STANLEY M. HOWARD, PhD, PE

Department of Materials and Metallurgical Engineering
South Dakota School of Mines & Technology
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EDUCATION and CERTIFICATIONS

- BS. Metallurgical Engineering, Colorado School of Mines, Golden, CO (1967)
- Ph.D. Metallurgical Engineering (Minor - Chemical Petroleum Refining Engineering), Colorado School of Mines, Golden, CO (1971)
- PE Registered Professional Engineer, SD #2219 (1972)

PROFESSIONAL EXPERIENCE

1971 - present	Department of Materials and Metallurgical Engineering Assistant Professor (1971 - 75), Associate Professor (1975 - 81) Professor (1981 - 14), Emeritus Professor (2014 -), Chair (1994-2000) South Dakota School of Mines & Technology; Rapid City, SD
2004 - 2007	Yucca Mountain Project, Consultant/Auditor DOE Contractor (BSE/Longenecker) Summerlin, NV
2003 - 2004	Division of Metals and Ceramics - Consultant Oak Ridge National Laboratory Oak Ridge, TN
1992 - 2001	Caterpillar Corporation - Consultant Technical Center Peoria, IL
1988 - 1991	Electronic Manufacturing & Production Facility - Consultant U. S. Department of the Navy Ridgecrest, CA
1986 - 1987	Kerr-McGee Corporation - Consultant Oklahoma City, OK
1981 - 1988	Group V Metals, Inc. - President (81 - 84), Vice President (84 - 88) Rapid City, South Dakota
1977 - 1982	Mintech, Inc. - President (77 - 82) Rapid City, South Dakota
1976 - 1977	Stanford Research Center - NSF Visiting Scientist Menlo Park, CA
1967 - 1971	Department of Metallurgical Engineering - Research Fellow Colorado School of Mines Golden, CO
1967 sum.	Atomic Weapons Division - Engineer Dow Chemical Company Golden, CO
1966 sum.	Kennecott Research Center - Engineer Assistant Kennecott Copper Corporation Salt Lake City, UT
1960 - 1966	Surface Water Division - Hydrological Engineer Assistant U. S. Geological Survey Cheyenne, WY

ENGINEERING COMPANY AFFILIATIONS

• Mintech, Inc. Rapid City, SD(1980)	Corrosion Engineering Services President (1980-84)
• Group V Metals, Inc. Spearfish, SD	Research, Development, and commercial licensing/production of Nb and Ta metal and high purity (5n+) Nb and Ta oxides President (1981-4) Vice President (1985-8)

AREAS OF PROFESSIONAL ACTIVITY

- High Purity Electronic Materials
  Computer Modeling
- High-Temperature Gas-Solid Reactors with Nucleation
- Three-Dimensional Unsteady-State Anisotropic Heat Transfer Models with Fusion
- High-Temperature Thermodynamics
  - Activities and Enthalpies in Liquid Metallic Solutions
- Phase Equilibria in Metallurgical Systems
- Corrosion in Aqueous Media - Corrosion in Geothermal Waters, High-Purity Water Systems
- Gas-Solid Corrosion at High Temperatures
- Stress Corrosion Cracking of Nuclear Reactor Fuel Rods - Fission Products Effect on Zircaloy
- Chlorination Metallurgy
  - Extraction of Refractory Metals
  - Production of High-Purity Refractory Oxides and Chlorides
  - Precious Metal Extraction
- Direct Laser Deposition
- Friction Stir Welding
- Kinetics of High-Temperature Reactions
  - Gas-Solid Reactions, Vapor-Transport Mechanisms, Toxic Emissions Control by Homogeneous Gas-Phase Reaction
- Process Control - Carburization
- Alloy Development - High-strength, high-conductivity alloys
- Distance Learning - Internet-deliverable and tracked Instructional Modules

SHORT COURSES PRESENTED

- *Corrosion Control and Prevention*, South Dakota School of Mines & Technology, Rapid City (1976)
- *Recovery and Sampling of Secondary Precious Metals*, U. S. Department of Defense Sponsored, South Dakota School of Mines and Technology, Rapid City (1987)
- *Recovery and Sampling of Secondary Precious Metals*, U. S. Department of Defense Sponsored, South Dakota School of Mines and Technology, Rapid City (1988)
- *Personal Computer Applications in Materials and Metallurgical Engineering*, The Minerals, Metals, and Materials Society Annual Meeting, Anaheim (1990)
- *Personal Computer Applications for Metals and Materials Engineering*, The Minerals, Metals, and Materials Society Annual Meeting, New Orleans (1991)
- *Computer Software and Methods in Metallurgical and Materials Engineering*, The Minerals, Metals, and Materials Society Annual Meeting, San Francisco (1994)

