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University of Idaho
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EDUCATION

Doctor of Philosophy, Johns Hopkins University, Baltimore, Maryland, 1985
Dissertation Advisor: Professor Stanley Corrsin
Bachelor of Science, University of Colorado, Boulder, Colorado, 1977

PROFESSIONAL EXPERIENCE

1997 – present	Professor of Mechanical Engineering, University of Idaho
2005 – 2006	Sabbatical: Center for Ecohydraulics Studies, UI Boise
1999 – 2005	Chair of Mechanical Engineering, University of Idaho
1991 - 1997	Associate Professor of Mechanical Engineering, University of Idaho.
1993 – 1994	Sabbatical: Visiting Research Professor of Mechanical Engineering, University of Ottawa. Guest researcher at High Speed Aerodynamics Laboratory, National Research Council of Canada.
1985 - 1991	Assistant Professor of Mechanical Engineering, University of Idaho.
1989 cal. year	Office of Naval Technology Postdoctoral Fellow, Naval Postgraduate School. Advisor: T. Sarpkaya.
1980 - 1985	Research Assistant, Johns Hopkins University

RESEARCH PROFILE

Fluid dynamics and turbulent transport with emphasis on unsteady flows and the heat and mass transfer coupled with them. Recent investigations include, (1) development of novel techniques for dynamic measurements of velocity, temperature, and species concentration fields in fluid flows, (2) fluid dynamics of abdominal aortic aneurysms and stenotic coronary arteries, (3) ultrasonic particle manipulation in flowing fluids, (4) experimental investigation of the flow over turbine blade models with realistic rough surfaces, and (5) enhancing design, build, and test projects with wind tunnels activities.

PROFESSIONAL ACTIVITIES AND AWARDS

Have reviewed proposals for NIH and NSF. Have reviewed manuscripts for the American Society of Mechanical Engineers (Biomechanical Engineering, Fluids Engineering, and Heat Transfer), Experiments in Fluids, the Journal of Biomechanics, and for the Annals of Biomedical Engineering. Have reviewed books for Applied Mechanics Reviews.

Member, American Society of Mechanical Engineers and American Physical Society (Fluid Dynamics Division)

Forum organizer and chair, "Symposium on the Manipulation of Particles by External Forcing," ASME Summer Annual Fluids Engineering Meeting, 1998

Forum organizer and chair, ASME Summer Annual Fluids Engineering Meeting, 1993 and 1995.

Panelist in the Fourth International Symposium on Thermal Anemometry, 1996 ASME Summer Annual Fluids Engineering Meeting

1989 calendar year. Office of Naval Technology Postdoctoral Fellowship

1978 - 1985 Johns Hopkins University Institute Fellowship

1977 Graduated with special honors from the University of Colorado

COURSES TAUGHT

Undergraduate classes: Sophomore Lab, Experimental Methods for Engineers, Senior Lab, Fluid Mechanics*, Gas Dynamics*, Honors seminar: Life, Art, and Technology in Moving Fluids

Graduate Classes: Advanced Fluid Dynamics*, Experimental Methods in Fluid Dynamics and Heat Transfer, Convection Heat Transfer*

*These course have been video taped and are offered to off campus students through the University of Idaho Engineering Outreach Program.

STUDENT RESEARCH SUPERVISION

Have served as major professor to three Ph.D. students and over 20 Masters of Science and Masters of Engineering students. Have supervised many undergraduate research assistants in on-going research projects. Several undergraduates have received summer funding and are co-authors of publications.

