th Forum on the Geology of Industrial Minerals: Nevada Bureau of Mines and Geology Special Publication 33, p. 23-30.
- Berg, R. B.**, and Equall, N., 2004, Scanning electron micrographs of sapphires from alluvial deposits in Southwestern Montana: Montana Bureau of Mines and Geology Open-file Report MBMG 491. Released as CD with interpretations of surface textures.
- Berg, R. B.**, and Hargrave, P., 2004, Geologic map of the Upper Clark Fork Valley, southwestern Montana: Montana Bureau of Mines and Geology Open file Report MBMG 506, map scale 1:50,000 with cross sections and 19 p. text.
- Duaine, Ted**, Sandau, Ken, Vuke, Susan, Hanson, Jay, Reddish, Shawn, and Reiten, Jon, 2004, Reevaluation of the hydrological system in the vicinity of the Anaconda mine at Belt Cascade County, Montana: Montana Bureau of Mines and Geology Open File Report 504, 84 p.
- Figueira, J.** - Anderson, C. G., **Figueira, J.**, Twidwell, L. G. "Collaborative Activities with Akita University", Akita University, Akita, Japan, August, 2004.
- Griffin, D. J.** - -- Hardy, P. C., **Griffin, D. J.**, Kuenzi, A. J. and Morrison, M. L.. 2004. "Abundance and habitat use of passage neotropical migrants." *Western North American Naturalist* 64:59-71.
- Hargrave, P.** - Berg, R. B., and **Hargrave, P.**, 2004, Geologic map of the Upper Clark Fork Valley, southwestern Montana: Montana Bureau of Mines and Geology Open file Report MBMG 506, map scale 1:50,000 with cross sections and 19 p. text.
- Hobbs, J. David** -- D. Stierle, A. Stierle, **J. David Hobbs**, J. Stokken, and J. Clardy. 2004. "Berkeleydione and Berkeleytrione, New Bioactive Metabolites from an Acid Mine Organism." *Organic Letters* 6(6): 1049-1052.
- Kuenzi, A. J.** -- Hardy, P. C., Griffin, D. J., **Kuenzi, A. J.** and Morrison, M. L.. 2004. "Abundance and habitat use of passage neotropical migrants." *Western North American Naturalist* 64:59-71.
- LaFave, J. I.**, Smith, L. N., and Patton, T. W., 2004, Ground-Water Resources of the Flathead Lake Area: Flathead, Lake, Sanders, and Missoula Counties, Montana, Part A: Montana Bureau of Mines and Geology, Ground-Water Assessment Atlas No. 2, 132 p. [inc.11 plates].
- Link, C.A.** -- Speece, M. A., Miller, C. R., Miller, P. F., **Link, C. A.**, Flynn, K. F., and Dolena, T. M., 2004, "A rapid-deployment, three-dimensional (3-D), seismic reflection system": Proc. 2004 NSF Design, Service and Manufacturing Grantees and Research Conference, CD Rom Format, 10 pp.
- Madison, J. P.** - Metesh, J. J. and **Madison, J. P.**, 2004, "Summary of Investigation of Upper Silver Bow Creek, Butte, Montana," Montana Bureau of Mines and Geology Open File Report 507, 7 page(s).
- Metesh, J. J.** and Madison, J. P., 2004, "Summary of Investigation of Upper Silver Bow Creek, Butte, Montana," Montana Bureau of Mines and Geology Open File Report 507, 7 page(s).
- Metesh, J. J.**, 2004, "Spring inventory, Yellowstone controlled ground-water area", Montana Bureau of Mines and Geology Open File Report 510, 54 page(s).
- Munday, Pat**, "History of Science," Vol. 5, *New Dictionary of the History of Ideas* (Charles Scribner's Sons, 2004).
- Munday, Pat**, "Hope for Grayling." *Free Flows* 2 (Summer 2004): 11.
- Munday, Pat**, "Rules for River Recreation." *Free Flows* 2 (Fall 2004): 5.
- Munday, Pat**, "Cattle Ranch University." *Free Flows* 2 (Winter 2004): 8.
- Munday, Pat**, "Three Threats to Stream Access." *Headwaters Headlines* 8 (June 2004): 2.