COURSES TAUGHT

Graduate

- Advanced Chemical Metallurgy
- Advanced Simulation Techniques
- Thermodynamics of Solids
- Steelmaking

Undergraduate

- Freshman Engineering
- Properties of Materials
- FORTRAN Programming
- Programming (BASIC, FORTRAN, VBA)
- Metallurgical Thermodynamics
- Extractive Metallurgy I, II
- Engineering Economics
- Applied Numerical Methods
- Introduction to Material Science
- Transport Phenomena in Metallurgical Eng
- Engineering Fundamentals I & II
- Process Control, Optimization, and Modeling

HONORS AND HONORARY SOCIETIES

- AIME Outstanding Educator Award, 2004
- Research Award: The Santa Fe Symposium on Jewelry Manufacturing Technology, May 1996
- Benard A. Ennenga Faculty Award: South Dakota School of Mines and Technology, 1993-4
- Presidential Award: South Dakota School of Mines & Technology; Rapid City, SD, 1994
- Alpha Sigma Mu Honorary Society, 1966
- The Society of Sigma Xi, 1970
- Honored Guest: Kroll Institute Dedication; Golden, CO, 1974

PROFESSIONAL SERVICE, ORGANIZATIONS

- TMS: The Metals Materials, and Minerals Society
  - Vice President (2015)
  - Executive Board (2009-2012)
  - Board of Directors (2006-2012)
  - Financial Planning Officer (2009-2012)
  - Financial Planning Committee (2009-2012)
  - Audit Committee Chair (2009-2012)
  - Retirement Committee Executive Board (2009-2012)
  - Professional Registration Committee (PE Exam Writer) (1990 -)
  - EPD Publications Representative (2007-2009)
  - TMS Nominating Committee – (2004 -2008)
  - EPD Publication Committee – Chairman (2004 -2008)
  - TMS Education Committee (2002 –2007)
  - Extractive Processing Division Council Member EPD-TMS (2002-2008)
  - EPD Scholarship Selection Committee (2001 – 2008)
  - Student Affairs Committee – EPD Liaison (2001 -2004)
  - Waste Minimization Committee (1993 – 2009)
  - Physical Chemistry of Extractive Processes Committee (1971 – 1990)
  - Board of Review Metallurgical Transactions (1973 - 81)
  - Papers and Publications Committee - Extractive Metallurgy Division (1973 - 81)
  - Physical Chemistry Committee - Extractive Metallurgy Division (Vice Chairman 1983)
  - Physical Chemistry Committee - Extractive Metallurgy Division (Secretary 1982)
  - Physical Chemistry Committee - Extractive Metallurgy Division (Chairman 1984)
  - Process Fundamentals Committee - Extractive Metallurgy Division
  - Process Flow Diagrams Sub Committee, Chairman (1986-8)
  - Session Chair
    - Diffusion in Liquid Metals, Dallas (1974)
    - Gas/Solid and Gas/Liquid Reactions, Denver (1978)
    - Thermodynamics II: Modeling, Chicago (1981)
    - 6th Int'l Conf on Trends in Weld Res, Pine Mtn., GA (2002)
    - Thermodynamics of Alloys I, Las Vegas (1976)
    - Gases in Liquid Metals, New Orleans (1979)
    - Waste Treatment Minimization Conf, Lulea, Sweden (2002)
- ASM: The Materials Information Society (current)
- The American Ceramic Society (ACerS) (current)
- Association for Iron & Steel Technology (AIST) (current)
- The Minerals, Metals, and Materials, Society (TMS) (1966-current)
- Sigma Xi Research Society (current)
- Hoover Award Selection Committee, AIME Representative (2008 -2011)
- The National Association of Corrosion Engineers (NACE) (2007)
- Laser Institute of America (2004)
- Alpha Sigma Mu Honorary Society
  - Board of Directors(1980 - 84)
  - National Secretary (1980 - 84)
  - Student Chapter Advisor (1980-1995)
- ASTM: American Society for Testing Materials
  - Committee on Geothermal Resources and Energy; Secretary (1979 - 82)
- Metallurgical Engineering Program Assessment Consultant (2006-)
- SD Engineering Society
- ARPA-E METALS Reviewer; Washington DC August, 2013