REFEREED JOURNAL PUBLICATIONS

- Budwig, R.S., Anderson, M.J., Putnam, G., and Manning, C. Ultrasonic particle size fractionation in a moving air stream. Submitted to the Journal of Ultrasonics.
- Stephens, Terrance L. and Budwig, Ralph S. 2007 Three-axis acoustic device for levitation of droplets in an open gas stream and its application to examine sulfur dioxide absorption by water droplets. *Rev. Sci. Instrum.*, **78**, 01490-1 to 11490-8.
- McIlroy Jr, H.M. and Budwig, R.S. 2007 The boundary layer over turbine blade models with realistic rough surfaces. *ASME Journal of Turbomachinery*, **129**, 318 – 330.
- Anderson, M.J., Line, K.S., and Budwig, R.S. 2002 The effect of large openings on cavity amplification at ultrasonic frequencies. *J. Acoust. Soc. Am.*, **112**, 2771-2778.
- Egelhoff, C.J., Budwig, R.S., Elger, D.F., Khraishi, T.A., and Johansen, K.H. 1999 Model studies of flow in abdominal aortic aneurysms during resting and exercise conditions. *J. Biomechanics*, **32**, 1319-1329.
- Zwart, Philip, Budwig, Ralph, and Tavoularis, Stavros. 1997 Grid turbulence in compressible flow. *Experiments in Fluids*, **23**, 520-522.
- Budwig, R., Egelhoff, C.J., and Tavoularis, S. 1997 Laminar pulsatile flow through a axisymmetric sudden expansion. *ASME Journal of Fluids Engineering* **119**, 208-211.
- Elger, D.F., Blacketter, D.M., Budwig, R.S., and Johansen, K.H. 1996 The influence of shape on the stresses in model abdominal aortic aneurysms. *ASME Journal of Biomechanical Engineering*, **118**, 326-332.
- Budwig, R. 1994 Refractive index matching methods for liquid flow investigations. *Experiments in Fluids*. **17**, 350-355.

- Budwig, R., Elger, D., Hooper, H., and Slippy, J. 1993 Steady flow in abdominal aortic aneurysm models. *Journal of Biomechanical Engineering*, **115**, 418-423.
- Lee, T. and Budwig, R. 1991 The onset and development of circular cylinder vortex wakes in uniformly accelerating flows. *J. Fluid Mech.* **232**, 611-627.
- Lee, T. and Budwig, R. 1991 Two improved methods for low-speed hot-wire calibration. *Meas. Sci. Technol.* **2**, 643-646.
- Lee, T., and Budwig, R. 1991 A study of the effect of aspect ratio on circular cylinder wakes. *Phys. Fluids A*. **3**, 309-315.
- Budwig, R. 1990 Comments on "Thermistor thermometry induced errors induced by forced convection" by K. Kroos, *ICHMT*, 14, 281, 1987. *Int Comm. Heat and Mass Transfer*, **17**, 117.
- Budwig, R. and Quijano, C. 1989 A new method for in-situ dynamic calibration of temperature sensors. *Rev. Sci. Instrum.* **60**, 3717-3720.
- Budwig, R. and Peattie, R. 1989 Two new circuits for hydrogen bubble flow visualization. *J. Phys. E: Sci. Instrum.* **22**, 250-254.
- Peattie, R. and Budwig, R. 1989 Heat transfer in laminar oscillatory flow in cylindrical and conical tubes. *Int J Heat Mass Transfer.* **32**, 923.
- Budwig, R., Tavoularis, S. & Corrsin, S. 1985 Temperature fluctuations and heat flux in grid generated isotropic turbulence with streamwise and transverse temperature gradients. *J. Fluid Mech.* **153**, 441-460.

REFEREED PROCEEDINGS

- McIlroy Jr, H.M. and Budwig, R.S. The boundary layer over turbine blade models with realistic rough surfaces. In the Proceedings of ASME Turbo Expo 2005, paper GT200-68342, June, 2005, Reno.
- H.M. McIlroy, Jr., R.S. Budwig, and D.M. McEligot, 2003, "Scaling of Turbine Blade Roughness for Model Studies," presented at the ASME Congress - IMECE'03, paper IMECE2003-42167, Washington, D.C., November 2003.
- Anderson, M.J., Budwig, R.S., Cluff, A., Lemmon, E.C., and Putnam, G. The physics and technology of ultrasonic particle separation in air. Invited presentation and paper. In the proceedings of the 2003 World Congress on Ultrasonics, pp. 1615 – 1621, Paris, 2003.
- Elger, D., Budwig, R, et al. Changing Educational Practices – Uncovering the Real Issues, Proceedings of the 2003 ASEE/IEEE Frontiers in Education Conference, Boulder, CO, November, 2003.
- Anderson, M.J., Budwig, R.S., Line, K.S., and Frankel, J.G. Use of acoustic radiation pressure to concentrate small particles in an air flow. In the proceedings of the 2002 IEEE-UFFC conference held in Munich, October, 2002.
- Cunnington, J.M., Westra, L.J., Beyerlein, S.W., Budwig, R.S., and Elger D.F. Design of a wind tunnel facility for hands-on use by beginning engineering students. In the proceedings of the proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition held in Montreal, June 2002.
- Egelhoff, C.J., Budwig, R.S., Foster, J.K., and Hanson B. Investigation of coronary artery stenosis hemodynamics using experimental and computational models: influence of flowrate, size, symmetry and wall roughness. In the proceeding of the ASME International Mechanical Engineering Congress and Exposition, paper number IMECE2001/BED-23135, New York, November 2001.
- Beyerlein, S., Blackketter, D., Lemmon, E.C., and Budwig, R. 2001 Rubric for connecting classroom teaching/learning with ABET 2000 program outcome expectations. In the proceedings of the Best Assessment Processes IV Symposium on the campus of Rose-Hulman Institute of Technology, April 6-8, 2001, Terre Haute, Indiana.