Munday, Pat, "Why Land Use Planning?" *Headwaters Headlines* 8 (Winter 2004): 3.

Patton, T. W. -- LaFave, J. I., Smith, L. N., and **Patton, T. W.**, 2004, Ground-Water Resources of the Flathead Lake Area: Flathead, Lake, Sanders, and Missoula Counties, Montana, Part A: Montana Bureau of Mines and Geology, Ground-Water Assessment Atlas No. 2, 132 p. [inc.11 plates].

Reddish, Shawn -- Duaine, Ted, Sandau, Ken, Vuke, Susan, Hanson, Jay, **Reddish, Shawn**, and Reiten, Jon, 2004, Reevaluation of the hydrological system in the vicinity of the Anaconda mine at Belt Cascade County, Montana: Montana Bureau of Mines and Geology Open File Report 504, 84 p.

Reiten, Jon -- Duaine, Ted, Sandau, Ken, Vuke, Susan, Hanson, Jay, Reddish, Shawn, and **Reiten, Jon**, 2004, Reevaluation of the hydrological system in the vicinity of the Anaconda mine at Belt Cascade County, Montana: Montana Bureau of Mines and Geology Open File Report 504, 84 p.

Sandau, Ted -- Duaine, Ted, **Sandau, Ken**, Vuke, Susan, Hanson, Jay, Reddish, Shawn, and Reiten, Jon, 2004, Reevaluation of the hydrological system in the vicinity of the Anaconda mine at Belt Cascade County, Montana: Montana Bureau of Mines and Geology Open File Report 504, 84 p.

Smith, L. N. -- LaFave, J. I., Smith, L. N., and Patton, T. W., 2004, Ground-Water Resources of the Flathead Lake Area: Flathead, Lake, Sanders, and Missoula Counties, Montana, Part A: Montana Bureau of Mines and Geology, Ground-Water Assessment Atlas No. 2, 132 p. [inc.11 plates].

Smith, L. N. -- Locke, W., and **Smith, L. N.**, 2004, Pleistocene mountain glaciation in Montana, USA, *in* Ehlers, J., and Gibbard, P. L., eds., *Extent and Chronology of Glaciations*: Amsterdam, The Netherlands, Elsevier, p. 117–121.

Smith, L. N., 2004, Late Pleistocene stratigraphy and implications for deglaciation and subglacial processes in the Flathead Valley, northwestern Montana, USA: *Sedimentary Geology*, v. 165, p. 295-332.

Spath, W. - Amtmann, J., Berry, S. and **Spath, W.** In Press. "Heart Rate Effects of a Beginning Judo Class." *Intermountain Journal of Sciences*.

Speece, M.A. -- Zeiler, C.P., Stickney, M.C., and **Speece, M.A.**, (accepted for publication 2004), "Revised Velocity Structure of Western Montana", *Bulletin of the Seismological Society of America*.

Speece, M. A. -- Allen, A. L., **Speece, M. A.**, and El-Werr, A. K., 2004, "Ground-Penetrating Radar (GPR) studies at Saqqara, Egypt", *Proc. National Conference on Undergraduate Research*, CD Rom Format, 8 pp.

Speece, M. A. -- Reichhardt, D. K., Hargrave, M. R., Jones, G., Maki, D. L., Miller, C. R., and **Speece, M. A.**, 2004, "An assessment of seismic and thermal imaging techniques for archaeological applications": *Proc. Symposium on the Applications of Geophysics to Engineering and Environmental Problems*, 193-205.

Speece, M. A., Miller, C. R., Miller, P. F., Link, C. A., Flynn, K. F., and Dolena, T. M., 2004, "A rapid-deployment, three-dimensional (3-D), seismic reflection system": *Proc. 2004 NSF Design, Service and Manufacturing Grantees and Research Conference*, CD Rom Format, 10 pp.

Stickney, M., C. B., Derkey, R.E., Watson, S.M., Bartholomew, M.J., **Stickney, M.C.**, and Downey P.J., 2004, "Geologic map of the Deer Lodge 15' Quadrangle, southwest Montana", MBMG Open File 271 (digital version of 1993 map), 2 plates, 23 p.