SHORT COURSES ATTENDED

- "Third Biennial Conference and Workshop on Computer Software for Chemical and Extractive Metallurgy Calculations," University of Missouri - Rolla (1989)
- "Facility for the Analysis of Chemical Thermodynamics," McMaster University, Hamilton, Ontario (1989)

INSTRUCTIONAL TEXTBOOKS, AND MONOGRAPHS

- S. M. Howard, Engineering Fundamentals, South Dakota School of Mines & Technology, 1974
- S. M. Howard and K. N. Han, Recovery and Sampling of Secondary Precious Metals, South Dakota School of Mines & Tech, 1986
- S. M. Howard, Process Control, Optimization, and Modeling, South Dakota School of Mines & Technology, 1986
- S. M. Howard, Computer Applications in Metallurgical Engineering and Material Science: 1990, TMS, Pittsburgh, PA, 1990, 1991
- S. M. Howard, Applied Numerical Methods On-line textbook, SDSM&T, Rapid City, SD , 2008
- S. M. Howard, Thermodynamics and Thermochemistry for Metallurgical Engineers, On-line textbook, SDSM&T, Rapid City, SD , 2013

SUMMER POSITIONS AND CONSULTING POSITIONS

- Dow Chemical Company; Atomic Energy Division; Rocky Flats, CO
- Lien Metals; Rapid City, SD
- Kennecott Copper Research Center; Salt Lake City, UT
- Stanford Research Institute; Materials Research Group; Menlo Park, CA
- Kerr McGee Corporation; Technical Center; Oklahoma City, OK
- U. S. Department of Defense, Defense Logistics Agency; Battle Creek, MI
- U. S. Department of Defense, Department of the Navy; Ridgecrest, CA
- Caterpillar Incorporated; Technical Center, Peoria, IL
- Yucca Mountain Project, Outer Barrier Corrosion Audit, Summerlin, NV (2004-7)

PATENTS

- S. M. Howard and Stone, G; "High Strength and High Electrical Conductivity Copper Alloys." US Patent #6074499. June 13, 2000
- S. M. Howard and Stone, G; "High Strength and High Electrical Conductivity Copper Alloys." US Patent #6231700. May 15, 2001