- McKenzie, L.J., Conley, D.M., Walser, T., Beyerlein, S.W., and Budwig, R.S. Using participant-oriented evaluation to evaluate technical electives in mechanical engineering. In the proceedings of the American Evaluation Associate Annual Conference, November 2001.
- Elger, D.F., Beyerlein, S.W., and Budwig, R.S. Using design, build, and test projects to teach engineering. In the proceedings of the 30th ASEE/IEEE Frontiers in Education Conference, October, 2000.
- Egelhoff, C.J., Budwig, R.S., Elger, D.F., and Khraishi, T.A. A model study of flow regimes in abdominal aortic aneurysms. In the proceeding of the ASME Symposium on Bio-Medical Fluid Engineering, FEDSM97-3431.
- Khraishi, T.A., Elger, D.F., Budwig, R.S., and Johansen, K.H. The effect of branch arteries on the wall stresses abdominal aortic aneurysm models. In the proceeding of the ASME Symposium on Bio-Medical Fluid Engineering, FEDSM97-3432.
- Budwig, R., Zwart, P.J., Nguyen, V., and Tavoularis, S. Grid generated turbulence in compressible streams. In the proceedings of the Symposium on Transitional and Turbulent Compressible Flows, ASME Fluids Engineering Division Summer Meeting, FED-Vol. 224, pp. 209-216, August, 1995.
- Elger, D.F., Slippy, J.B., Budwig, R.S., and Khraishi, T.A., Johansen, K.H. A numerical study of the hemodynamics in a model abdominal aortic aneurysm. In the proceedings of the Symposium on Bio-Medical Fluids Engineering, ASME FED Summer Meeting, FED-Vol. 212, pp. 15-22, August, 1995.
- Hooper, H., Budwig, R., Elger, D.F., and Slippy, J. Flush mount hot-film anemometry: calibration methods and transition measurements. In the proceedings of the Third International Symposium on Thermal Anemometry, ASME FED Summer Meeting, FED-Vol. 167, pp.169-174, June, 1993.
- Lee, T. and Budwig, R. The onset and development of vortex streets in unsteady flow. In the proceedings of the ASME International Symposium on Nonsteady Fluid Dynamics, FED-Vol. 92, pp. 51-58, June, 1990.
- Beyerlein, S., Budwig, R., and Anderson, M. 1992 Teaching students to acquire and analyze voltage signals from dynamic systems. In the proceedings of the 1992 Annual Meeting of the American Society of Engineering Education, Toledo, OH, June, 1991.
- Budwig, R., Anderson, M., Beyerlein, S., and Elger, D. 1991 An undergraduate sound measurement laboratory. In the proceedings of the 1991 Annual Meeting of the American Society of Engineering Education, New Orleans, June, 1991.

BOOK REVIEWS

- Physics of Pulsatile Flow by M. Zamir. Springer-Verlag, Wien, Austria. 2000. Reviewed by Ralph S. Budwig in Applied Mechanics Reviews, vol 55, no 2, March 2002.
- Viscous Fluid Flow by T.C. Papanastasiou, G.C. Georgiou and A.N. Alexandrou. CRC press, Boca Raton FL. 2000. Reviewed by Ralph S. Budwig in Applied Mechanics Reviews, vol 53, no 5 May 2000.
- Introduction to Fluid Mechanics by J.A. Fay. MIT Press, Cambridge MA. 1994. Reviewed by Ralph S. Budwig in Applied Mechanics Reviews, vol 48, no 5 May 1995.

SELECTED CONFERENCE PUBLICATIONS, ABSTRACTS, AND OTHER REPORTS

- McIlroy, H. M. Jr., Budwig, R. S., and McEligot, D. M., "Effects of realistic roughness on turbine blade flow," David Taylor Model Basin, Naval Surface Warfare Center, Carderock Division, Carderock, MD., January 24, 2005, presented by D. M. McEligot.