Stickney, M. -- Wong, I., Olig, S., Dober, M., Wright, D., Nemser, E., Lageson, D., Silva, W., **Stickney, M.**, Lemieux, M., and Anderson, L., 2004, "Probabilistic earthquake ground motion hazard maps for Montana: Proceedings of the Basin and Range Province Seismic Hazards Summit II", 2004, p 158-162.

Stickney, M. C. -- Zeiler, C.P., **Stickney, M.C.**, and Speece, M.A., (accepted for publication 2004), "Revised Velocity Structure of Western Montana", *Bulletin of the Seismological Society of America*.

Stickney, M. C. and Lageson, D. R., 2004, "Active tectonics and strain partitioning in the northern Intermountain Seismic Belt: Basin and Range Province Seismic Hazards Summit II Program and Abstracts", p. 140-143.

Stierle, A. A. and Stierle, D. B., 2004. "Bioprospecting in the Berkeley Pit: Bioactive Metabolites from Acid Mine Waste Extremophiles", *Invited Book Chapter In: "Bioactive Natural Products"*, Atta-Ur-Rahman, Ed.; Elsevier Science Publishers: Amsterdam.

- Stierle, A.** -- D. Stierle, **A. Stierle**, J. David Hobbs, J. Stokken, and J. Clardy. 2004. "Berkeleydione and Berkeleytrione, NewBioactive Metabolites from an Acid Mine Organism." *Organic Letters* 6(6): 1049-1052.
- Stierle, A. A.**, Stierle, D. and Kemp, K. 2004. "Novel Sesquiterpenoid Matrix Metalloproteinase-3 Inhibitors from an Acid Mine Waste Extremophile" D. John Faulkner and Paul Scheurer memorial issue of *J. Nat. Prod.* **67(8)**: 1392-1395.
- Stierle, D. B.** -- A. Stierle and **D. B. Stierle**, 2004. "Bioprospecting in the Berkeley Pit: Bioactive Metabolites from Acid Mine Waste Extremophiles", Invited Book Chapter In: "Bioactive Natural Products", Atta-Ur-Rahman, Ed.; Elsevier Science Publishers: Amsterdam.
- Stierle, D.** -- A. Stierle, **D. Stierle**, and K. Kemp, 2004. "Novel Sesquiterpenoid Matrix Metalloproteinase-3 Inhibitors from an Acid Mine Waste Extremophile." D. John Faulkner and Paul Scheurer memorial issue of *J. Nat. Prod.* **67(8)**: 1392-1395.
- Stierle, D.**, Stierle, A., Hobbs, J. David, Stokken, J. and Clardy, J. 2004. "Berkeleydione and Berkeleytrione, NewBioactive Metabolites from an Acid Mine Organism" *Organic Letters* 6(6): 1049-1052.
- Twidwell, L.** -- C. Anderson, **L. Twidwell**, J. Figueira, "Collaborative Activities between Montana Tech of The University of Montana and Akita University," International Symposium for Resource Science and Engineering of Rare Metals, August 25-27, 2004, Akita, Japan.
- Twidwell, L. G.** -- E. Dahlgren, **L.G. Twidwell**, S. McGrath, "Removal of Selenium from Mine and Waste Waters, Proceedings 1st International Conference Advances in Mineral Resources Management and Environmental Geotechnology," MJMP&EP, June 7-9, 2004, Chania, Crete, Greece, Heliotospos Conferences, Athens, Greece (ISBN:960-88153-0-4), pp 536-42.
- Twidwell, L. G.**, Berg, R., Young, C., "Deep Water Sediment/Pore Water Characterization from an Acidic Metal-Laden Pitlake," Proceedings 1st International Conference Advances in Mineral Resources Management and Environmental Geotechnology, MJMP&EP, June 7-9, 2004, Chania, Crete, Greece, Heliotospos Conferences, Athens, Greece (ISBN:960-88153-0-4), pp 507-12.
- Twidwell, L. G.**, Huang, H. H., Hadden, G. A., "Investigation to Develop a Galvanically Enhanced Cementation Technology for Removing Oxyanions of Arsenic and Selenium from Minewaste Waters," EPA Mine Waste Technology Program, MWTP-213, 2004, MSE-Technology Applications, Butte, MT, 51 p.
- Vuke, S.M.**, 2004, Geologic map of the Divide area, southwestern Montana: MBMG OFR 502, scale 1:50,000.
- Vuke, S.M.**, Coppinger, W. W., and Cox, B. E., 2004, Geologic map of Cenozoic deposits in the Upper Jefferson Valley, southwestern Montana: MBMG OFR 505, scale 1:50,000.
- Vuke, S.M.**, and Wilde, E.M., 2004, Geologic map of the Melstone 30' X 60' quadrangle, eastern Montana: Montana Bureau of Mine and Geology Open File Report 513, scale 1:100,000.
- Vuke, Susan** -- Duaine, Ted, Sandau, Ken, **Vuke, Susan**, Hanson, Jay, Reddish, Shawn, and Reiten, Jon, 2004, Reevaluation of the hydrological system in the vicinity of the Anaconda mine at Belt Cascade County, Montana: Montana Bureau of Mines and Geology Open File Report 504, 84 p.
- Vuke, S.M.** -- Wilde, E.M. and **Vuke, S.M.**, 2004, Geologic map of the Jordan 30' X 60' quadrangle, eastern Montana: Montana Bureau of Mines and Geology Open File Report 514, scale 1:100,000.
- Vuke, S.M.** -- Wilde, E.M. and **Vuke, S.M.**, 2004, Geologic map of the Sand Springs 30' X 60' quadrangle, eastern Montana: Montana Bureau of Mines and Geology Open File Report 515, scale 1:100,000.
- Weight, W. D.** (2005) "Level Measurements in Groundwater Monitoring Wells;" Chapter 26 in: Environmental Instrumentation and Analysis Handbook; R. Down and J Lehr, eds; John Wiley and Sons, New Jersey, pp 567-592.
- Weight, W. D.** and Johansen, E. A. (2004) "Quantifying the Variables Causing Debris Flows in Drainages Ravaged by Fires" in proceedings of the 39th Symposium on Engineering Geology and Geotechnical Engineering, Butte, Montana.
- Wilde, E.M.** -- Vuke, S.M., and **Wilde, E.M.**, 2004, Geologic map of the Melstone 30' X 60' quadrangle, eastern Montana: Montana Bureau of Mines and Geology Open File Report 513, scale 1:100,000.