SELECTED PUBLICATIONS

- S. M. Howard and J. P. Hager, and J. H. Jones: *Thermodynamic Properties of the Cu-Sn and Cu-Au Systems by Mass Spectrometry* Metall. Trans., 1970, vol. 1, pp. 415-21
- S. M. Howard and J. P. Hager, and J. H. Jones: *Thermodynamic Properties of the Ge-Cu and Ge-Au Systems by Mass Spectrometry*, Metall. Trans., 1973, vol. 4, pp. 2383-88
- S. M. Howard and J. P. Hager: *Thermodynamic Properties of the Liquid Sn-Ge and Sn-Au System by Mass Spectrometry*, Metall. Trans. Vol. 9B, 1978, pp. 51-59
- Daniel Cubicciotti, Robin L. Jones, S. M. Howard, et al.: *The Formation of Iodine Induced Stress Corrosion Cracks in Zircaloys*, Journal of Nuclear Metals, 1978, vol. 78, pp. 2-16
- S.M. Howard: *Direct Activity Measurements in the Liquid Ag-Cu System Using a Valved Knudsen Cell- Mass Spectrometer System*, Metall. Trans. B, 1989, vol. 20B, pp. 845-52
- S.M. Howard and Qiling Yu: *Direct Activity Measurements in the Liquid Ag-Au-Ge System and its Solution Model Development by Computational Techniques*, Materials Research Society Symposium Proceedings, 1993, vol. 291, pp. 425-30
- J. Lui, S.M. Howard, and K. H. Han: *Adsorption Behavior of Cadmium and Zinc Ions on Oxide/Water Interfaces*, Langmuir, 1993, vol. 9, No. 12, pp. 3635-9
- J. I. Lee, S.M. Howard, J. J. Kellar, W. Cross, and K. H. Han: *Electrochemical Interactions between Silver and Sulfur in Sodium Solutions*, Metall. Trans. B, 2001, vol. 32B, pp. 895-901
- Stanley M. Howard, Bharat K. Jasthi, W. J. Arbegast, Glenn J. Grant, Santosh Koduri, Darrell R. Herling: *Friction Stir Welding of MA 957 Oxide Dispersion Strengthened Ferritic Steel*, Friction Stir Welding and Processing III, 2005, ed. K. V. Jata, M. W. Mahoney, R. S. Mishra, and T. J. Lienhert, The Minerals, Metals & Materials Society (TMS), Warrendale, PA, pp.75-9
- Sudip Bhattacharya, Stanley M. Howard, Jerrod Roalstad and James W. Sears: *Development of Functionally Graded Materials for Manufacturing Tools and Dies and Industrial Processing Equipment*, International Conference on Powder Metallurgy & Particulate Materials, Novel Materials II**,** vol. II: p*art 9*, Montréal, Québec, Canada, June 19-23, 2005, Metal Powder Industries Federation (MPIF), Princeton, NJ
- Christina Keller, S. Howard, et al.: *CUBED: South Dakota 2010 Research Center For DUSEL Experiments*, Nuclear Physics A, 2010, 834, pp. 816c–818c
- Bharat Jasthi, Edward Chen, William Arbegast, Matthew Heringer, Douglas Bice, Stanley Howard: *Friction Stir Welding of Alloy 22*, Proceedings Friction Stir Welding and Processing VI, ed. R. S. Mishra, M W. Mahoney, Y. Sato, Y Hovanski, and R. Verma, Friction Stir Welding and Processing VI, 2011 TMS Annual Meeting & Exhibition, Feb 28, 2011, San Diego, CA, The Materials, Metals, and Materials Society (TMS), Warrendale, PA, pp. 11-18
- B.K. Jasthi, E.Y. Chen, W.J. Arbegast, B. Kaligotla, M. West, C.A. Widener, and S. M. Howard: *Microstructure and Mechanical Properties of Friction Stir Processed Cast Alloy 718*, 9th International Symposium on Friction Stir Welding Proceedings, May 15-17, 2012, Huntsville, TWI Ltd, Granta Park, Great Abington, Cambridge, CB21 6AL, UK.
- B.K. Jasthi, W. J. Arbegast, and S. M. Howard: *Effect of Thermal Aging on the Corrosion and Microstructure of Friction Stir Welded Alloy 22*, Metall. Trans. A, 2012, vol. 43A, pp. 3192-201
- X.Q. Ma, B.K. Jasthi, and S.M. Howard: *Friction Stir Welding of Bulk Metallic Glass Vitreloy 106a*, Journal of Manufacturing Science and Engineering, in revision, 2013,MANU-13-1438, 8p
- N. Abgrall, S. Howard, et al., *The MAJORANA DEMONSTRATOR Neutrinoless Double-Beta Decay Experiment*, Advances in High Energy Physics, vol. 2014, Article ID 365432, 18 pages, 2014. doi:10.1155/2014/365432.
- Xiaoqian Ma, Stanley M. Howard and Bharat K. Jasthi: *Friction Stir Welding of Bulk Metallic Glass Vitreloy 106a*, Journal of Manufacturing Science and Engineering, 2014, vol. 136, issue 5, 7 pages, doi: 10.1115/1.4027941

SELECTED PRESENTATIONS AT TECHNICAL MEETINGS

- Stanley M. Howard and J. P. Hager: *Thermodynamic Properties of the Liquid Ge-Cu and Ge-Au Systems by Mass Spectrometry*, Annual Meeting of AIME, Denver, CO, 1970
- Stanley M. Howard and J. P. Hager: *Thermodynamic Properties of the Liquid Pb-Pd System by Galvanic Cell and Mass Spectrometry*, Annual Meeting of AIME, Denver, CO, 1970
- Stanley M. Howard, John Jones, and J. P. Hager: *Thermodynamic Properties of the Liquid Sn-Au and Sn-Ge Systems by Mass Spectrometry*, Annual Meeting of AIME, New York, 1971