- McIlroy, H. M. Jr., Budwig, R. S., and McEligot, D. M., "Effects of realistic roughness on turbine blade flow," Mechanical Engineering Department, West Virginia University, Morgantown, WV., January 28, 2005, presented by D. M. McEligot.
- McIlroy, H. M. Jr., Budwig, R. S., and McEligot, D. M., 2003, "Effects of realistic roughness on turbine blade flow," E. R. G. Eckert 100th Anniversary Symposium on Heat Transfer, University of Minnesota, Minneapolis, MN, September 13, 2004, presented by D. M. McEligot.
- Budwig, R.S., Anderson, M.A., Putnam, G., Crew, T., and Frankel, J. "Particle separation in air flows by acoustic radiation pressure". A poster presented in the flow visualization gallery at the 57th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Seattle, November, 2004.
- Anderson, M.J., Line, K.S., and Budwig, R.S. The effect of mean fluid flow on an acoustic standing wave in an open cavity, presented at the 144th Meeting of the Acoustical Society of America, December 2002.
- Budwig, R.S., Frankel, J.G., Anderson, M.J., and Line, K.S., Use of radiation pressure to move small particles in an air flow-through resonator. Presented at the 142nd Meeting of the Acoustical Society of America, December 2001.
- Line, K.S., Anderson, M.J., and Budwig, R.S., The performance of a two-dimensional acoustic resonators with large openings. Presented at the 142nd Meeting of the Acoustical Society of America, December 2001.
- Budwig, R.S., McIlroy Jr., H.M., Dalling, W.J., McEligot, D.M., Condie, K.G., Pink, R.J., and McCreery, G.E.. Near-wall behavior of a transitional boundary layer. Presented at the Annual Meeting of the American Physical Society, Division of Fluid Dynamics, San Diego, November 2001.
- Budwig, R.S., "The boundary layer over turbine blade models with realistic rough surfaces." Presented at the Air Force Office of Scientific Research Contractors' Meeting in Turbulence and Rotating Flows, August 2000, Dayton, Ohio.
- Egelhoff, C.J., Budwig, R.S., Foster, J.K., and Hanson B., "Coronary artery stenosis flow: experimental and computational investigation". Presented at the Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Washington, D.C., November 2000.
- Budwig, R.S., Hansen, B., Egelhoff, C.J., and Foster, J., "A study of pulsatile flow in stenotic coronary artery models: Influence of flow rate and stenosis size, symmetry, and wall roughness." Presented at the 2000 Annual Fall Meeting of the Biomedical Engineering Society, October 2000, Seattle, Washington.
- Egelhoff, C.J., Budwig, R.S., Elger, D.F., and Daniels, J., "A study of pulsatile flow in stenotic coronary artery models." In the proceedings of the Forum on Unsteady Flows, ASME Fluids Engineering Division Summer Meeting, FED-Vol. 225. Paper number FEDSM98-4948, June 1998.
- Elger, D.F., Boyd-Davis, T.M., and Budwig, R.S., "Comparison of streaming flow produced by a cylinder and a V shaped rod." In the Proceedings of the 1998 ASME Fluids Engineering Division Summer Meeting, June, 1998, Washington, DC. Paper number FEDSM98-5184.
- Egelhoff, C.J., Comstock, J., Foster, J., and Budwig, R.S., "Visualization of pulsatile flow in stenotic coronary artery models". A poster presented in the flow visualization gallery at the Fifty-First Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Philadelphia, November, 1998.
- Egelhoff, C.J., Comstock, J., Khraishi, T.A., Elger, D.F., and Budwig, R.S., "Model studies of abdominal aortic aneurysms hemodynamics". A poster presented in the flow visualization gallery at the Fiftieth Annual Meeting of the American Physical Society, Division of Fluid Dynamics, San Francisco, November, 1997.