Wilde, E.M. and Vuke, S.M., 2004, Geologic map of the Jordan 30' X 60' quadrangle, eastern Montana: Montana Bureau of Mines and Geology Open File Report 514, scale 1:1000,000.

Wilde, E.M. and Vuke, S.M., 2004, Geologic map of the Sand Springs 30' X 60' quadrangle, eastern Montana: Montana Bureau of Mines and Geology Open File Report 515, scale 1:100,000.

Young C. -- Twidwell, L. G., Berg, R., **Young, C.**, "Deep Water Sediment/Pore Water Characterization from an Acidic Metal-Laden Pitlake," Proceedings 1st International Conference Advances in Mineral Resources Management and Environmental Geotechnology, MJMP&EP, June 7-9, 2004, Chania, Crete, Greece, Heliotos Conferences, Athens, Greece (ISBN:960-88153-0-4), pp 507-12.

Ziegler, B. "Utopie et Perversion dans 'Le Jardin des supplices'", Cahiers Octave Mirbeau, Vol. 11, 2004, pp. 91-114. (article)

Ziegler, B. "Countdown to 'Twelve': Nick McDonell's Midnight Special", Notes on Contemporary Literature, Vol. 35, no. 1, Jan. 2005, pp. 10-14 (article).

Ziegler, B. "The Mirror of Divinity: The World and Creation in J.-K. Huysmans", Newark, DE: The University of Delaware Press, 2004 (book).