- Stanley M. Howard and J. P. Hager: *Additional Methods of Measuring Activities by Mass Spectrometry*, Annual Meeting of AIME, San Francisco, CA, 1972
- Stanley M. Howard and J. P. Hager: *Binary Gibbs-Duhem Integration Using an Implicitly Defined Integration Function*, Annual Meeting of AIME, Dallas, TX 1974
- Stanley M. Howard and Dan Carda: *Corrosivity of Geothermal Waters of Western South Dakota*, Corrosion/80, National Association of Corrosion Engineers, Chicago, IL, 1980
- Stanley M. Howard and Dan Carda: *Geothermal Direct Heat Applications*, Semi-annual Review Meeting, Geothermal Energy Division, U. S. Department of Energy, Boise, ID, 1981
- Stanley M. Howard: *A New Method of Directly Measuring Activities By the Mass Spectrometric Analysis of Knudsen Cell Effusates From a Valved Knudsen Cell*, Annual Meeting of AIME, Chicago, IL, 1981
- Stanley M. Howard: *Direct Activity Measurements in the Liquid Ag-Au-Ge System and its Solution Model Development by Computational Techniques*, Materials Research Institute Annual Meeting, Detroit, MI, 1993
- Stanley M. Howard: *Computer Simulation of The Investment Casting Process Using Rapidcast® Software*, 9th Annual Santa Fe Symposium, Albuquerque, NM, 1995
- Stanley M. Howard, Bharat K. Jasthi, William J. Arbegast, Glenn J. Grant, Santosh Koduri, Darrell R. Herling: *Friction Stir Welding of MA 957 Oxide Dispersion Strengthened Ferritic Steel*, Friction Stir Welding and Processing III**,** TMS 2005 Annual Meeting, San Francisco, CA, Feb 13-17, 2005
- Rakesh Suravarapu, Katharine Flores, William Arbegast, Stanley Howard: Friction Stir Welding Of Bulk Metallic Glasses – Vitreloy106a Friction Stir Welding And Processing - IV Symposium, TMS Annual Meeting & Exhibition, Orlando, FL,2007
- Bharat Jasthi, Stanley Howard, Casey Allen, William Arbegast: Effects of Friction Stir Welding On The Coefficient Of Thermal Expansion Of Invar 36, Friction Stir Welding And Processing – IV Symposium. TMS Annual Meeting & Exhibition, Orlando, FL,2007
- Bharat Jasthi, Aaron Costello, William Arbegast, Stanley Howard: Investigation Of Laser Deposition Of High Temperature Refractory Pin Tools For Friction Stir Welding, Friction Stir Welding And Processing - IV Symposium, TMS Annual Meeting & Exhibition, Orlando, FL,2007
- James Sears, Jerrod Roalstad, Sudip Bhattacharya, Aaron Costello, Stanley Howard: *Characterization Of A Cobalt-Based Powder Alloy Laser Deposited on H-13 Hot Die Forging Tools*, Properties And Performance of High Temperature Alloys And Coatings Symposium, TMS Annual Meeting & Exhibition, Orlando, FL,2007
- S. M. Howard, W. Arbegast, Bharat K Jasthi: Friction Stir Welding of Alloy 22, Symposium on Friction Stir Welding and Processing VI, Session on High Temperature Materials I, 2010 Meeting, 2011 TMS Annual Meeting & Exhibition, Seattle, WA, Feb 14-18, 2010
- Bharat Jasthi, Edward Chen, William Arbegast, Matthew Heringer, Douglas Bice, Stanley Howard: *Friction Stir Processing of Cast Inconel 718*, Friction Stir Welding and Processing VI Symposium, 2011 TMS Annual Meeting & Exhibition, San Diego, CA, Feb 28-Mar 3, 2011
- Bharat Jasthi, Edward Chen, William Arbegast, Matthew Heringer, Douglas Bice, Stanley Howard: *Friction Stir Welding of Alloy 22*, Friction Stir Welding and Processing VI Symposium, 2011 TMS Annual Meeting & Exhibition, San Diego, CA, Feb 28-Mar 3, 2011

SPONSORED RESEARCH FUNDING

- National Science Foundation
- U. S. Environmental Protection Agency
- NSF-EPSCoR
- U. S. Department of Energy
- Control Data Corporation
- U. S. Department of Defense
- U. S. Bureau of Mines
- U. S. Energy, Research, and Development Agency
- State of SD Office of Energy Policy
- State of SD Office of Economic Development
- SIPI Metals, Chicago, Ill
- Army Research Laboratory
- Edison Welding Institute
- Pacific Northwest Nat'l Laboratory