- Budwig, R.S. and Foster, J.K., "Oil flow characteristics in the test section of the INEEL MIR facility." A final report submitted to Donald McEligot at INEEL in September, 1997.
- Budwig, R.S., Egelhoff, C.J., Elger, D.F., Stephens, T.L., and Johansen, K.H. Turbulence in Abdominal Aortic Aneurysms. Presented at the Annual Meeting of the Biomedical Engineering Society, October, 1996.
- Khraishi, T.A., Elger, D.F., Slippy, J.B., Budwig, R.S., and, Johansen, K.H. The effect of modeling parameters on the hemodynamics of abdominal aortic aneurysm. In the proceedings of the Forum on Unsteady Flows, ASME FED Summer Meeting, July, 1996.
- Elger, D.F., Justice, G.K., and Budwig, R.S. The fluid dynamics of oscillating flow within an axisymmetric sudden expansion. In the proceedings of the Forum on Unsteady Flows, ASME FED Summer Meeting, July, 1996.
- Budwig, R., and Carleson, T., Martinez, J., and Tieg, J. Interphase transport to stationary and oscillated droplets. (Abstract) Bulletin of the American Physical Society, 40 (12), 1922, 1995.
- Budwig, R.S., Yamane, R., and Crowe, C.T., eds., Instructional Fluid Dynamics, FED-Vol. 220, ASME: New York, 1995.
- Martinez, J.V., Budwig, R.S., and Carleson, T.E. The visualization and measurement of concentration fields of ultrasonically levitated and oscillated droplets. Flow Visualization VII, Proceeding of the 7th International Symposium on Flow Visualization, ed. J.P. Crowder, pp. 378-383, Begell House, Inc., New York, 1995.
- Justice, G.K., Elger, D.F., and Budwig, R.S. 1995 Visualization of oscillating flow through a sudden expansion. Flow Visualization VII, Proceeding of the 7th International Symposium on Flow Visualization, ed. J.P. Crowder, pp. 498-503, Begell House, Inc., New York, 1995.
- Budwig, R. and Tavoularis, S. 1995 Steady and pulsatile flows through an axisymmetric sudden expansion. In the proceedings of the Forum on Unsteady Flows, ASME FED Summer Meeting, August, 1995.
- Budwig, R., Martinez, J. and Carleson, T. Hydrodynamic and mass transfer characteristics of acoustically levitated and oscillated droplets. (Abstract) Bulletin of the American Physical Society, **38** (12), 2226, 1993.
- Budwig, R.S., Foss, J.F., and Stock, D.E., eds., Forum on Instructional Fluid Dynamics Experiments, FED-Vol. 152, ASME: New York, 1993.
- Elger, D., Budwig, R., and Slippy, J. A second lab for introducing laser-Doppler-velocimetry. The proceeding of the Forum on Instructional Fluid Dynamics Experiments, ASME FED Summer Meeting, June, 1993.
- Budwig, R., Elger, D.F., Hooper, H., and Slippy, J. Flow patterns and wall stresses in abdominal aortic aneurysm models. (Abstract) Proceedings of the Biomedical Engineering Society Third Annual Fall Meeting, 1992.
- Elger, D.F., Budwig, R.S., Hooper, H., and Slippy, J. Flow in a single axisymmetric bulge in a tube. (Abstract) Bulletin of the American Physical Society, **36** (10), 2718, 1991.
- Shropshire, G., Budwig, R., and Karsky, T. 1991 Computer simulation and measurement of parameters for a direct nozzle injection sprayer. Paper No. PNW9188-1542. Am. Soc. Agric. Eng.
- Budwig, R. 1991 Instrumentation for dynamic measurements. Final report submitted to OEID/ENG Office of the National Science Foundation, June, 1991.
- Budwig, R. and Karsky, T. 1990 Evaluation and development of chemical injection systems for mobile agricultural spray equipment. Final report submitted to Western Region Pesticide Assessment Program (USDA); August, 1990.
- Budwig, R. 1990 Instrumentation for dynamic measurements. Progress report submitted to OEID/ENG Office of the National Science Foundation, February, 1990.

- Budwig, R. 1989 Time dependent separated flow over bluff bodies. Final report submitted to the Office of Naval Technology, December, 1989.
- Budwig, R. and Quijano, C. 1989 A new method for in-situ dynamic calibration of temperature sensors. In the proceedings of the ASCE/ASME Mechanics Conference, La Jolla, California, July, 1989.
- Budwig, R., Beyerlein, S., Messenger, M., Niebauer, D., and Quijano, C. Dynamic temperature measurement. In the proceedings of the 1988 ASEE Annual Conference. Portland, Oregon, June, 1988.
- Budwig, R., McDonald, J., and Karsky, T. 1988 Evaluation of chemical injection systems for mobile agricultural equipment. Paper No. 88-1542. Am. Soc. Agric. Eng.
- Budwig, R. 1987 Vortex shedding behind a circular cylinder in constant acceleration flows. (Abstract) Bull. Am. Phys. Soc. 32, 2093.