APPENDIX C
Industrial Collaborations
July 2003 through June 2004

PI Name	Dept	Title of Project	Primary Funding Source	2nd Funding Source	Total Project Awarded
Anderson, C	CAMP	Task II - Technical Assistance for the Titanium Extraction Mining and Process Engineering Research (TEMPER) Program	UTRS		\$495,620.00
Anderson, C	CAMP	Alkaline Sulfide Gold Hydrometallurgy Research	CAST	Profile Resources	\$69,956.00
Anderson, C	CAMP	Yetter & Warden LLP Expert Witness Technical Assistance	Yetter & Warden		\$51,602.31
Anderson, C	CAMP	Nickel Laterite Metallurgy	Western Mine Engineering		\$36,366.50
Anderson, C	CAMP	Copper Gold Ore Process Development	Elkhorn Goldfields, Inc.		\$25,172.16
Anderson, C	CAMP	Final Hydrometallurgical Report	Formation Capital		\$22,413.67
Anderson, C	CAMP	Expert Witness Support	William F. Boyd (Hecla Mining)		\$13,448.30
Anderson, C	CAMP	Copper Concentrate Pressure Leaching	Phelps Dodge		\$5,000.00
Anderson, C	CAMP	Arsenic Abatement Study	Teck Cominco Metals		\$7,039.65
Anderson, C	CAMP	Industrial Partner Support	Stillwater Mining Company		\$6,024.57
Anderson, C	CAMP	Mercury Abatement Project	C.V.G. Bauxilum C.A.		\$5,504.00
Anderson, C	CAMP	Pressure Hydrometallurgy	Andeburg Consulting Services		\$4,500.00
Anderson, C	CAMP	Expert Witness Support	BMW Lawyers		\$1,661.40
Donovan, R	ENGR	Distributed Ad-Hoc Intelligent Sensor Intrusion Detection System	G-5 Technologies		\$99,903.00
Gerbrandt, B	ENG	Yankee Doodle Tailings	Montana Resources		\$3,959.00

PI Name	Dept	Title of Project	Primary Funding Source	2nd Funding Source	Total Project Awarded
Gerbrandt, B	ENG	Revegetation Monitoring PGG - Extension - Montana Resources	Montana Resources		\$4,667.00
Knudsen, P	MIN	Reclamation of Gem River Mine	G.R. Ventures, Inc.		\$6,000.00
Macgregor, W	PTC	Hemorheology Instrumentation Testing and Validation and Certification	Rheologies, Inc		\$5,000.00
Moon, T	GEOP	A Real-Time Coal Content/Ore Grade (COG) Sensor	MBRCT	Resonon	\$24,720.00
Moon, T	GEOP	A Real-Time Ore Grade Assessment in "Look-Ahead" Mining - A Down-Hole Probe	DOE	Resonon	\$17,111.00
Porter, K	MBMG	Husky Energy Geologic Field Course -	Husky Energy		\$6,150.00
Verlanic, A	OUTREACH	Technical Outreach - RYO Correctional Facility	RYO Correctional Facility		\$2,000.00
				Total	<u>\$913,818.56</u>

APPENDIX D
International Collaborations
July 2003 through June 2004

International Campus Visitors To Montana Tech						
Name	Arrival	Institution	Citizenship	Departure	Agenda / Purpose	Host
Mario Quentas	1/24/2004	UNAP-Puno	Peru	May-04	Exchange	John Brower
Dr. Greg Hope	9/1/2003	Griffith University, Brisbane, Queensland	Australia	12/1/2003	Formalize relations with Tech, MET and CAMP	Courtney Young & Corby Anderson
Father Steve Judd / Victor Maqqe	7/9/2003	Mary Knoll House/UNAP-Puno	Peru	7/9/2003	Exchange	Brower/Patton

Montana Tech Faculty International Travel / Exchange					
Name	Arrival	Institution	Country	Departure	Agenda / Purpose
Dr. Kumar Ganesan	6/20/04	University di Roma "La Sapienza"	Italy	July 5, 2004	Meet Dr. Wolmer in Vienna, Biomedical Center Attend Biomedical Engineering Conf. in Salzburg; Attend Heart Valve Disease Conference in Paris
Darby Stacey , Graduate Student, Metallurgical and Materials Engineering	6/19/04	Monash University, Melbourne	Australia	August 13, 2004	Master's Degree Research: Electro Chemistry of Alkaline Sulfide Leaching Systems