MAJOR COMPUTER MODELS DEVELOPED FOR INDUSTRY & GOVERNMENT

- Generalized Model for a Gas Flow Reactor with Particulate Nucleation and Growth
- Three Dimensional Thermal Gradients in Multilayered Circuit Boards during Solder Reflow
- Gas Kinetics in the Carburization Process
- Use of Oxygen Probes to Determine Nitriding Potentials in Steel Heat Treating
- Modeling of Carburization Profiles

SOFTWARE/WEB DEVELOPMENT (http://showard.sdsmt.edu)

- Roster Builder, 2003.
- Outlook Calendar Populator by Merge Mail VBA Macro, 2003
- ThermoXP, 2002.
- CalendarMaker, 2005
- GradeAutoMailer, 2006
- Xcuser, 2006
- Ellingham Diagram Maker, 2007-14
- Multi-university Cooperative Continuous Curriculum Improvement System for ABET Accreditation in BS Metallurgical Engineering.
- Applied Numerical Methods Textbook
- Metallurgical Thermochemistry Textbook, 2010-
- *GradesToGo* Campus Grading Utility, 2008-
- ABET and Continuous Improvement System: http://www.ABETMetEng.org/SD (1998 -)

CAMPUS COMMITTEES

- Faculty Senate - Chair
- Research – Chair
- Computation – Chair
- Library – Chair
- Faculty Club – Chair
- Science Fair
- Honors Convocation
- Undergraduate Transfer
- Materials Engineering and Science
- Engineering Accreditation
- Academic Appeals
- EPSCoR Proposal Committee
- Enrollment Task Force Committee
- Outstanding Recent Graduate
- Hardrocker Flying Club
- Freshman Curriculum
- Freshmen Advisor
- Aviation Committee
- Safety Committee
- SWEAT – Team for Accreditation Review

CAMPUS SERVICE

- Past Chair of the SDSM&T Faculty and Faculty Senate (2013 -14)
- President Search Committee (2013)
- Physical Metallurgy Professor Search Committee (2013)
- Extractive Metallurgy Professor Search Committee (2013)
- Academic Appeals Committee (1998 -)
- United Way community Representative (2012)
- United Way "Over the Top" Organizer (2012 -)
- Chair of the SDSM&T Faculty (2010 - 12)
- Chair of the SDSM&T Faculty Senate (2010 - 12)
- Associate Vice President for Research-Economic Development Search Committee (2012)
- Physical Metallurgy Professor Search Committee (2004)
- Material Advantage Student Chapter Advisor (2000 -)
- TMS/ASM Chapter Faculty Advisor (1987 -1999)
- Alpha Sigma Mu Chapter Faculty Advisor (1980 - 92)
- Visiting Scientist Lecturer (1991 - 92)
- Chair, Department of Materials and Metallurgical Engineering (1994 - 2000).
- Metallurgical Engineering ABET and Continuous Improvement Director (1988 -)
- Tech Day (1974 - 75) - Organized, and Chaired
- Football Ticket Sales (197 - 78) - Supervised personnel at Tech football games
- Science Day (1976) - Chairman
- High School Recruiting Engineering Representative

OTHER SKILLS AND ACHIEVEMENTS

- Land Surveyor
- Certified Scuba Diver
- French Language
- Aircraft Pilot

COMPUTER EXPERTISE

MATLAB	Visual Basic	JavaScript	FireWorks
MathCad	Microsoft Excel	LINGO	Director
Dreamweaver	LabView	ThermoCalc	FrontPage
MSCPal	Microsoft Word	Dictra	Authorware
RapidCast	Mathematica	PageMaker	Visual Studio.NET
Flash	Power Point	Publisher	Computer Languages
PageMaker	Solid Works	AllWebMenus	APL
Met Sim	MatLab	MATLAB	C+
F*A*C*T	Pathware	ProCast	BASIC
			FORTRAN

COMMUNITY SERVICE

• United Way Community	2012-14
• Rapid City Waste Tire Task Force	1994
• Highway Cleanup Program	Material Advantage Chapter (Sheridan Lake Road) (2000 -)
• Wellspring Children's Home	Material Advantage Chapter Day Hosting of Children(2000 - 2012)
• Visiting Scientist Program	1,430 K-6 students addressed (1991-2)
• Parent Teachers Association	Board Member; Pinedale School; Rapid City, SD
• Consultation (gratis)	Corrosion advice to numerous non-profit organizations
• Tutor	High School Student Math
• After School Programs	WPC West Middle School after-school programs