FUNDED RESEARCH

- PI of UI portion: "Optimal bio-aerosol sampler," ARO STTR Phase II, UI portion - \$120,500, November, 2004 to September, 2006
- PI: "Design of a subsoil granular polyacrylamide application system," USDA, \$26,028, September 2004 to August, 2006
- PI of UI portion: "Optimal bio-aerosol sampler," ARO STTR Phase I, UI portion - \$16,600, August, 2003 to March, 2004
- Co-PI: "Enhancing 'design, build and test projects' by adapting wind tunnel activities," NSF, \$92,289, May, 2000 to April, 2002
- PI: "The boundary layer over turbine blade models with realistic rough surfaces," AFOSR, \$315,000, May, 2000 to April, 2003
- Co-PI: "Open acoustic resonators with mean flow," ARO, \$278,031, June, 2000 to May, 2003
- Travel Grant, University of Idaho Research Council, \$900, May, 1998.
- Co-PI: "An experimental study of oscillating flow through a sudden expansion," NASA Idaho Space Grant Consortium, \$5,000, July, 1995 to February, 1996
- Co-PI: "Absorption of sulfur dioxide by circulating and oscillating drops," EPA, \$240,000, October, 1994 to September, 1997.
- Travel Grant, Associated Western Universities, \$400, July, 1995.
- Travel Grant, University of Idaho Research Council, \$600, May, 1995.
- PI: "Hemodynamic effects on the growth and rupture of abdominal aortic aneurysms," NIH, \$102,907, May, 1994 to November, 1996.
- Co-PI: "An experimental study of oscillating flow through a sudden expansion," NASA Idaho Space Grant Consortium, \$5,000, March, 1994 to February, 1995.
- PI: UI sabbatical evaluation committee, July, 1993 to June, 1994. Approved.
- Co-PI: "The behavior and mass transfer of charged droplet swarms in alternating and direct electric fields," DOE, \$42,000, December 1, 1992 to November 30, 1993.
- Travel Grant, University of Idaho Research Council, \$600, September, 1992.
- PI: "Investigation of flow phenomena and wall shear stress in aneurysm models," American Heart Association, \$14,665, July 1, 1991 to June 30, 1992.
- Co-PI: "Development of improved methods for direct chemical injection in agricultural field sprayers," USDA, \$18,000, July 1, 1991 to December 30, 1992.
- PI: "Investigation of flow phenomena and wall shear stress in aneurysm models," American Heart Association, \$10,824, July 1, 1990 to June 30, 1991.
- Travel Grant, University of Idaho Research Council, \$600, March, 1990.
- Project director: "Instrumentation for Dynamic Measurements," NSF, Instrumentation and Laboratory Improvement Program, \$46,000, November, 1988.

- Co-PI: "Evaluation and development of chemical injection systems for mobile agricultural spray equipment," USDA, \$15,000, August, 1988 to August, 1989.
- PI: "Evaluation and development of chemical injection systems for mobile agricultural spray equipment," FMC Agricultural Chemical Group, \$7,000, July, 1988.
- PI: "An experimental investigation of the wake of a circular cylinder in unsteady flow," University of Idaho Research Council, \$4000, July 1, 1986 to June 30, 1987.
- PI: "A non invasive technique for the measurement of temperature in turbulent flows," University of Idaho Research Council, \$3500, July 1, 1985 to June 30, 1986.
- Co-PI: On applications for equipment donations from Hewlett-Packard. The Mechanical Engineering Department has obtained in excess of one million dollars of equipment from Hewlett-Packard from 1986 to present.

SELECTED COMMITTEE WORK

University Level

- Graduate Student Association Research Exhibition Judge 2002, 2003, & 2005
- Honors Committee 2000 – 2003
- Search Committee for UI VP Research 2000 - 01
- Graduate Council (peer elected office), 1995 – present
- Affirmative Action Committee, 1995 -1997
- Faculty Council (peer elected office), 1990 -1993

College Level

- Chair of Engineering Design Expo, 2005
- Search Committee Chair for C.E. Chair, 2001- 02
- Tenure and Promotion Task Force, 1999 - 2002

Departmental Level

- Laboratory Committee, 1986 - present
- Numerous search committees and tenure review committees
- Accreditation Committee (Chair) 1999 - 2005