Josh Junkert , Graduate Student, Metallurgical and Materials Engineering	6/4/04	Griffith University, Brisbane	Australia	August 13, 2004	Master's Degree Research: Surface- Enhanced Spectral Data
Dr. Corby Anderson	6/4/2004	Technology University of Greece	Greece	6/11/2004	Attend and present two papers; chair a session at conference; meet with the head of the Mineral Resources Engineering Department.
Dr. Larry Twidwell	6/4/2004	Technology University of Greece	Greece	6/11/2004	Attend and present paper at conference; meet with the head of the Mineral Resources Engineering.
Dr. Kumar Ganesan	5/12/2004	University of New South Wales	Sydney, Australia	5/25/2004	Visit University and attend Biomaterials Conference
Dr. Chris Gammons / Steve Parker	3/10/04	Universidad Nacional del Comahue	Argentina	3/21/04	Collaborative Research
Dr. Kumar Ganesan	12/18/03	Central Electrochemical Research Inst.	India	12/31/03	Collaborative Research
Dr. Kumar Ganesan	10/30/03	Nanyang Technical Univ.	Malaysia	11/11/03	Develop Collaborative Research – Biomedical
Dr. Larry Twidwell	8/23/03	University of British Columbia, Vancouver	Canada	08/28/03	Hydro 2003 Conference and UBC Visit
Dr. Corby Anderson	8/23/03	University of British Columbia, Vancouver	Canada	08/29/03	Hydro 2003 Conference
Hsin-Hsiung Huang	8/21/03	University of British Columbia, Vancouver	Canada	08/29/03	Hydro 2003 Conference, UBC visit, recruit @ BCIT
Dr. Courtney Young	8/21/03	University of British Columbia, Vancouver	Canada	08/29/03	Hydro 2003 Conference, UBC visit, recruit @ BCIT

[International Program](#) > [Ongoing Research](#) > Alkaline Sulfide Gold Leaching

Darby Stacey is working on his master's degree in Metallurgy at Montana Tech. For his thesis, he is studying the electro chemistry of alkaline sulfide leaching systems which are the important factors that make gold leaching economical and faster. The title of this thesis is, "Alkaline Sulfide Gold Leaching".

Darby spent two months at Monash University which is located in Melbourne, Australia. Melbourne, a port city, is a large commercial and industrial center where many multinational corporations are located.

While conducting research for his thesis at Monash University, Darby was under the direction of Matthew Geffrey. Darby stated, "The program was excellent. Monash University had world class equipment. I got about six months of research done in about three weeks. They were very patient and nurturing with me, brought me up to speed on how electro chemistry works, and taught me how to use the equipment." He said that he did about one third of the research for his master's thesis while in Australia.



While attending Monash University, Darby lived near the campus in the Bayview Conference Center which houses many students from the University. He said he now has many friends all over the world from the people he met during this program. He added that while in Australia, he surfed at Turquay Beach, one of Australia's top surfing beaches and he took a nature tour off the Gold Coast which had both jungle and untouched beaches. While in the city, he attended concerts and plays in downtown Melbourne, including a concert of "The Who".

In reference to other students who are interested in Montana Tech's International Program, Darby said, "Get involved with this program. I had "zero" out-of-pocket expense and I got a lot of research done, as well as being able to see a different part of the world."

[International Program](#) > [Ongoing Research](#) > Surface Enhanced Spectral Data

Josh Junkert is a Montana Tech student working with Dr. Courtney Young on his master's program in the field of Metallurgical and Materials Engineering. Josh spent the summer at Griffith University performing cutting-edge research relating to the global gold mining industry. Griffith University is located in Brisbane, in the sunshine state of Queensland. With 1.1 million people, Brisbane is Australia's third largest city. Brisbane has a subtropical climate with average highs of 70 degrees in the winter and 85 degrees in the summer. The city is a modern cosmopolitan center with museums, cafes, shopping and nightlife. The city offers beaches, river walks, gardens, wildlife parks with the country's largest population of koalas.

Concerning his work while at Griffith University, Josh stated, "Research was conducted using a red-laser Raman spectrometer constructed by Dr. Gregory Hope, the Head of Science and a professor of physical chemistry, to retrieve surface-enhanced spectral data pertaining to my thesis subject of interest. Special thanks go to Gretel, Kim, and Carolyn, Ph.D. students of Dr. Hope, for their time and patience while I learned the facilities available."

In reference to Montana Tech's International program, Josh said, "Hopefully, opportunities like this will be possible for future student generations to come. It is evident that relationships formed on an international level can blossom into future research opportunities as well as possible international job placements. In the world today, with so much turmoil, this can only help create a little more understanding that we must operate on a one world economy way of thinking. Once again, thanks to all that made this opportunity possible."

